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Radio Resource Control (RRC);
Protocol specification
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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:
   1 presented to TSG for information;
   2 presented to TSG for approval;
   3 or greater indicates TSG approved document under change control.

y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.
1 Scope

The present document specifies the Radio Resource Control protocol for the radio interface between UE and E-UTRAN as well as for the radio interface between RN and E-UTRAN.

The scope of the present document also includes:

- the radio related information transported in a transparent container between source eNB and target eNB upon inter eNB handover;
- the radio related information transported in a transparent container between a source or target eNB and another system upon inter RAT handover.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
[3] 3GPP TS 36.302: "Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer".
[10] 3GPP TS 22.011: "Service accessibility".


[16] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[17] 3GPP TS 25.101: "Universal Terrestrial Radio Access (UTRA); User Equipment (UE) radio transmission and reception (FDD)".

[18] 3GPP TS 25.102: "Universal Terrestrial Radio Access (UTRA); User Equipment (UE) radio transmission and reception (TDD)".


[20] 3GPP TS 45.005: "Radio transmission and reception".

[21] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".

[22] 3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

[23] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".


[26] 3GPP2 C.S0024-C v2.0: "cdma2000 High Rate Packet Data Air Interface Specification".

[27] 3GPP TS 23.003: "Numbering, addressing and identification".

[28] 3GPP TS 45.008: "Radio subsystem link control".

[29] 3GPP TS 25.133: "Requirements for Support of Radio Resource Management (FDD)".


[31] 3GPP TS 36.401: "Evolved Universal Terrestrial Radio Access (E-UTRA); Architecture description".

[32] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

[33] 3GPP2 A.S0008-C v4.0: "Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network".

[34] 3GPP2 C.S0004-F v1.0: "Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems"

[35] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[36] 3GPP TS 44.060: "General Packet Radio Service (GPRS); Mobile Station (MS) - Base Station System (BSS) interface; Radio Link Control/Medium Access Control (RLC/MAC) protocol".

[37] 3GPP TS 23.041: "Technical realization of Cell Broadcast Service (CBS)"

[38] 3GPP TS 23.038: "Alphabets and Language"
[39] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access (E-UTRAN); S1 Application Protocol (S1 AP)".

[40] 3GPP TS 25.304: "Universal Terrestrial Radio Access (UTRAN); User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode".


[42] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[43] 3GPP TS 45.005: "GSM/EDGE Radio transmission and reception".

[44] 3GPP2 C.S0089-A v2.0: "E-UTRAN - cdma2000 HRPD Connectivity and Interworking Air Interface Specification"

[45] 3GPP TS 44.018: "Mobile radio interface layer 3 specification; Radio Resource Control (RRC) protocol".

[46] 3GPP TS 25.223: "Spreading and modulation (TDD)".

[47] 3GPP TS 26.041: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".


[49] 3GPP TS 24.008: "Mobile radio interface layer 3 specification; Core network protocols; Stage 3".

[50] 3GPP TS 45.010: "Radio subsystem synchronization".

[51] 3GPP TS 23.272: "Circuit Switched Fallback in Evolved Packet System; Stage 2".

[52] 3GPP TS 26.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[53] 3GPP2 C.S0097-0 v3.0: "E-UTRAN - cdma2000 1x Connectivity and Interworking Air Interface Specification".

[54] 3GPP TS 26.355: "LTE Positioning Protocol (LPP)"


[56] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

[57] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".

[58] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".

[59] 3GPP TS 22.368: "Service Requirements for Machine Type Communications; Stage 1".

[60] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

[61] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".

[62] 3GPP TS 22.146: "Multimedia Broadcast/Multicast Service (MBMS); Stage 1".

[63] 3GPP TR 36.816: "Evolved Universal Terrestrial Radio Access (E-UTRA); Study on signalling and procedure for interference avoidance for in-device coexistence".

[64] IS-GPS-200F: "Navstar GPS Space Segment/Navigation User Segment Interfaces".
3GPP TS 25.307: "Requirement on User Equipments (UEs) supporting a release-independent frequency band".

3GPP TS 24.312: "Access Network Discovery and Selection Function (ANDSF) Management Object (MO)".

IEEE 802.11-2012, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE Std.

3GPP TS 23.303: "Proximity-based services (ProSe); Stage 2".

3GPP TS 24.334: "Proximity-services (ProSe) User Equipment (UE) to ProSe function protocol aspects; Stage 3".

3GPP TS 24.333: "Proximity-services (ProSe) Management Objects (MO)".

3GPP TS 36.314: "Evolved Universal Terrestrial Radio Access (E-UTRA); Layer 2-Measurements".

3GPP TS 24.105: "Application specific Congestion control for Data Communication (ACDC) Management Object (MO)".

3GPP TS 23.179: "Functional architecture and information flows to support mission critical communication services; Stage 2".

3GPP TS 24.302: "Access to the 3GPP Evolved Packet Core (EPC) via non-3GPP access networks".

3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses; Stage-2".

Wi-Fi Alliance® Technical Committee, Hotspot 2.0 Technical Task Group Hotspot 2.0 (Release 2) Technical Specification Version 3.11.

3GPP TS 22.101: "Service aspects; Service principles".


3GPP TS 36.307: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements on User Equipments (UEs) supporting a release-independent frequency band".


3GPP TS 37.340: "NR; Multi-connectivity; Overall description; Stage-2".

3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) Specification".

3GPP TS 38.133: "NR; Requirements for support of radio resource management".

3GPP TS 38.101: "NR; User Equipment (UE) radio transmission and reception".


3GPP TS 38.306: "NR; UE Radio Access Capabilities".

3GPP TS 38.213: "NR; Physical layer procedures".

3GPP TS 38.215: "NR; Physical layer measurements".

3GPP TS 26.247: "Transparent end-to-end Packet-switched Streaming Service (PSS); Progressive Download and Dynamic Adaptive Streaming over HTTP (3GP-DASH)".

3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception".
3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**Anchor carrier:** In NB-IoT, a carrier where the UE assumes that NPSS/NSSS/NPBCH/SIB-NB for FDD or NPSS/NSSS/NPBCH for TDD are transmitted.

**Bandwidth Reduced:** Refers to operation in downlink and uplink with a limited channel bandwidth of 6 PRBs.

**Cellular IoT EPS Optimisation:** Provides improved support of small data transfer, as defined in TS 24.301 [35].

**Commercial Mobile Alert System:** Public Warning System that delivers Warning Notifications provided by Warning Notification Providers to CMAS capable UEs.

**Common access barring parameters:** The common access barring parameters refer to the access class barring parameters that are broadcast in SystemInformationBlockType2 outside the list of PLMN specific parameters (i.e. in ac-BarringPerPLMN-List).

**Control plane CIoT EPS optimisation:** Enables support of efficient transport of user data (IP, non-IP or SMS) over control plane via the MME without triggering data radio bearer establishment, as defined in TS 24.301 [35].

**Control plane EDT:** Early Data Transmission used with the Control plane CIoT EPS optimisation.

**CSG member cell:** A cell broadcasting the identity of the selected PLMN, registered PLMN or equivalent PLMN and for which the CSG whitelist of the UE includes an entry comprising cell’s CSG ID and the respective PLMN identity.

**Dual Connectivity:** A UE in RRC_CONNECTED is configured with Dual Connectivity when configured with a Master and a Secondary Cell Group.

**Early Data Transmission:** Allows one uplink data transmission optionally followed by one downlink data transmission during the random access procedure as specified in TS 36.300 [9] without establishing or resuming the RRC connection. The S1 connection is established or resumed upon reception of the uplink data and may be released or suspended along with the transmission of the downlink data. Early data transmission refers to both CP-EDT and UP-EDT.

**E-UTRA-NR Dual Connectivity:** A form of dual connectivity, defined in TS 37.340 [81], in which a UE in RRC_CONNECTED is configured with MCG cells using E-UTRA and SCG cells using NR as defined in TS 37.340 [81].

**EU-Alert:** Public Warning System that delivers Warning Notifications provided by Warning Notification Providers using the same AS mechanisms as defined for CMAS.

**Field:** The individual contents of an information element are referred as fields.

**Floor:** Mathematical function used to ‘round down’ i.e. to the nearest integer having a lower or equal value.

**Information element:** A structural element containing a single or multiple fields is referred as information element.
Korean Public Alert System (KPAS): Public Warning System that delivers Warning Notifications provided by Warning Notification Providers using the same AS mechanisms as defined for CMAS.

**Master Cell Group:** For a UE not configured with DC, the MCG comprises all serving cells. For a UE configured with DC, the MCG concerns a subset of the serving cells comprising of the PCell and zero or more secondary cells.

**Mixed Operation Mode:** In NB-IoT FDD, multi-carrier operation where the anchor carrier is in standalone mode while the non-anchor carrier is in inband or guardand mode, and vice versa. See TS 36.300 [9].

**MBMS service:** MBMS bearer service as defined in TS 23.246 [56] (i.e. provided via an MRB or an SC-MRB).

**NB-IoT:** NB-IoT allows access to network services via E-UTRA with a channel bandwidth limited to 200 kHz.

**NB-IoT UE:** A UE that uses NB-IoT.

**NCSG:** Network controlled small gap as defined in TS 36.133 [16].

**Non-anchor carrier:** In NB-IoT, a carrier where the UE does not assume that NPSS/NSSS/NPBCH/SIB-NB for FDD or NPSS/NSSS/NPBCH for TDD are transmitted.

**Primary Cell:** The cell, operating on the primary frequency, in which the UE either performs the initial connection establishment procedure or initiates the connection re-establishment procedure, or the cell indicated as the primary cell in the handover procedure.

**Primary Secondary Cell:** The SCG cell in which the UE is instructed to perform random access or initial PUSCH transmission if random access procedure is skipped when performing the SCG change procedure.

**Primary Timing Advance Group:** Timing Advance Group containing the PCell or the PSCell.

**PUCCH SCell:** An SCell configured with PUCCH.

**RLC bearer configuration:** The lower layer part of the radio bearer configuration comprising the RLC and logical channel configurations.

**Secondary Cell:** A cell, operating on a secondary frequency, which may be configured once an RRC connection is established and which may be used to provide additional radio resources. Except for the case of EN-DC, the PSCell is considered to be an SCell.

**Secondary Cell Group:** For a UE configured with DC, the subset of serving cells not part of the MCG, i.e. comprising of the PSCell and zero or more other secondary cells.

**Secondary Timing Advance Group:** Timing Advance Group neither containing the PCell nor the PSCell. A secondary timing advance group contains at least one cell with configured uplink.

**Serving Cell:** For a UE in RRC_CONNECTED not configured with CA/ DC there is only one serving cell comprising of the primary cell. For a UE in RRC_CONNECTED configured with CA/ DC the term 'serving cells' is used to denote the set of one or more cells comprising of the primary cell and all secondary cells.

**Sidelink:** UE to UE interface for sidelink communication, V2X sidelink communication and sidelink discovery. The sidelink corresponds to the PC5 interface as defined in TS 23.303 [68].

**Sidelink communication:** AS functionality enabling ProSe Direct Communication as defined in TS 23.303 [68], between two or more nearby UEs, using E-UTRA technology but not traversing any network node. In this version, the terminology "sidelink communication" without "V2X" prefix only concerns PS unless specifically stated otherwise.

**Sidelink discovery:** AS functionality enabling ProSe Direct Discovery as defined in TS 23.303 [68], using E-UTRA technology but not traversing any network node.

**Sidelink operation:** Includes sidelink communication, V2X sidelink communication and sidelink discovery.

**Split SRB:** in MR-DC, an SRB between the MN and the UE, allowing selection of either the direct path or the path via the SN as well as duplication of RRC PDUs across both paths as defined in TS 37.340 [81].

**UE in CE:** Refers to a UE that is capable of using coverage enhancement, and requires coverage enhancement mode to access a cell or is configured in a coverage enhancement mode.
User plane CIoT EPS optimisation: Enables support for change from EMM-IDLE mode to EMM-CONNECTED mode without the need for using the Service Request procedure, as defined in TS 24.301 [35].

User plane EDT: Early Data Transmission used with the User plane CIoT EPS optimisation.

Timing Advance Group: A group of serving cells that is configured by RRC and that, for the cells with an UL configured, use the same timing reference cell and the same Timing Advance value. A Timing Advance Group only includes cells of the same cell group i.e. it either includes MCG cells or SCG cells.

V2X Sidelink communication: AS functionality enabling V2X Communication as defined in TS 23.285 [78], between nearby UEs, using E-UTRA technology but not traversing any network node.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1], TS 36.300 [9] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1] or TS 36.300 [9].

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1xRTT</td>
<td>CDMA2000 1x Radio Transmission Technology</td>
</tr>
<tr>
<td>AB</td>
<td>Access Barring</td>
</tr>
<tr>
<td>ACDC</td>
<td>Application specific Congestion control for Data Communication</td>
</tr>
<tr>
<td>ACK</td>
<td>Acknowledgement</td>
</tr>
<tr>
<td>AILC</td>
<td>Assistance Information bit for Local Cache</td>
</tr>
<tr>
<td>AM</td>
<td>Acknowledged Mode</td>
</tr>
<tr>
<td>ANDSF</td>
<td>Access Network Discovery and Selection Function</td>
</tr>
<tr>
<td>ARQ</td>
<td>Automatic Repeat Request</td>
</tr>
<tr>
<td>AS</td>
<td>Access Stratum</td>
</tr>
<tr>
<td>ASN.1</td>
<td>Abstract Syntax Notation One</td>
</tr>
<tr>
<td>AUL</td>
<td>Autonomous Uplink</td>
</tr>
<tr>
<td>BCCH</td>
<td>Broadcast Control Channel</td>
</tr>
<tr>
<td>BCD</td>
<td>Binary Coded Decimal</td>
</tr>
<tr>
<td>BCH</td>
<td>Broadcast Channel</td>
</tr>
<tr>
<td>BL</td>
<td>Bandwidth reduced Low complexity</td>
</tr>
<tr>
<td>BLER</td>
<td>Block Error Rate</td>
</tr>
<tr>
<td>BR</td>
<td>Bandwidth Reduced</td>
</tr>
<tr>
<td>BR-BCCH</td>
<td>Bandwidth Reduced Broadcast Control Channel</td>
</tr>
<tr>
<td>CA</td>
<td>Carrier Aggregation</td>
</tr>
<tr>
<td>CBR</td>
<td>Channel Busy Ratio</td>
</tr>
<tr>
<td>CCCH</td>
<td>Common Control Channel</td>
</tr>
<tr>
<td>CCO</td>
<td>Cell Change Order</td>
</tr>
<tr>
<td>CE</td>
<td>Coverage Enhancement</td>
</tr>
<tr>
<td>CG</td>
<td>Cell Group</td>
</tr>
<tr>
<td>CIoT</td>
<td>Cellular IoT</td>
</tr>
<tr>
<td>CMAS</td>
<td>Commercial Mobile Alert Service</td>
</tr>
<tr>
<td>CP</td>
<td>Control Plane</td>
</tr>
<tr>
<td>CP-EDT</td>
<td>Control Plane EDT</td>
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<tr>
<td>C-RNTI</td>
<td>Cell RNTI</td>
</tr>
<tr>
<td>CRS</td>
<td>Cell-specific Reference Signal</td>
</tr>
<tr>
<td>CSFB</td>
<td>CS fallback</td>
</tr>
<tr>
<td>CSG</td>
<td>Closed Subscriber Group</td>
</tr>
<tr>
<td>CSI</td>
<td>Channel State Information</td>
</tr>
<tr>
<td>DC</td>
<td>Dual Connectivity</td>
</tr>
<tr>
<td>DCCCH</td>
<td>Dedicated Control Channel</td>
</tr>
<tr>
<td>DCI</td>
<td>Downlink Control Information</td>
</tr>
<tr>
<td>DCN</td>
<td>Dedicated Core Networks</td>
</tr>
<tr>
<td>DFN</td>
<td>Direct Frame Number</td>
</tr>
<tr>
<td>DL</td>
<td>Downlink</td>
</tr>
<tr>
<td>DL-SCH</td>
<td>Downlink Shared Channel</td>
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<tr>
<td>DRB</td>
<td>(user) Data Radio Bearer</td>
</tr>
<tr>
<td>DRX</td>
<td>Discontinuous Reception</td>
</tr>
<tr>
<td>DTCCH</td>
<td>Dedicated Traffic Channel</td>
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<tr>
<td>EAB</td>
<td>Extended Access Barring</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>eDRX</td>
<td>Extended DRX</td>
</tr>
<tr>
<td>EDT</td>
<td>Early Data Transmission</td>
</tr>
<tr>
<td>EHPLMN</td>
<td>Equivalent Home Public Land Mobile Network</td>
</tr>
<tr>
<td>eIMTA</td>
<td>Enhanced Interference Management and Traffic Adaptation</td>
</tr>
<tr>
<td>ENB</td>
<td>Evolved Node B</td>
</tr>
<tr>
<td>EN-DC</td>
<td>E-UTRA NR Dual Connectivity</td>
</tr>
<tr>
<td>EPC</td>
<td>Evolved Packet Core</td>
</tr>
<tr>
<td>EPDCCH</td>
<td>Enhanced Physical Downlink Control Channel</td>
</tr>
<tr>
<td>EPS</td>
<td>Evolved Packet System</td>
</tr>
<tr>
<td>ETWS</td>
<td>Earthquake and Tsunami Warning System</td>
</tr>
<tr>
<td>E-UTRA</td>
<td>Evolved Universal Terrestrial Radio Access</td>
</tr>
<tr>
<td>E-UTRA/5GC</td>
<td>E-UTRA connected to 5GC</td>
</tr>
<tr>
<td>E-UTRA/EPC</td>
<td>E-UTRA connected to EPC</td>
</tr>
<tr>
<td>E-UTRAN</td>
<td>Evolved Universal Terrestrial Radio Access Network</td>
</tr>
<tr>
<td>FDD</td>
<td>Frequency Division Duplex</td>
</tr>
<tr>
<td>FFS</td>
<td>For Further Study</td>
</tr>
<tr>
<td>GERAN</td>
<td>GSM/EDGE Radio Access Network</td>
</tr>
<tr>
<td>GNSS</td>
<td>Global Navigation Satellite System</td>
</tr>
<tr>
<td>G-RNTI</td>
<td>Group RNTI</td>
</tr>
<tr>
<td>GSM</td>
<td>Global System for Mobile Communications</td>
</tr>
<tr>
<td>HARQ</td>
<td>Hybrid Automatic Repeat Request</td>
</tr>
<tr>
<td>HFN</td>
<td>Hyper Frame Number</td>
</tr>
<tr>
<td>HPLMN</td>
<td>Home Public Land Mobile Network</td>
</tr>
<tr>
<td>HRPD</td>
<td>CDMA2000 High Rate Packet Data</td>
</tr>
<tr>
<td>HSDN</td>
<td>High Speed Dedicated Network</td>
</tr>
<tr>
<td>H-SFN</td>
<td>Hyper SFN</td>
</tr>
<tr>
<td>IDC</td>
<td>In-Device Coexistence</td>
</tr>
<tr>
<td>IE</td>
<td>Information element</td>
</tr>
<tr>
<td>IMEI</td>
<td>International Mobile Equipment Identity</td>
</tr>
<tr>
<td>IMSI</td>
<td>International Mobile Subscriber Identity</td>
</tr>
<tr>
<td>IoT</td>
<td>Internet of Things</td>
</tr>
<tr>
<td>ISM</td>
<td>Industrial, Scientific and Medical</td>
</tr>
<tr>
<td>kB</td>
<td>Kilobyte (1000 bytes)</td>
</tr>
<tr>
<td>L1</td>
<td>Layer 1</td>
</tr>
<tr>
<td>L2</td>
<td>Layer 2</td>
</tr>
<tr>
<td>L3</td>
<td>Layer 3</td>
</tr>
<tr>
<td>LAA</td>
<td>Licensed-Assisted Access</td>
</tr>
<tr>
<td>LWA</td>
<td>LTE-WLAN Aggregation</td>
</tr>
<tr>
<td>LWAAP</td>
<td>LTE-WLAN Aggregation Adaptation Protocol</td>
</tr>
<tr>
<td>LWIP</td>
<td>LTE-WLAN Radio Level Integration with IPsec Tunnel</td>
</tr>
<tr>
<td>MAC</td>
<td>Medium Access Control</td>
</tr>
<tr>
<td>MBMS</td>
<td>Multimedia Broadcast Multicast Service</td>
</tr>
<tr>
<td>MBSFN</td>
<td>Multimedia Broadcast multicast service Single Frequency Network</td>
</tr>
<tr>
<td>MCG</td>
<td>Master Cell Group</td>
</tr>
<tr>
<td>MCOCT</td>
<td>Maximum Channel Occupancy Time</td>
</tr>
<tr>
<td>MCPTT</td>
<td>Mission Critical Push To Talk</td>
</tr>
<tr>
<td>MDT</td>
<td>Minimization of Drive Tests</td>
</tr>
<tr>
<td>MIB</td>
<td>Master Information Block</td>
</tr>
<tr>
<td>MO</td>
<td>Mobile Originating</td>
</tr>
<tr>
<td>MPCDCCH</td>
<td>MTC Physical Downlink Control Channel</td>
</tr>
<tr>
<td>MRB</td>
<td>MBMS Point to Multipoint Radio Bearer</td>
</tr>
<tr>
<td>MRO</td>
<td>Mobility Robustness Optimisation</td>
</tr>
<tr>
<td>MSI</td>
<td>MCH Scheduling Information</td>
</tr>
<tr>
<td>MT</td>
<td>Mobile Terminating</td>
</tr>
<tr>
<td>MT-SI</td>
<td>Multimedia Telephony Service for IMS</td>
</tr>
<tr>
<td>MUST</td>
<td>MultiUser Superposition Transmission</td>
</tr>
<tr>
<td>N/A</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>NACC</td>
<td>Network Assisted Cell Change</td>
</tr>
<tr>
<td>NAICS</td>
<td>Network Assisted Interference Cancellation/Suppression</td>
</tr>
<tr>
<td>NAS</td>
<td>Non Access Stratum</td>
</tr>
<tr>
<td>NB-IoT</td>
<td>NarrowBand Internet of Things</td>
</tr>
<tr>
<td>NPBCH</td>
<td>Narrowband Physical Broadcast channel</td>
</tr>
</tbody>
</table>
NPDCCH  Narrowband Physical Downlink Control channel
NPDSCH  Narrowband Physical Downlink Shared channel
NPRACH  Narrowband Physical Random Access channel
NPSS    Narrowband Primary Synchronization Signal
NPUSCH  Narrowband Physical Uplink Shared channel
NR      NR Radio Access
NRS     Narrowband Reference Signal
NSSAI   Network Slice Selection Assistance Information
NSSS    Narrowband Secondary Synchronization Signal
OS      OFDM Symbol
P2X     Pedestrian-to-Everything
PCCH    Paging Control Channel
PCell   Primary Cell
PDCCCH  Physical Downlink Control Channel
PDCP    Packet Data Convergence Protocol
PDU     Protocol Data Unit
PLMN    Public Land Mobile Network
PMK     Pairwise Master Key
PO      Paging Occasion
posSIB  Positioning SIB
ProSe   Proximity based Services
PS      Public Safety (in context of sidelink), Packet Switched (otherwise)
PSCell  Primary Secondary Cell
PSK     Pre-Shared Key
PTAG    Primary Timing Advance Group
PUCCH   Physical Uplink Control Channel
QCI     QoS Class Identifier
QoE     Quality of Experience
QoS     Quality of Service
RACH    Random Access CHannel
RAI     Release Assistance Indication
RAT     Radio Access Technology
RB      Radio Bearer
RCLWI   RAN Controlled LTE-WLAN Integration
RLC     Radio Link Control
RMTC    RSSI Measurement Timing Configuration
RN      Relay Node
RNA     RAN-based Notification Area
RNAU    RAN-based Notification Area Update
RNTI    Radio Network Temporary Identifier
ROHC    ROBust Header Compression
RPLMN   Registered Public Land Mobile Network
RRC     Radio Resource Control
RSCP    Received Signal Code Power
RSRP    Reference Signal Received Power
RSRQ    Reference Signal Received Quality
RSS     Resynchronisation signal
RSSI    Received Signal Strength Indicator
SAE     System Architecture Evolution
SAP     Service Access Point
SBAS    Satellite Based Augmentation System
SC      Sidelink Control
SCell   Secondary Cell
SCG     Secondary Cell Group
SC-MRB  Single Cell MRB
SC-RNTI Single Cell RNTI
SD-RSRP Sidelink Discovery Reference Signal Received Power
SFN     System Frame Number
SI      System Information
SIB     System Information Block
SI-RNTI System Information RNTI
SL      Sidelink
In the ASN.1, lower case may be used for some (parts) of the above abbreviations e.g. c-RNTI.

4 General

4.1 Introduction

In this specification, (parts of) procedures and messages specified for the UE equally apply to the RN for functionality necessary for the RN. There are also (parts of) procedures and messages which are only applicable to the RN in its communication with the E-UTRAN, in which case the specification denotes the RN instead of the UE. Such RN-specific aspects are not applicable to the UE.

This specification covers EN-DC i.e. the case in which the UE is configured with resources belonging to a secondary node using NR RAT. The NR related configuration is performed using NR RRC as specified in TS 38.331 [82].

NB-IoT is a non backward compatible variant of E-UTRAN supporting a reduced set of functionality. In this specification, (parts of) procedures and messages specified for the UE equally apply to the UE in NB-IoT. There are also some features and related procedures and messages that are not supported by UEs in NB-IoT.

In particular, the following features are not supported in NB-IoT and corresponding procedures and messages do not apply to the UE in NB-IoT:

- Connected mode mobility (Handover and measurement reporting);
- Inter-RAT cell reselection or inter-RAT mobility in connected mode;
- CSG;
- Relay Node (RN);
- Carrier Aggregation (CA);
- Dual connectivity (DC);
- PDCP duplication;
- GBR (QoS);
- ACB, EAB, SSAC and ACDC;
- MBMS, except for MBMS via SC-PTM in Idle mode;
- Self-configuration and self-optimisation;
- Measurement logging and reporting for network performance optimisation;
- Public warning systems e.g. CMAS, ETWS and PWS;
- Real time services (including emergency call);
- CS services and CS fallback;
- In-device coexistence;
- RAN assisted WLAN interworking;
- Network-assisted interference cancellation/suppression;
- Sidelink (including direct communication and direct discovery).

**NOTE:** In regard to mobility, NB-IoT is a separate RAT from E-UTRAN.

In this specification, there are also (parts of) procedures and messages which are only applicable to UEs in NB-IoT, in which case this is stated explicitly.

This specification is organised as follows:
- sub-clause 4.2 describes the RRC protocol model;
- sub-clause 4.3 specifies the services provided to upper layers as well as the services expected from lower layers;
- sub-clause 4.4 lists the RRC functions;
- clause 5 specifies RRC procedures, including UE state transitions;
- clause 6 specifies the RRC message in a mixed format (i.e. tabular & ASN.1 together);
- clause 7 specifies the variables (including protocol timers and constants) and counters to be used by the UE;
- clause 8 specifies the encoding of the RRC messages;
- clause 9 specifies the specified and default radio configurations;
- clause 10 specifies the RRC messages transferred across network nodes;
- clause 11 specifies the UE capability related constraints and performance requirements.
4.2 Architecture

4.2.1 UE states and state transitions including inter RAT

A UE is in RRC_CONNECTED when an RRC connection has been established or in RRC_INACTIVE (if the UE is connected to 5GC) when RRC connection is suspended. If this is not the case, i.e. no RRC connection is established, the UE is in RRC_IDLE state. The RRC states can further be characterised as follows:

- **RRC_IDLE:**
  - A UE specific DRX may be configured by upper layers (not applicable for NB-IoT);
  - UE controlled mobility;
  - The UE:
    - Monitors a Paging channel to detect incoming calls (by CN paging), system information change, for ETWS capable UEs, ETWS notification, and for CMAS capable UEs, CMAS notification;
    - Performs neighbouring cell measurements and cell (re-)selection;
    - Acquires system information.
    - Performs logging of available measurements together with location and time for logged measurement configured UEs.

- **RRC_INACTIVE:**
  - A UE specific DRX may be configured by upper layers or by RRC layer;
  - A RAN-based notification area is configured by RRC layer;
  - The UE:
    - Applies RRC_IDLE procedures unless specified otherwise;
    - Monitors a Paging channel for CN paging using 5G-S-TMSI and RAN paging using I-RNTI;
    - Performs periodic RAN-based notification area update;
    - Performs RAN-based notification area update when moving out of the configured RAN-based notification area;

- **RRC_CONNECTED:**
  - Transfer of unicast data to/from UE.
  - At lower layers, the UE may be configured with a UE specific DRX.
  - For UEs supporting CA, use of one or more SCells, aggregated with the PCell, for increased bandwidth;
  - For UEs supporting DC, use of one SCG, aggregated with the MCG, for increased bandwidth;
  - For UEs supporting EN-DC, option to configure one NR SCG in conjunction with the MCG for DRBs and SRBs, for improved performance (SRBs) and increased bandwidth (DRBs);
  - Network controlled mobility, i.e. handover and cell change order with optional network assistance (NACC) to GERAN (not applicable for NB-IoT);
  - The UE:
    - Monitors a Paging channel and/or System Information Block Type 1 contents to detect system information change, for ETWS capable UEs, ETWS notification, and for CMAS capable UEs, CMAS notification (not applicable for NB-IoT);
    - Monitors control channels associated with the shared data channel to determine if data is scheduled for it;
- Provides channel quality and feedback information (not applicable for NB-IoT);
- Performs neighbouring cell measurements and measurement reporting (not applicable for NB-IoT);
- Acquires system information (not applicable for NB-IoT).

The following figure not only provides an overview of the RRC states in E-UTRA, but also illustrates the mobility support between E-UTRAN, E-UTRA connected to 5GC, UTRAN and GERAN.

**Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP**

The following figure illustrates the mobility support between E-UTRAN, E-UTRA connected to 5GC, CDMA2000 1xRTT and CDMA2000 HRPD. The details of the CDMA2000 state models are out of the scope of this specification.

**Figure 4.2.1-2: Mobility procedures between E-UTRA and CDMA2000**

The inter-RAT handover procedure(s) supports the case of signalling, conversational services, non-conversational services and combinations of these.
In addition to the state transitions shown in Figure 4.2.1-1 and Figure 4.2.1-2, there is support for connection release with redirection information from E-UTRA RRC_CONNECTED to GERAN, UTRAN and CDMA2000 (HRPD Idle/1xRTT Dormant mode). A UE in RRC_INACTIVE enters RRC_IDLE when it enters another RAT or switches to another CN type.

For NB-IoT, mobility between E-UTRA and UTRAN, GERAN and between E-UTRA and CDMA2000 1xRTT and CDMA2000 HRPD is not supported at AS level and hence only the E-UTRA states depicted in Figure 4.2.1-1 are applicable.

### 4.2.2 Signalling radio bearers

"Signalling Radio Bearers" (SRBs) are defined as Radio Bearers (RB) that are used only for the transmission of RRC and NAS messages. More specifically, the following SRBs are defined:

- SRB0 is for RRC messages using the CCCH logical channel;
- SRB1 is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the establishment of SRB2, all using DCCH logical channel;
- For NB-IoT, SRB1bis is for RRC messages (which may include a piggybacked NAS message) as well as for NAS messages prior to the activation of security, all using DCCH logical channel;
- SRB2 is for RRC messages which include logged measurement information as well as for NAS messages, all using DCCH logical channel. SRB2 has a lower-priority than SRB1 and is always configured by E-UTRAN after security activation. SRB2 is not applicable for NB-IoT;
- SRB4 is for RRC messages which include application layer measurement reporting information, all using DCCH logical channel. SRB4 can only be configured by E-UTRAN after security activation.

In downlink piggybacking of NAS messages is used only for one dependant (i.e. with joint success/failure) procedure: bearer establishment/ modification/ release. In uplink NAS message piggybacking is used only for transferring the initial NAS message during connection setup.

**NOTE 1:** The NAS messages transferred via SRB2 are also contained in RRC messages, which however do not include any RRC protocol control information.

Once security is activated, all RRC messages on SRB1, SRB2 and SRB4, including those containing NAS or non-3GPP messages, are integrity protected and ciphered by PDCP. NAS independently applies integrity protection and ciphering to the NAS messages.

For a UE configured with DC, all RRC messages, regardless of the SRB used and both in downlink and uplink, are transferred via the MCG. In case of EN-DC, after connection establishment NR PDCP may be configured for both SRB1 and SRB2 and if so, these SRBs may be configured as split SRB. For a split SRB, the UE receives RRC messages via both MCG and NR SCG i.e. handles out of order and duplicate PDUs as specified in TS 38.323 [83]. For a split SRB, the network configures via the cell group(s) the UE sends uplink RRC messages.

**NOTE 2:** In case of EN-DC, SRB3 may be configured for the transfer of some NR RRC messages between UE and SgNB via the NR radio interface, see TS 38.331 [82].

*Editor's note:* Duplication in UL, for split SRB and DRBs, is FFS and completed in June 2018.

### 4.3 Services

#### 4.3.1 Services provided to upper layers

The RRC protocol offers the following services to upper layers:

- Broadcast of common control information;
- Broadcast of positioning assistance data;
- Notification of UEs in RRC_IDLE and RRC_INACTIVE, e.g. about a terminating call, for ETWS, for CMAS;
- Transfer of dedicated control information, i.e. information for one specific UE.
4.3.2 Services expected from lower layers

In brief, the following are the main services that RRC expects from lower layers:

- PDCP: integrity protection and ciphering;
- RLC: reliable and in-sequence transfer of information, without introducing duplicates and with support for segmentation and concatenation.

Further details about the services provided by Packet Data Convergence Protocol layer (e.g. integrity and ciphering) are provided in TS 36.323 [8]. The services provided by Radio Link Control layer (e.g. the RLC modes) are specified in TS 36.322 [7]. Further details about the services provided by Medium Access Control layer (e.g. the logical channels) are provided in TS 36.321 [6]. The services provided by physical layer (e.g. the transport channels) are specified in TS 36.302 [3].

4.4 Functions

The RRC protocol includes the following main functions:

- Broadcast of system information:
  - Including NAS common information;
  - Information applicable for UEs in RRC_IDLE, e.g. cell (re-)selection parameters, neighbouring cell information and information (also) applicable for UEs in RRC_CONNECTED, e.g. common channel configuration information;
  - Including ETWS notification, CMAS notification (not applicable for NB-IoT);
  - Including positioning assistance data.
- RRC connection control:
  - Paging;
  - Establishment/ modification/ suspension / resumption / release of RRC connection, including e.g. assignment/ modification of UE identity (C-RNTI), establishment/ modification/ suspension/ resumption/ release of SRB1, SRB1bis, SRB2 and SRB4, access class barring;
  - Initial security activation, i.e. initial configuration of AS integrity protection (SRBs) and AS ciphering (SRBs, DRBs);
  - For RNs, configuration of AS integrity protection for DRBs;
  - RRC connection mobility including e.g. intra-frequency and inter-frequency handover, associated security handling, i.e. key/ algorithm change, specification of RRC context information transferred between network nodes;

NOTE 1: In NB-IoT, only key change (but no re-keying) at RRC Connection Resumption and RRC context information transfer are applicable.

- Establishment/ modification/ release of RBs carrying user data (DRBs);
- Radio configuration control including e.g. assignment/ modification of ARQ configuration, HARQ configuration, DRX configuration;
- For RNs, RN-specific radio configuration control for the radio interface between RN and E-UTRAN;
- In case of CA, cell management including e.g. change of PCell, addition/ modification/ release of SCell(s) and addition/modification/release of STAG(s);
- In case of DC, cell management including e.g. change of PSCell, addition/ modification/ release of SCG cell(s) and addition/modification/release of SCG TAG(s).
- In case of EN-DC, transparent transfer of NR RRC messages (e.g. DL: reconfiguration messages used to add or modify the NR SCG configuration or to (re-)configure measurements; UL: measurement reports and reconfiguration complete messages) and of configurations of radio bearers using NR PDCP.

- QoS control including assignment/modification of semi-persistent scheduling (SPS) configuration information for DL and UL, assignment/modification of parameters for UL rate control in the UE, i.e. allocation of a priority and a prioritised bit rate (PBR) for each RB (not applicable for NB-IoT);

- Recovery from radio link failure;

- In case of LWA, RCLWI and LWIP, WLAN mobility set management including e.g. addition/modification/release of WLAN(s) from the WLAN mobility set;

- Inter-RAT mobility including e.g. security activation, transfer of RRC context information (not applicable for NB-IoT);

- Measurement configuration and reporting (not applicable for NB-IoT):
  - Establishment/modification/release of measurements (e.g. intra-frequency, inter-frequency and inter-RAT measurements);
  - Setup and release of measurement gaps;
  - Measurement reporting;
  - Other functions including e.g. transfer of dedicated NAS information and non-3GPP dedicated information, transfer of UE radio access capability information, support for E-UTRAN sharing (multiple PLMN identities);

- Generic protocol error handling;

- Support of self-configuration and self-optimisation (not applicable for NB-IoT);

- Support of measurement logging and reporting for network performance optimisation [60] (not applicable for NB-IoT);

NOTE 2: Random access is specified entirely in the MAC including initial transmission power estimation.

### 4.5 Data available for transmission for NB-IoT

For the purpose of MAC Data Volume and Power Headroom reporting, the NB-IoT UE shall consider the following as data available for transmission in the RRC layer:

- For SDUs to be submitted to lower layers:
  - the SDU itself, if the SDU has not yet been processed by RRC, or
  - the PDU if the SDU has been processed by RRC; or
  - The data available for transmission in upper layers not submitted to the RRC layer.

### 5 Procedures

#### 5.1 General

##### 5.1.1 Introduction

The procedural requirements are structured according to the main functional areas: system information (5.2), connection control (5.3), inter-RAT mobility (5.4) and measurements (5.5). In addition, sub-clause 5.6 covers other aspects e.g. NAS dedicated information transfer, UE capability transfer, sub-clause 5.7 specifies the generic error handling, sub-clause 5.8 covers MBMS (i.e. MBMS service reception via MRB), sub-clause 5.8a covers SC-PTM (i.e. MBMS service reception via SC-MRB), sub-clause 5.9 covers RN-specific procedures and sub-clause 5.10 covers sidelink.
For NB-IoT, only a subset of the above procedural requirements applies: system information (5.2), connection control (5.3), some part of other aspects (5.6), general error handling (5.7), and SC-PTM (5.8a). Subclauses inter-RAT mobility (5.4), measurements (5.5), MBMS (5.8), RN procedures (5.9) and Sidelink (5.10) are not applicable in NB-IoT.

5.1.2 General requirements

The UE shall:

1. process the received messages in order of reception by RRC, i.e. the processing of a message shall be completed before starting the processing of a subsequent message;

NOTE 1: E-UTRAN may initiate a subsequent procedure prior to receiving the UE's response of a previously initiated procedure.

1. within a sub-clause execute the steps according to the order specified in the procedural description;

1. consider the term 'radio bearer' (RB) to cover SRBs and DRBs but not MRBs or SC-MRBs unless explicitly stated otherwise;

1. set the *rrc-TransactionIdentifier* in the response message, if included, to the same value as included in the message received from E-UTRAN that triggered the response message;

1. upon receiving a choice value set to *setup*:

2. apply the corresponding received configuration and start using the associated resources, unless explicitly specified otherwise;

1. upon receiving a choice value set to *release*:

2. clear the corresponding configuration and stop using the associated resources;

NOTE 1a: Following receipt of choice value set to release, the UE considers the field as if it was never configured.

1. upon handover to E-UTRA; or

1. upon receiving an *RRCConnectionReconfiguration* message including the *fullConfig*:

2. apply the Conditions in the ASN.1 for inclusion of the fields for the DRB/PDCP/RLC setup during the reconfiguration of the DRBs included in the *drb-ToAddModList*;

NOTE 2: At each point in time, the UE keeps a single value for each field except for during handover when the UE temporarily stores the previous configuration so it can revert back upon handover failure. In other words: when the UE reconfigures a field, the existing value is released except for during handover.

NOTE 3: Although not explicitly stated, the UE initially considers all functionality to be deactivated/released until it is explicitly stated that the functionality is setup/activated. Correspondingly, the UE initially considers lists to be empty e.g. the list of radio bearers, the list of measurements.

1. upon receiving an extension field comprising the entries in addition to the ones carried by the original field (regardless of whether E-UTRAN may signal more entries in total); apply the following generic behaviour if explicitly stated to be applicable:

2. create a combined list by concatenating the additional entries included in the extension field to the original field while maintaining the order among both the original and the additional entries;

2. for the combined list, created according to the previous, apply the same behaviour as defined for the original field;

NOTE 4: A field comprising a list of entries normally includes 'list' in the field name. The typical way to extend (the size of) such a list is to introduce a field comprising the additional entries, which should include 'listExt' in the name of the field/IE. E.g. *field1List-RAT, field1ListExt-RAT*.

1. consider the term DC to cover the case of an E-UTRA MCG and SCG, while the term EN-DC covers the case of an E-UTRA MCG and NR SCG (as well as an E-UTRA MCG with NR PDCP configuration in a secondary node); Likewise, MCG covers the case of an E-UTRA MCG, SCG covers the case of an E-UTRA SCG, serving
cell covers the case of an E-UTRA serving cell, PDCP covers the case of PDCP defined by E-UTRA specifications;

NOTE 5: In this specification, UE configuration refers to the parameters configured by E-UTRA RRC unless stated otherwise.

5.2 System information

5.2.1 Introduction

5.2.1.1 General

System information is divided into the MasterInformationBlock (MIB) and a number of SystemInformationBlocks (SIBs) and SystemInformationBlockPos (posSIBs). The MIB includes a limited number of most essential and most frequently transmitted parameters that are needed to acquire other information from the cell, and is transmitted on BCH. SIBs other than SystemInformationBlockType1 and posSIBs are carried in SystemInformation (SI) messages. The mapping of SIBs and posSIBs to SI messages is flexibly configurable by schedulingInfoList and posSchedulingInfoList, respectively, included in SystemInformationBlockType1, with restrictions that: each SIB is contained only in a single SI message and each SIB and posSIB is contained at most once in that SI message; only SIBs and posSIBs having the same scheduling requirement (periodicity) can be mapped to the same SI message; SystemInformationBlockType2 is always mapped to the SI message that corresponds to the first entry in the list of SI messages in schedulingInfoList. There may be multiple SI messages transmitted with the same periodicity. SystemInformationBlockType1 and all SI messages are transmitted on DL-SCH.

The Bandwidth reduced Low Complexity (BL) UEs and UEs in Coverage Enhancement (CE) apply Bandwidth Reduced (BR) version of the SIB, posSIB or SI messages. A UE considers itself in enhanced coverage as specified in TS 36.304 [4]. In this and subsequent clauses, anything applicable for a particular SIB, posSIB or SI message equally applies to the corresponding BR version unless explicitly stated otherwise.

For NB-IoT, a reduced set of system information block with similar functionality but different content is defined; the UE applies the NB-IoT (NB) version of the MIB and the SIBs. These are denoted MasterInformationBlock-NB, MasterInformationBlock-TDD-NB and SystemInformationBlockTypeX-NB in this specification. All other system information blocks (without NB suffix) are not applicable to NB-IoT; this is not further stated in the corresponding text.

NOTE 1: The physical layer imposes a limit to the maximum size a SIB can take. When DCI format 1C is used the maximum allowed by the physical layer is 1736 bits (217 bytes) while for format 1A the limit is 2216 bits (277 bytes), see TS 36.212 [22] and TS 36.213 [23]. For BL UEs and UEs in CE, the maximum SIB and SI message size is 936 bits, see TS 36.213 [23]. For NB-IoT, the maximum SIB and SI message size is 680 bits, see TS 36.213 [23].

In addition to broadcasting, E-UTRAN may provide SystemInformationBlockType1 and/or SystemInformationBlockType2, including the same parameter values, via dedicated signalling i.e., within an RRCConnectionReconfiguration message.

The UE applies the system information acquisition and change monitoring procedures for the PCell, except when being a BL UE or a UE in CE or a NB-IoT UE in RRC_CONNECTED mode while T311 is not running. For an SCell, E-UTRAN provides, via dedicated signalling, all system information relevant for operation in RRC_CONNECTED when adding the SCell. However, a UE that is configured with DC shall acquire the MasterInformationBlock of the PSCell but use it only to determine the SFN timing of the SCG, which may be different from the MCG. Upon change of the relevant system information of a configured SCell, E-UTRAN releases and subsequently adds the concerned SCell, which may be done with a single RRCConnectionReconfiguration message. If the UE is receiving or interested to receive an MBMS service in a cell, the UE shall apply the system information acquisition and change monitoring procedure to acquire parameters relevant for MBMS operation and apply the parameters acquired from system information only for MBMS operation for this cell.

NOTE 2: E-UTRAN may configure via dedicated signalling different parameter values than the ones broadcast in the concerned SCell.

In MBMS-dedicated cell, non-MBSFN subframes are used for providing MasterInformationBlock-MBMS (MIB-MBMS) and SystemInformationBlockType1-MBMS. SIBs other than SystemInformationBlockType1-MBMS are carried in SystemInformation-MBMS message which is also provided on non-MBSFN subframes.
An RN configured with an RN subframe configuration does not need to apply the system information acquisition and change monitoring procedures. Upon change of any system information relevant to an RN, E-UTRAN provides the system information blocks containing the relevant system information to an RN configured with an RN subframe configuration via dedicated signalling using the RNReconfiguration message. For RNs configured with an RN subframe configuration, the system information contained in this dedicated signalling replaces any corresponding stored system information and takes precedence over any corresponding system information acquired through the system information acquisition procedure. The dedicated system information remains valid until overridden.

NOTE 3: E-UTRAN may configure an RN, via dedicated signalling, with different parameter values than the ones broadcast in the concerned cell.

5.2.1.2 Scheduling

The MIB uses a fixed schedule with a periodicity of 40 ms and repetitions made within 40 ms. The first transmission of the MIB is scheduled in subframe #0 of radio frames for which the SFN mod 4 = 0, and repetitions are scheduled in subframe #0 of all other radio frames. For TDD/FDD system with a bandwidth larger than 1.4 MHz that supports BL UEs or UEs in CE, MIB transmission may additionally be repeated in subframe#0 of the same radio frame, and in subframe#9 of the previous radio frame for FDD and subframe #5 of the same radio frame for TDD.

NOTE: The UE may assume the scheduling of MIB repetitions does not change. E-UTRAN may indicate in MobilityControlInfo whether optional MIB repetitions are enabled or not.

The MIB-MBMS uses a fixed schedule with a periodicity of 160 ms and repetitions made within 160 ms. The first transmission of the MIB-MBMS is scheduled in subframe #0 of radio frames for which the SFN mod 16 = 0, and repetitions are scheduled in subframe #0 of all other radio frames for which the SFN mod 4 = 0.

The SystemInformationBlockType1 uses a fixed schedule with a periodicity of 80 ms and repetitions made within 80 ms. The first transmission of SystemInformationBlockType1 is scheduled in subframe #5 of radio frames for which the SFN mod 8 = 0, and repetitions are scheduled in subframe #5 of all other radio frames for which SFN mod 2 = 0.

For BL UEs or UEs in CE, MIB is applied which may be provided with additional repetitions, while for SIB1 and further SI messages, separate messages are used which are scheduled independently and with content that may differ. The separate instance of SIB1 is named as SystemInformationBlockType1-BR. The SystemInformationBlockType1-BR uses a schedule with a periodicity of 80ms. TBS for SystemInformationBlockType1-BR and the repetitions made within 80ms are indicated via schedulingInfoSIB1-BR in MIB or optionally in the RRCCConnectionReconfiguration message including the MobilityControlInfo.

The SystemInformationBlockType1-MBMS uses fixed schedule with a periodicity of 160 ms. The first transmission of SystemInformationBlockType1-MBMS is scheduled in subframe #0 of radio frames for which the SFN mod 16 = 0, and repetitions are scheduled in subframe #0 of all other radio frames for which SFN mod 8 = 0. Additionally, the SystemInformationBlockType1-MBMS and other system informations blocks may be scheduled in additional non-MBSFN subframes indicated in MasterInformationBlock-MBMS.

The SI messages are transmitted within periodically occurring time domain windows (referred to as SI-windows) using dynamic scheduling. Each SI message is associated with a SI-window and the SI-windows of different SI messages do not overlap. That is, within one SI-window only the corresponding SI is transmitted. The length of the SI-window is common for all SI messages, and is configurable. Within the SI-window, the corresponding SI message can be transmitted a number of times in any subframe other than MBSFN subframes, uplink subframes in TDD, and subframe #5 of radio frames for which SFN mod 2 = 0. The UE acquires the detailed time-domain scheduling (and other information, e.g. frequency-domain scheduling, used transport format) from decoding SI-RNTI on PDCCH (see TS 36.321 [6]). For a BL UE or a UE in CE, the detailed time/frequency domain scheduling information for the SI messages is provided in SystemInformationBlockType1-BR.

For UEs other than BL UE or UEs in CE SI-RNTI is used to address SystemInformationBlockType1 as well as all SI messages. On MBMS-dedicated cell and on FeMBMS/Unicast-mixed cell, SI-RNTI with value in accordance with TS 36.321 [6] is used to address all SI messages whereas SI-RNTI with value in accordance with TS 36.321 [6] is used to address SystemInformationBlockType1-MBMS.

SystemInformationBlockType1 configures the SI-window length and the transmission periodicity for the SI messages.

5.2.1.2a Scheduling for NB-IoT

The MasterInformationBlock-NB (MIB-NB) uses a fixed schedule with a periodicity of 640 ms and repetitions made within 640 ms. The first transmission of the MIB-NB is scheduled in subframe #0 of radio frames for which the SFN
mod 64 = 0 and repetitions are scheduled in subframe #0 of all other radio frames. The transmissions are arranged in 8 independently decodable blocks of 80 ms duration.

The MasterInformationBlock-TDD-NB (MIB-TDD-NB) uses a fixed schedule with a periodicity of 640 ms and repetitions made within 640 ms. The first transmission of the MIB-TDD-NB is scheduled in subframe #0 of every other frame in 16 continuous frames. The starting frame for the first transmission of the MIB-TDD-NB is derived from the cell PCID and the number of repetitions within the 2560 ms period and repetitions are made, equally spaced, within the 2560 ms period (see TS 36.213 [23]). TBS for SystemInformationBlockType1-NB and the repetitions made within the 2560 ms are indicated by schedulingInfoSIB1 field in the MIB-NB. If additionalTransmissionSIB1 is set to TRUE in the MIB-NB, additional SIB1-NB transmission occurs in subframe #3 of the same radio frames where SIB1-NB transmission occurs with the same number of repetitions.

For FDD, SIB1-NB transmission occurs in subframe #4 of every other frame in 16 continuous frames. The starting frame for the first transmission of the SIB1-NB is derived from the cell PCID and the number of repetitions within the 2560 ms period and repetitions are made, equally spaced, within the 2560 ms period (see TS 36.213 [23]). TBS for SystemInformationBlockType1-NB, the repetitions made within the 2560 ms, and the subframe index (#0 or #4) are indicated by schedulingInfoSIB1 field in the MIB-TDD-NB.

The SI messages are transmitted within periodically occurring time domain windows (referred to as SI-windows) using scheduling information provided in SystemInformationBlockType1-NB. Each SI message is associated with a SI-window and the SI-windows of different SI messages do not overlap. That is, within one SI-window only the corresponding SI is transmitted. The length of the SI-window is common for all SI messages, and is configurable.

Within the SI-window, the corresponding SI message can be transmitted a number of times over 2 or 8 consecutive NB-IoT downlink subframes depending on TBS. The UE acquires the detailed time/frequency domain scheduling information and other information, e.g. used transport format for the SI messages from schedulingInfoList field in SystemInformationBlockType1-NB. The UE is not required to accumulate several SI messages in parallel but may need to accumulate a SI message across multiple SI windows, depending on coverage condition.

SystemInformationBlockType1-NB configures the SI-window length and the transmission periodicity for all SI messages.

5.2.1.3 System information validity and notification of changes

Change of system information (other than for ETWS, CMAS and EAB parameters and other than for AB parameters for NB-IoT) only occurs at specific radio frames, i.e. the concept of a modification period is used. System information may be transmitted a number of times with the same content within a modification period, as defined by its scheduling. The modification period boundaries are defined by SFN values for which SFN mod m = 0, where m is the number of radio frames comprising the modification period. The modification period is configured by system information. If H-SFN is provided in SystemInformationBlockType1-BR, modification period boundaries for BL UEs and UEs in CE are defined by SFN values for which (H-SFN * 1024 + SFN) mod m = 0. For NB-IoT, H-SFN is always provided and the modification period boundaries are defined by SFN values for which (H-SFN * 1024 + SFN) mod m = 0.

To enable system information update notification for RRC_IDLE UEs configured to use a DRX cycle longer than the modification period, an eDRX acquisition period is defined. The boundaries of the eDRX acquisition period are determined by H-SFN values for which H-SFN mod 256 = 0. For NB-IoT, the boundaries of the eDRX acquisition period are determined by H-SFN values for which H-SFN mod 1024 = 0.

NOTE 1: If the UE in RRC_IDLE is configured to use extended DRX cycle, e.g., in the order of several minutes or longer, in case the eNB is reset the UE SFN may not be synchronized to the new eNB SFN. The UE is expected to recover, e.g., acquire MIB within a reasonable time, to avoid repeated paging failures.

When the network changes (some of the) system information, it first notifies the UEs about this change, i.e. this may be done throughout a modification period. In the next modification period, the network transmits the updated system information. These general principles are illustrated in figure 5.2.1.3-1, in which different colours indicate different system information. Upon receiving a change notification, the UE not configured to use a DRX cycle that is longer than...
the modification period acquires the new system information immediately from the start of the next modification period. Upon receiving a change notification applicable to eDRX, a UE in RRC_IDLE configured to use a DRX cycle that is longer than the modification period acquires the updated system information immediately from the start of the next eDRX acquisition period. The UE applies the previously acquired system information until the UE acquires the new system information. The possible boundaries of modification for SystemInformationBlockType1-BR are defined by SFN values for which SFN mod 512 = 0 except for notification of ETWS/CMAS for which the eNB may change SystemInformationBlockType1-BR content at any time. For NB-IoT, the possible boundaries of modification for SystemInformationBlockType1-NB are defined by SFN values for which (H-SFN * 1024 + SFN) mod 4096 = 0.

The Paging message is used to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change. If the UE is in RRC_CONNECTED or is not configured to use a DRX cycle longer than the modification period in RRC_IDLE, and receives a Paging message including the systemInfoModification, it knows that the system information will change at the next modification period boundary. A UE in RRC_IDLE that is configured to use a DRX cycle longer than the modification period, and receives in an eDRX acquisition period at least one Paging message including the systemInfoModification-eDRX, shall acquire the updated system information at the next eDRX acquisition period boundary. Although the UE may be informed about changes in system information, no further details are provided e.g. regarding which system information will change, except if systemInfoValueTagSI is received by BL UEs or UEs in CE.

In RRC_CONNECTED, BL UEs or UEs in CE or NB-IoT UEs are not required to acquire system information except when T311 is running or upon handover where the UE is only required to acquire the MasterInformationBlock in the target PCell. In RRC_IDLE, E-UTRAN may notify BL UEs or UEs in CE or NB-IoT UEs about SI update, and except for NB-IoT, ETWS and CMAS notification and EAB modification, using Direct Indication information, as specified in 6.6 (or 6.7.5 in NB-IoT) and TS 36.212 [22].

NOTE 2: Upon system information change essential for BL UEs, UEs in CE, or NB-IoT UEs in RRC_CONNECTED, E-UTRAN may initiate connection release.

SystemInformationBlockType1 (or MasterInformationBlock-NB/ MasterInformationBlock-TDD-NB in NB-IoT) includes a value tag systemInfoValueTag, that indicates if a change has occurred in the SI messages. UEs may use systemInfoValueTag, e.g. upon return from out of coverage, to verify if the previously stored SI messages are still valid. MasterInformationBlock (using systemInfoUnchanged-BR) and optionally RSS may indicate that a change has not occurred in the SIB1-BR and SI messages of the current cell at least over the SI validity time, and the BL UEs or UEs in CE may use systemInfoUnchanged-BR or RSS, e.g. upon return from out of coverage, to verify if the previously stored SIB1-BR and SI messages are still valid. Additionally, for other than BL UEs or UEs in CE or NB-IoT UEs, the UE considers stored system information to be invalid after 3 hours from the moment it was successfully confirmed as valid, unless specified otherwise. BL UE or UE in CE considers stored system information to be invalid after 24 hours from the moment it was successfully confirmed as valid, unless the UE is configured by parameter si-ValidityTime to consider stored system information to be invalid 3 hours after validity confirmation. NB-IoT UE considers stored system information to be invalid after 24 hours from the moment it was successfully confirmed as valid. If a BL UE, UE in CE or NB-IoT UE in RRC_CONNECTED state considers the stored system information invalid, the UE shall continue using the stored system information while in RRC_CONNECTED state in the serving cell.

For BL UEs or UEs in CE or NB-IoT UEs, the change of specific SI message can additionally be indicated by a SI message specific value tag systemInfoValueTagSI. If systemInfoValueTag included in the SystemInformationBlockType1-BR (or MasterInformationBlock-NB/ MasterInformationBlock-TDD-NB in NB-IoT) is different from the one of the stored system information and if systemInfoValueTagSI is included in the SystemInformationBlockType1-NB (or SystemInformationBlockType1-NB in NB-IoT) for a specific SI message and is different from the stored one, the UE shall consider this specific SI message to be invalid. If only systemInfoValueTag is included and is different from the stored one, the BL UE or UE in CE should consider any stored system information except SystemInformationBlockType10, SystemInformationBlockType11, SystemInformationBlockType12 and
SystemInformationBlockType14 to be invalid; the NB-IoT UE should consider any stored system information except SystemInformationBlockType14-NB to be invalid.

On MBMS-dedicated cell and on FeMBMS/Unicast-mixed cell, the change of system information and ETWS/CMAS notification is indicated by using Direct Indication FeMBMS defined in 6.6a. The modification periodicity follows MCCH modification periodicity as defined in 5.8.1.3.

E-UTRAN may not update systemInfoValueTag upon change of some system information e.g. ETWS information, CMAS information, regularly changing parameters like time information (SystemInformationBlockType8, SystemInformationBlockType16, hyperSFN-MSB in SystemInformationBlockType1-NB), EAB and AB parameters, or positioning system information blocks. Similarly, E-UTRAN may not include the systemInfoModification within the Paging message upon change of some system information.

The UE that is not configured to use a DRX cycle longer than the modification period verifies that stored system information remains valid by either checking systemInfoValueTag in SystemInformationBlockType1 (or MasterInformationBlock-NB/ MasterInformationBlock-TDD-NB in NB-IoT) after the modification period boundary, or attempting to find the systemInfoModification indication at least modificationPeriodCoeff times during the modification period, in case no paging is received, in every modification period. If no paging message is received by the UE during a modification period, the UE may assume that no change of system information will occur at the next modification period boundary. If UE in RRC_CONNECTED, during a modification period, receives one paging message, it may deduce from the presence/absence of systemInfoModification whether a change of system information other than ETWS information, CMAS information and EAB parameters will occur in the next modification period or not.

When the RRC_IDLE UE is configured with a DRX cycle that is longer than the modification period, and at least one modification period boundary has passed since the UE last verified validity of stored system information, the UE verifies that stored system information remains valid by checking the systemInfoValueTag before establishing or resuming an RRC connection.

ETWS and/or CMAS capable UEs in RRC_CONNECTED, other than BL UEs and UEs in CE, shall attempt to read paging at least once every defaultPagingCycle to check whether ETWS and/or CMAS notification is present or not.

5.2.1.4 Indication of ETWS notification

ETWS primary notification and/or ETWS secondary notification can occur at any point in time. The Paging message is used to inform ETWS capable UEs in RRC_IDLE and UEs in RRC_CONNECTED about presence of an ETWS primary notification and/or ETWS secondary notification. If the UE receives a Paging message including the etws-Indication, it shall start receiving the ETWS primary notification and/or ETWS secondary notification according to schedulingInfoList contained in SystemInformationBlockType1. If the UE receives Paging message including the etws-Indication while it is acquiring ETWS notification(s), the UE shall continue acquiring ETWS notification(s) based on the previously acquired schedulingInfoList until it re-acquires schedulingInfoList in SystemInformationBlockType1.

NOTE: The UE is not required to periodically check schedulingInfoList contained in SystemInformationBlockType1, but Paging message including the etws-Indication triggers the UE to re-acquire schedulingInfoList contained in SystemInformationBlockType1 for scheduling changes for SystemInformationBlockType10 and SystemInformationBlockType11. The UE may or may not receive a Paging message including the etws-Indication and/or systemInfoModification when ETWS is no longer scheduled.

ETWS primary notification is contained in SystemInformationBlockType10 and ETWS secondary notification is contained in SystemInformationBlockType11. Segmentation can be applied for the delivery of a secondary notification. The segmentation is fixed for transmission of a given secondary notification within a cell (i.e. the same segment size for a given segment with the same messageIdentifier, serialNumber and warningMessageSegmentNumber). An ETWS secondary notification corresponds to a single CB data IE as defined according to TS 23.041 [37].

5.2.1.5 Indication of CMAS notification

CMAS notification can occur at any point in time. The Paging message is used to inform CMAS capable UEs in RRC_IDLE and UEs in RRC_CONNECTED about presence of one or more CMAS notifications. If the UE receives a Paging message including the cmas-Indication, it shall start receiving the CMAS notifications according to schedulingInfoList contained in SystemInformationBlockType1. If the UE receives Paging message including the cmas-Indication while it is acquiring CMAS notification(s), the UE shall continue acquiring CMAS notification(s) based on the previously acquired schedulingInfoList until it re-acquires schedulingInfoList in SystemInformationBlockType1.
NOTE: The UE is not required to periodically check schedulingInfoList contained in SystemInformationBlockType1, but Paging message including the cmas-Indication triggers the UE to re-acquire schedulingInfoList contained in SystemInformationBlockType1 for scheduling changes for SystemInformationBlockType12. The UE may or may not receive a Paging message including the cmas-Indication and/or systemInfoModification when SystemInformationBlockType12 is no longer scheduled.

CMAS notification is contained in SystemInformationBlockType12. Segmentation can be applied for the delivery of a CMAS notification. The segmentation is fixed for transmission of a given CMAS notification within a cell (i.e. the same segment size for a given segment with the same messageId, serialNumber and warningMessageSegmentNumber). E-UTRAN does not interleave transmissions of CMAS notifications, i.e. all segments of a given CMAS notification transmission are transmitted prior to those of another CMAS notification. A CMAS notification corresponds to a single CB data IE as defined according to TS 23.041 [37].

5.2.1.6 Notification of EAB parameters change

Change of EAB parameters can occur at any point in time. The EAB parameters are contained in SystemInformationBlockType14. The Paging message is used to inform EAB capable UEs in RRC_IDLE about a change of EAB parameters or that SystemInformationBlockType14 is no longer scheduled. If the UE receives a Paging message including the eab-ParamModification, it shall acquire SystemInformationBlockType14 according to schedulingInfoList contained in SystemInformationBlockType1. If the UE receives a Paging message including the eab-ParamModification while it is acquiring SystemInformationBlockType14, the UE shall continue acquiring SystemInformationBlockType14 based on the previously acquired schedulingInfoList until it re-acquires schedulingInfoList in SystemInformationBlockType1.

NOTE: The EAB capable UE is not expected to periodically check schedulingInfoList contained in SystemInformationBlockType1.

5.2.1.7 Access Barring parameters change in NB-IoT

Change of Access Barring (AB) parameters can occur at any point in time. The AB parameters are contained in SystemInformationBlockType14-NB. Update of the AB parameters does not impact the systemInfoValueTag in the MasterInformationBlock-NB/MasterInformationBlock-TDD-NB or the systemInfoValueTagSI in SystemInformationBlockType1-NB.

A NB-IoT UE checks ab-Enabled indication in the MasterInformationBlock-NB/MasterInformationBlock-TDD-NB to know whether access barring is enabled. If access barring is enabled the UE shall not initiate the RRC connection establishment / resume for all access causes except mobile terminating calls until the UE has a valid version of SystemInformationBlockType14-NB.

5.2.2 System information acquisition

5.2.2.1 General

![Figure 5.2.2.1-1: System information acquisition, normal](image)

The UE applies the system information acquisition procedure to acquire the AS- and NAS- and positioning-system information that is broadcasted by the E-UTRAN. The procedure applies to UEs in RRC_IDLE and UEs in RRC_CONNECTED.

For BL UE, UE in CE and NB-IoT UE, specific conditions apply, as specified below.
5.2.2.2 Initiation

The UE shall apply the system information acquisition procedure upon selecting (e.g. upon power on) and upon re-selecting a cell, after handover completion, after entering E-UTRA from another RAT, upon return from out of coverage, upon receiving a notification that the system information has changed, upon receiving an indication about the presence of an ETWS notification, upon receiving an indication about the presence of a CMAS notification, upon receiving a notification that the EAB parameters have changed, upon receiving a request from CDMA2000 upper layers, upon receiving a request from positioning upper layers and upon exceeding the maximum validity duration. Unless explicitly stated otherwise in the procedural specification, the system information acquisition procedure overwrites any stored system information, i.e. delta configuration is not applicable for system information and the UE discontinues using a field if it is absent in system information unless explicitly specified otherwise.

In RRC_CONNECTED, BL UEs and UEs in CE are required to acquire system information when T311 is running or upon handover where the UE is only required to acquire the MasterInformationBlock in the target PCell.

NOTE: Upon handover, E-UTRAN provides system information required by the UE in RRC_CONNECTED except MIB with RRC signalling, i.e. systemInformationBlockType1Dedicated and mobilityControlInfo.

5.2.2.3 System information required by the UE

The UE shall:

1> ensure having a valid version, as defined below, of (at least) the following system information, also referred to as the 'required' system information:

2> if in RRC_IDLE:
   3> if the UE is a NB-IoT UE:
      4> the MasterInformationBlock-NB/MasterInformationBlock-TDD-NB and SystemInformationBlockType1-NB as well as SystemInformationBlockType2-NB through SystemInformationBlockType5-NB, SystemInformationBlockType22-NB;
   3> else:
      4> the MasterInformationBlock and SystemInformationBlockType1 (or SystemInformationBlockType1-BR depending on whether the UE is a BL UE or the UE in CE) as well as SystemInformationBlockType2 through SystemInformationBlockType8 and SystemInformationBlockType24 (depending on support of the concerned RATs), SystemInformationBlockType17 (depending on support of RAN-assisted WLAN interworking), SystemInformationBlockType25 (depending on support of E-UTRA/5GC);

2> if in RRC_INACTIVE:

3> the MasterInformationBlock and SystemInformationBlockType1 as well as SystemInformationBlockType2 through SystemInformationBlockType8 (depending on support of the concerned RATs), SystemInformationBlockType25;

2> if in RRC_CONNECTED; and

2> the UE is not a BL UE; and

2> the UE is not in CE; and

2> the UE is not a NB-IoT UE:

3> the MasterInformationBlock, SystemInformationBlockType1 and SystemInformationBlockType2 as well as SystemInformationBlockType8 (depending on support of CDMA2000), SystemInformationBlockType17 (depending on support of RAN-assisted WLAN interworking), SystemInformationBlockType25 (depending on support of E-UTRA/5GC);

2> if in RRC_CONNECTED and T311 is running; and

2> the UE is a BL UE or the UE is in CE or the UE is a NB-IoT UE;

3> the MasterInformationBlock (or MasterInformationBlock-NB/ MasterInformationBlock-TDD-NB in NB-IoT), SystemInformationBlockType1-BR (or SystemInformationBlockType1-NB in NB-IoT) and
SystemInformationBlockType2 (or SystemInformationBlockType2-NB in NB-IoT), and for NB-IoT SystemInformationBlockType22-NB;

1> delete any stored system information after 3 hours or 24 hours from the moment it was confirmed to be valid as defined in 5.2.1.3, unless specified otherwise;

1> consider any stored system information except SystemInformationBlockType10, SystemInformationBlockType11, SystemInformationBlockType12 and systemInformationBlockType14 (systemInformationBlockType14-NB in NB-IoT) to be invalid if systemInfoValueTag included in the SystemInformationBlockType1 (MasterInformationBlock-NB/ MasterInformationBlock-TDD-NB in NB-IoT) is different from the one of the stored system information and in case of NB-IoT UEs, BL UEs and UEs in CE, systemInfoValueTagSI is not broadcasted. Otherwise consider system information validity as defined in 5.2.1.3;

5.2.2.4 System information acquisition by the UE

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1 or BR-BCCH configuration defined in 9.1.1.8;

1> if the procedure is triggered by a system information change notification:

2> if the UE uses an idle DRX cycle longer than the modification period:

3> start acquiring the required system information, as defined in 5.2.2.3, from the next eDRX acquisition period boundary;

2> else

3> start acquiring the required system information, as defined in 5.2.2.3, from the beginning of the modification period following the one in which the change notification was received;

NOTE 1: The UE continues using the previously received system information until the new system information has been acquired.

1> if the UE is in RRC_IDLE and enters a cell for which the UE does not have stored a valid version of the system information required in RRC_IDLE, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_IDLE, as defined in 5.2.2.3;

1> following successful handover completion to a PCell for which the UE does not have stored a valid version of the system information required in RRC_CONNECTED, as defined in 5.2.2.3:

2> acquire, using the system information acquisition procedure as defined in 5.2.3, the system information required in RRC_CONNECTED, as defined in 5.2.2.3;

2> upon acquiring the concerned system information:

3> discard the corresponding radio resource configuration information included in the radioResourceConfigCommon previously received in a dedicated message, if any;

1> following a request from CDMA2000 upper layers:

2> acquire SystemInformationBlockType8, as defined in 5.2.3;

1> neither initiate the RRC connection establishment/resume procedure nor initiate transmission of the RRCConnectionReestablishmentRequest message until the UE has a valid version of the MasterInformationBlock (MasterInformationBlock-NB/ MasterInformationBlock-TDD-NB in NB-IoT) and SystemInformationBlockType1 (SystemInformationBlockType1-NB in NB-IoT) messages as well as SystemInformationBlockType2 (SystemInformationBlockType2-NB in NB-IoT), and for NB-IoT, SystemInformationBlockType22-NB;

1> not initiate the RRC connection establishment/resume procedure subject to EAB until the UE has a valid version of SystemInformationBlockType14, if broadcast;

1> if the UE is ETWS capable:
2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:
   3> discard any previously buffered warningMessageSegment;
   3> clear, if any, the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;
2> when the UE acquires SystemInformationBlockType1 following ETWS indication, upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:
   3> if schedulingInfoList indicates that SystemInformationBlockType10 is present:
      4> if the UE is in CE:
         5> start acquiring SystemInformationBlockType10;
      4> else
         5> start acquiring SystemInformationBlockType10 immediately;
   3> if schedulingInfoList indicates that SystemInformationBlockType11 is present:
      4> start acquiring SystemInformationBlockType11 immediately;
NOTE 2: UEs shall start acquiring SystemInformationBlockType10 and SystemInformationBlockType11 as described above even when systemInfoValueTag in SystemInformationBlockType1 has not changed.
1> if the UE is CMAS capable:
   2> upon entering a cell during RRC_IDLE, following successful handover or upon connection re-establishment:
      3> discard any previously buffered warningMessageSegment;
      3> clear, if any, stored values of messageIdentifier and serialNumber for SystemInformationBlockType12 associated with the discarded warningMessageSegment;
   2> when the UE acquires SystemInformationBlockType1 following CMAS indication, upon entering a cell during RRC_IDLE, following successful handover and upon connection re-establishment:
      3> if schedulingInfoList indicates that SystemInformationBlockType12 is present:
         4> acquire SystemInformationBlockType12;
   NOTE 3: UEs shall start acquiring SystemInformationBlockType12 as described above even when systemInfoValueTag in SystemInformationBlockType1 has not changed.
1> if the UE is interested to receive MBMS services:
   2> if the UE is capable of MBMS reception as specified in 5.8:
      3> if schedulingInfoList indicates that SystemInformationBlockType13 is present and the UE does not have stored a valid version of this system information block:
         4> acquire SystemInformationBlockType13;
      3> else if SystemInformationBlockType13 is present in SystemInformationBlockType1-MBMS and the UE does not have stored a valid version of this system information block:
         4> acquire SystemInformationBlockType13 from SystemInformationBlockType1-MBMS;
   2> if the UE is capable of SC-PTM reception as specified in 5.8a:
      3> if schedulingInfoList indicates that SystemInformationBlockType20 (SystemInformationBlockType20-NB in NB-IoT) is present and the UE does not have stored a valid version of this system information block:
         4> acquire SystemInformationBlockType20 (SystemInformationBlockType20-NB in NB-IoT);
   2> if the UE is capable of MBMS Service Continuity:
3> if schedulingInfoList indicates that SystemInformationBlockType15 (SystemInformationBlockType15-NB in NB-IoT) is present and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType15 (SystemInformationBlockType15-NB in NB-IoT);

1> if the UE is EAB capable:

2> when the UE does not have stored a valid version of SystemInformationBlockType14 upon entering RRC_IDLE, or when the UE acquires SystemInformationBlockType1 following EAB parameters change notification, or upon entering a cell during RRC_IDLE, or before establishing an RRC connection if using eDRX with DRX cycle longer than the modification period:

3> if schedulingInfoList indicates that SystemInformationBlockType14 is present:

4> start acquiring SystemInformationBlockType14 immediately;

3> else:

4> discard SystemInformationBlockType14, if previously received;

NOTE 4: EAB capable UEs start acquiring SystemInformationBlockType14 as described above even when systemInfoValueTag in SystemInformationBlockType1 has not changed.

NOTE 5: EAB capable UEs maintain an up to date SystemInformationBlockType14 in RRC_IDLE.

1> if the UE is capable of sidelink communication and is configured by upper layers to receive or transmit sidelink communication:

2> if the cell used for sidelink communication meets the S-criteria as defined in TS 36.304 [4]; and

2> if schedulingInfoList indicates that SystemInformationBlockType18 is present and the UE does not have stored a valid version of this system information block:

3> acquire SystemInformationBlockType18;

1> if the UE is capable of sidelink discovery and is configured by upper layers to receive or transmit sidelink discovery announcements on the primary frequency:

2> if schedulingInfoList of the serving cell/ PCell indicates that SystemInformationBlockType19 is present and the UE does not have stored a valid version of this system information block:

3> acquire SystemInformationBlockType19;

1> if the UE is capable of sidelink discovery and, for each of the one or more frequencies included in discInterFreqList, if included in SystemInformationBlockType19 and for which the UE is configured by upper layers to receive sidelink discovery announcements on:

2> if SystemInformationBlockType19 of the serving cell/ PCell does not provide the corresponding reception resources; and

2> if schedulingInfoList of the cell on the concerned frequency indicates that SystemInformationBlockType19 is present and the UE does not have stored a valid version of this system information block:

3> acquire SystemInformationBlockType19;

1> if the UE is capable of sidelink discovery and, for each of the one or more frequencies included in discInterFreqList, if included in SystemInformationBlockType19 and for which the UE is configured by upper layers to transmit sidelink discovery announcements on:

2> if SystemInformationBlockType19 of the serving cell/ PCell includes discTxResourcesInterFreq which is set to acquireSI-FromCarrier; and

2> if schedulingInfoList of the cell on the concerned frequency indicates that SystemInformationBlockType19 is present and the UE does not have stored a valid version of this system information block:

3> acquire SystemInformationBlockType19;
1> if the UE is a NB-IoT UE and if ab-Enabled included in MasterInformationBlock-NB/ MasterInformationBlock-
TDD-NB is set to TRUE:

2> not initiate the RRC connection establishment/resume procedure for all access causes except mobile
terminating calls until the UE has acquired the SystemInformationBlockType14-NB;

1> if the UE is capable of V2X sidelink communication and is configured by upper layers to receive or transmit
V2X sidelink communication on a frequency:

2> if schedulingInfoList on the serving cell/PCell indicates that SystemInformationBlockType21 is present and
the UE does not have stored valid version of this system information block:

3> acquire SystemInformationBlockType21 from serving cell/PCell;

2> if schedulingInfoList on the serving cell/PCell indicates that SystemInformationBlockType26 is present and
the UE does not have stored valid version of this system information block;

3> acquire SystemInformationBlockType26 from serving cell/PCell;

1> if the UE is capable of V2X sidelink communication and is configured by upper layers to receive V2X sidelink
communication on a frequency, which is not primary frequency:

2> if neither SystemInformationBlockType21 nor SystemInformationBlockType26 of the serving cell/ PCell
provide reception resource pool for V2X sidelink communication for the concerned frequency; and

2> if the cell used for V2X sidelink communication on the concerned frequency meets the S-criteria as defined
in TS 36.304 [4];

3> if schedulingInfoList on the concerned frequency indicates that SystemInformationBlockType21 is present
and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType21 from the concerned frequency;

3> if schedulingInfoList on the concerned frequency indicates that SystemInformationBlockType26 is present
and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType26 from the concerned frequency;

1> if the UE is capable of V2X sidelink communication and is configured by upper layers to transmit V2X sidelink
communication on a frequency, which is not primary frequency and is not included in v2x-InterFreqInfoList in
SystemInformationBlockType21 nor SystemInformationBlockType26 of the serving cell/PCell:

2> if the cell used for V2X sidelink communication on the concerned frequency meets the S-criteria as defined
in TS 36.304 [4];

3> if schedulingInfoList on the concerned frequency indicates that SystemInformationBlockType21 is present
and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType21 from the concerned frequency;

3> if schedulingInfoList on the concerned frequency indicates that SystemInformationBlockType26 is present
and the UE does not have stored a valid version of this system information block:

4> acquire SystemInformationBlockType26 from the concerned frequency;

1> if the NB-IoT UE supports NPRACH resources using preamble format 2:

2> if schedulingInfoList indicates that SystemInformationBlockType23-NB is present and the UE does not have
stored a valid version of this system information block:

3> acquire SystemInformationBlockType23-NB;

1> following a request from positioning upper layers:

2> acquire SystemInformationBlockPos, as defined in 5.2.3;
The UE may apply the received SIBs or posSIBs immediately, i.e. the UE does not need to delay using a SIB or posSIB until all SI messages have been received. The UE may delay applying the received SIBs until completing lower layer procedures associated with a received or a UE originated RRC message, e.g. an ongoing random access procedure.

NOTE 6: While attempting to acquire a particular SIB/posSIB, if the UE detects from schedulingInfoList/posSchedulingInfoList that it is no longer present, the UE should stop trying to acquire the particular SIB/posSIB.

5.2.2.5 Essential system information missing

The UE shall:
1> if in RRC_IDLE, RRC_INACTIVE or in RRC_CONNECTED while T311 is running:
2> if the UE is unable to acquire the MasterInformationBlock (MasterInformationBlock-NB/MasterInformationBlock-TDD-NB in NB-IoT); or
2> if the UE is neither a BL UE nor in CE nor in NB-IoT and the UE is unable to acquire the SystemInformationBlockType1; or
2> if the BL UE or UE in CE is unable to acquire SystemInformationBlockType1-BR or SystemInformationBlockType1-BR is not scheduled; or
2> if the NB-IoT UE is unable to acquire the SystemInformationBlockType1-NB:
3> consider the cell as barred in accordance with TS 36.304 [4]; and
3> perform barring as if intraFreqReselection is set to allowed, and as if the csg-Indication is set to FALSE;
2> else:
3> if the UE is unable to acquire the SystemInformationBlockType2 (or SystemInformationBlockType2-NB in NB-IoT) and for NB-IoT, SystemInformationBlockType22-NB if scheduled; or
3> if SystemInformationBlockType25 is broadcasted and if the UE is connected to 5GC and is unable to acquire the SystemInformationBlockType25:
4> treat the cell as barred in accordance with TS 36.304 [4];

5.2.2.6 Actions upon reception of the MasterInformationBlock message

Upon receiving the MasterInformationBlock message the UE shall:
1> apply the radio resource configuration included in the phich-Config;
1> if the UE is in RRC_IDLE or if the UE is in RRC_CONNECTED while T311 is running:
2> if the UE has no valid system information stored according to 5.2.2.3 for the concerned cell:
3> apply the received value of dl-Bandwidth to the ul-Bandwidth until SystemInformationBlockType2 is received;

Upon receiving the MasterInformationBlock-NB or MasterInformationBlock-TDD-NB message the UE shall:
1> apply the radio resource configuration included in accordance with the operationModeInfo.

No UE requirements related to the contents of MasterInformationBlock-MBMS apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.2.7 Actions upon reception of the SystemInformationBlockType1 message

Upon receiving the SystemInformationBlockType1 or SystemInformationBlockType1-BR either via broadcast or via dedicated signalling, the UE shall:
1> if the upper layers indicate the selected core network type as 5GC:
2> if the cellAccessRelatedInfoList-5GC contains an entry with the plmn-Identity or plmn-Index of the selected PLMN:

3> in the remainder of the procedures use plmn-IdentityList, trackingAreaCode, and cellIdentity for the cell as received in the corresponding cellAccessRelatedInfoList-5GC containing the selected PLMN;

1> else if the cellAccessRelatedInfoList contains an entry with the PLMN-Identity of the selected PLMN:

2> in the remainder of the procedures use plmn-IdentityList, trackingAreaCode, and cellIdentity for the cell as received in the corresponding cellAccessRelatedInfoList-5GC containing the selected PLMN;

1> if in RRC_IDLE or in RRC_CONNECTED while T311 is running; and

1> if the UE is a category 0 UE according to TS 36.306 [5]; and

1> if category0Allowed is not included in SystemInformationBlockType1:

2> consider the cell as barred in accordance with TS 36.304 [4];

1> if in RRC_CONNECTED while T311 is not running, and the UE supports multi-band cells as defined by bit 31 in featureGroupIndicators:

2> disregard the freqBandIndicator and multiBandInfoList, if received, while in RRC_CONNECTED;

2> forward the cellIdentity to upper layers;

2> forward the trackingAreaCode to upper layers;

1> else:

2> if the frequency band indicated in the freqBandIndicator is part of the frequency bands supported by the UE and it is not a downlink only band; or

2> if the UE supports multiBandInfoList, and if one or more of the frequency bands indicated in the multiBandInfoList are part of the frequency bands supported by the UE and they are not downlink only bands:

3> forward the cellIdentity to upper layers;

3> forward the trackingAreaCode to upper layers;

3> forward the ims-EmergencySupport to upper layers, if present;

3> forward the eCallOverIMS-Support to upper layers, if present;

3> if the UE is capable of 5G NAS:

4> forward the ims-EmergencySupport-5GC to upper layers, if present;

4> forward the eCallOverIMS-Support-5GC to upper layers, if present;

3> if, for the frequency band selected by the UE (from freqBandIndicator or multiBandInfoList), the freqBandInfo or the multiBandInfoList-v10j0 is present and the UE capable of multiNS-Pmax supports at least one additionalSpectrumEmission in the NS-PmaxList within the freqBandInfo or multiBandInfoList-v10j0:

4> apply the first listed additionalSpectrumEmission which it supports among the values included in NS-PmaxList within freqBandInfo or multiBandInfoList-v10j0;

4> if the additionalPmax is present in the same entry of the selected additionalSpectrumEmission within NS-PmaxList:

5> apply the additionalPmax;

4> else:

5> apply the p-Max;
2> else:

3> consider the cell as barred in accordance with TS 36.304 [4]; and

3> perform barring as if intraFreqReselection is set to notAllowed, and as if the csg-Indication is set to FALSE;

1> if in RRC_INACTIVE:

2> if the cell does not belong to the RAN notification area configured by RAN-NotificationAreaInfo:

3> initiate the RAN notification area update procedure as specified in 5.3.17;

Upon receiving the SystemInformationBlockType1-NB, the UE shall:

1> if the frequency band indicated in the freqBandIndicator is part of the frequency bands supported by the UE; or

1> if one or more of the frequency bands indicated in the multiBandInfoList are part of the frequency bands supported by the UE:

2> forward the cellIdentity to upper layers;

2> forward the trackingAreaCode to upper layers;

2> if attachWithoutPDN-Connectivity is received for the selected PLMN:

3> forward the attachWithoutPDN-Connectivity to upper layers;

2> else

3> indicate to upper layers that attachWithoutPDN-Connectivity is not present;

2> if, for the frequency band selected by the UE (from freqBandIndicator or multiBandInfoList), the freqBandInfo is present and the UE capable of multiNS-Pmax supports at least one additionalSpectrumEmission in the NS-PmaxList within the freqBandInfo:

3> apply the first listed additionalSpectrumEmission which it supports among the values included in NS-PmaxList within freqBandInfo;

3> if the additionalPmax is present in the same entry of the selected additionalSpectrumEmission within NS-PmaxList:

4> apply the additionalPmax;

3> else:

4> apply the p-Max;

2> else:

3> apply the additionalSpectrumEmission in SystemInformationBlockType2-NB and the p-Max;

1> else:

2> consider the cell as barred in accordance with TS 36.304 [4]; and

2> perform barring as if intraFreqReselection is set to notAllowed.

No UE requirements related to the contents of SystemInformationBlockType1-MBMS apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.
5.2.2.8 Actions upon reception of SystemInformation messages

No UE requirements related to the contents of the SystemInformation messages apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.9 Actions upon reception of SystemInformationBlockType2

Upon receiving SystemInformationBlockType2, the UE shall:

1> apply the configuration included in the radioResourceConfigCommon;
1> if in RRC_INACTIVE:
    2> apply the shortest of the ran-PagingCycle (if configured), the (UE specific) paging cycle (if indicated by upper layers), and the defaultPagingCycle included in the radioResourceConfigCommon;
1> else if upper layers indicate that a (UE specific) paging cycle is configured:
    2> apply the shortest of the (UE specific) paging cycle and the defaultPagingCycle included in the radioResourceConfigCommon;
1> if the mbsfn-SubframeConfigList is included:
    2> consider that DL assignments may occur in the MBSFN subframes indicated in the mbsfn-SubframeConfigList under the conditions specified in [23, 7.1];
1> apply the specified PCCH configuration defined in 9.1.1.3;
1> not apply the timeAlignmentTimerCommon;
1> if in RRC_CONNECTED and UE is configured with RLF timers and constants values received within rlf-TimersAndConstants:
    2> not update its values of the timers and constants in ue-TimersAndConstants except for the value of timer T300;
1> if in RRC_CONNECTED while T311 is not running; and the UE supports multi-band cells as defined by bit 31 in featureGroupIndicators or multipleNS-Pmax:
    2> disregard the additionalSpectrumEmission and ul-CarrierFreq, if received, while in RRC_CONNECTED;
1> if attachWithoutPDN-Connectivity is received for the selected PLMN:
    2> forward attachWithoutPDN-Connectivity to upper layers;
1> else:
    2> indicate to upper layers that attachWithoutPDN-Connectivity is not present;
1> if cp-CIoT-EPS-Optimisation is received for the selected PLMN:
    2> forward cp-CIoT-EPS-Optimisation to upper layers;
1> else:
    2> indicate to upper layers that cp-CIoT-EPS-Optimisation is not present;
1> if up-CIoT-EPS-Optimisation is received for the selected PLMN:
    2> forward up-CIoT-EPS-Optimisation to upper layers;
1> else:
    2> indicate to upper layers that up-CIoT-EPS-Optimisation is not present;
1> to upper layers either forward upperLayerIndication, if present for the selected PLMN, or otherwise indicate absence of this field;
Upon receiving `SystemInformationBlockType2-NB`, the UE shall:

1> apply the configuration included in the `radioResourceConfigCommon`;

1> apply the `defaultPagingCycle` included in the `radioResourceConfigCommon`;

1> if `SystemInformationBlockType22-NB` is scheduled:

2> read and act on information sent in `SystemInformationBlockType22-NB`;

1> apply the specified PCCH configuration defined in 9.1.1.3.

1> if in RRC_CONNECTED and UE is configured with RLF timers and constants values received within `rlf-TimersAndConstants`:

2> not update its values of the timers and constants in `ue-TimersAndConstants` except for the value of timer T300;

5.2.2.10 Actions upon reception of `SystemInformationBlockType3`

Upon receiving `SystemInformationBlockType3`, the UE shall:

1> if in RRC_IDLE, the `redistributionServingInfo` is included and the UE is redistribution capable:

2> perform E-UTRAN inter-frequency redistribution procedure as specified in TS 36.304 [4, 5.2.4.10];

1> if in RRC_IDLE, or in RRC_CONNECTED while T311 is running:

2> if, for the frequency band selected by the UE (from the procedure in Section 5.2.2.7) to represent the serving cell's carrier frequency, the `freqBandInfo` or the `multiBandInfoList-v10j0` is present in `SystemInformationBlockType3` and the UE capable of `multiNS-Pmax` supports at least one `additionalSpectrumEmission` in the `NS-PmaxList` within the `freqBandInfo` or `multiBandInfoList-v10j0`:

3> apply the first listed `additionalSpectrumEmission` which it supports among the values included in `NS-PmaxList` within `freqBandInfo` or `multiBandInfoList-v10j0`;

3> if the `additionalPmax` is present in the same entry of the selected `additionalSpectrumEmission` within `NS-PmaxList`:

4> apply the `additionalPmax`;

3> else:

4> apply the `p-Max`;

2> else:

3> apply the `p-Max`;

Upon receiving `SystemInformationBlockType3-NB`, the UE shall:

1> if in RRC_IDLE, or in RRC_CONNECTED while T311 is running:

2> if, for the frequency band selected by the UE (from the procedure in subclause 5.2.2.7) to represent the serving cell's carrier frequency, the `freqBandInfo` or the `multiBandInfoList` is present in `SystemInformationBlockType3-NB` and the UE capable of `multiNS-Pmax` supports at least one `additionalSpectrumEmission` in the `NS-PmaxList` within the `freqBandInfo` or the `multiBandInfoList`:

3> apply the first listed `additionalSpectrumEmission` which it supports among the values included in `NS-PmaxList` within `freqBandInfo` or `multiBandInfoList`;

3> if the `additionalPmax` is present in the same entry of the selected `additionalSpectrumEmission` within `NS-PmaxList`:

4> apply the `additionalPmax`;

3> else:
4> apply the \textit{p-Max};

2> else:

3> apply the \textit{p-Max};

5.2.2.11 Actions upon reception of \texttt{SystemInformationBlockType4}

No UE requirements related to the contents of this \texttt{SystemInformationBlock} (\texttt{SystemInformationBlockType4} or \texttt{SystemInformationBlockType4-NB}) apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.12 Actions upon reception of \texttt{SystemInformationBlockType5}

Upon receiving \texttt{SystemInformationBlockType5}, the UE shall:

1> if in RRC\_IDLE, the \texttt{redistribution\_InterFreq\_Info} is included and the UE is redistribution capable:

2> perform E-UTRAN inter-frequency redistribution procedure as specified in TS 36.304 [4, 5.2.4.10];

1> if in RRC\_IDLE, or in RRC\_CONNECTED while T311 is running:

2> if the frequency band selected by the UE to represent a non-serving E UTRA carrier frequency is not a downlink only band:

3> if, for the selected frequency band, the \texttt{freq\_Band\_Info} or the \texttt{multi\_Band\_Info\_List-v10j0} is present and the UE capable of \texttt{multi\textit{NS-Pmax}} supports at least one \texttt{additional\_Spectrum\_Emission} in the \texttt{NS-Pmax\_List} within \texttt{freq\_Band\_Info} or \texttt{multi\_Band\_Info\_List-v10j0}:

4> apply the first listed \texttt{additional\_Spectrum\_Emission} which it supports among the values included in \texttt{NS-Pmax\_List} within \texttt{freq\_Band\_Info} or \texttt{multi\_Band\_Info\_List-v10j0};

4> if the \texttt{additional\_Pmax} is present in the same entry of the selected \texttt{additional\_Spectrum\_Emission} within \texttt{NS-Pmax\_List}:

5> apply the \texttt{additional\_Pmax};

4> else:

5> apply the \textit{p-Max};

3> else:

4> apply the \textit{p-Max};

1> if in RRC\_IDLE and UE has stored \texttt{Var\_Meas\_Idle\_Config} and SIB5 includes the \texttt{meas\_Idle\_Config\_SIB} and the UE is capable of IDLE mode measurements for CA:

2> if T331 is running and \texttt{Var\_Meas\_Idle\_Config} does not contain \texttt{meas\_Idle\_Config}:

3> store the contents of \texttt{meas\_Idle\_Config\_SIB} within \texttt{meas\_Idle\_Config};

2> start performing idle mode measurements on supported carriers as specified in 5.6.20;

Upon receiving \texttt{SystemInformationBlockType5-NB}, the UE shall:

1> if in RRC\_IDLE, or in RRC\_CONNECTED while T311 is running:

2> if, for the frequency band selected by the UE (from \texttt{multi\_Band\_Info\_List}) to represent a non-serving NB-IoT carrier frequency, the \texttt{freq\_Band\_Info} is present and the UE capable of \texttt{multi\textit{NS-Pmax}} supports at least one \texttt{additional\_Spectrum\_Emission} in the \texttt{NS-Pmax\_List} within the \texttt{freq\_Band\_Info}:

3> apply the first listed \texttt{additional\_Spectrum\_Emission} which it supports among the values included in \texttt{NS-Pmax\_List} within \texttt{freq\_Band\_Info};

3> if the \texttt{additional\_Pmax} is present in the same entry of the selected \texttt{additional\_Spectrum\_Emission} within \texttt{NS-Pmax\_List}: 

ETSI
apply the additionalPmax;
else:
apply the p-Max;
else:
apply the p-Max;

5.2.2.13 Actions upon reception of SystemInformationBlockType6

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.14 Actions upon reception of SystemInformationBlockType7

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.15 Actions upon reception of SystemInformationBlockType8

Upon receiving SystemInformationBlockType8, the UE shall:

1. if sib8-PerPLMN-List is included and the UE is capable of network sharing for CDMA2000:
   2. apply the CDMA2000 parameters below corresponding to the RPLMN;
1. if the systemTimeInfo is included:
   2. forward the systemTimeInfo to CDMA2000 upper layers;
1. if the UE is in RRC_IDLE and if searchWindowSize is included:
   2. forward the searchWindowSize to CDMA2000 upper layers;
1. if parametersHRPD is included:
   2. forward the preRegistrationInfoHRPD to CDMA2000 upper layers only if the UE has not received the preRegistrationInfoHRPD within an RRCConnectionReconfiguration message after entering this cell;
   2. if the cellReselectionParametersHRPD is included:
      3. forward the neighCellList to the CDMA2000 upper layers;
1. if the parameters1XRTT is included:
   2. if the csfb-RegistrationParam1XRTT is included:
      3. forward the csfb-RegistrationParam1XRTT to the CDMA2000 upper layers which will use this information to determine if a CS registration/re-registration towards CDMA2000 1xRTT in the EUTRA cell is required;
   2. else:
      3. indicate to CDMA2000 upper layers that CSFB Registration to CDMA2000 1xRTT is not allowed;
2. if the longCodeState1XRTT is included:
   3. forward the longCodeState1XRTT to CDMA2000 upper layers;
2. if the cellReselectionParameters1XRTT is included:
   3. forward the neighCellList to the CDMA2000 upper layers;
2. if the csfb-SupportForDualRxUEs is included:
   3. forward csfb-SupportForDualRxUEs to the CDMA2000 upper layers;
Upon receiving SystemInformationBlockType9, the UE shall:

1> if hnb-Name is included, forward the hnb-Name to upper layers;

5.2.2.17 Actions upon reception of SystemInformationBlockType10

Upon receiving SystemInformationBlockType10, the UE shall:

1> forward the received warningType, messageIdentifier and serialNumber to upper layers;

5.2.2.18 Actions upon reception of SystemInformationBlockType11

Upon receiving SystemInformationBlockType11, the UE shall:

1> if there is no current value for messageIdentifier and serialNumber for SystemInformationBlockType11; or

1> if either the received value of messageIdentifier or of serialNumber or of both are different from the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> use the received values of messageIdentifier and serialNumber for SystemInformationBlockType11 as the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> discard any previously buffered warningMessageSegment;

2> if all segments of a warning message have been received:

3> assemble the warning message from the received warningMessageSegment;

3> forward the received warning message, messageIdentifier, serialNumber and dataCodingScheme to upper layers;

3> stop reception of SystemInformationBlockType11;

3> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;

2> else:

3> store the received warningMessageSegment;

3> continue reception of SystemInformationBlockType11;

1> else if all segments of a warning message have been received:

2> assemble the warning message from the received warningMessageSegment;

2> forward the received complete warning message, messageIdentifier, serialNumber and dataCodingScheme to upper layers;

2> stop reception of SystemInformationBlockType11;

2> discard the current values of messageIdentifier and serialNumber for SystemInformationBlockType11;
else:

store the received warningMessageSegment;

continue reception of SystemInformationBlockType11;

The UE should discard any stored warningMessageSegment and the current value of messageIdentifier and serialNumber for SystemInformationBlockType11 if the complete warning message has not been assembled within a period of 3 hours.

5.2.2.19 Actions upon reception of SystemInformationBlockType12

Upon receiving SystemInformationBlockType12, the UE shall:

1> if the SystemInformationBlockType12 contains a complete warning message and the complete geographical area coordinates (if any):

2> forward the received warning message, messageIdentifier, serialNumber, dataCodingScheme and the geographical area coordinates (if any) to upper layers;

2> continue reception of SystemInformationBlockType12;

1> else:

2> if the received values of messageIdentifier and serialNumber are the same (each value is the same) as a pair for which a warning message and the geographical area coordinates (if any) are currently being assembled:

3> store the received warningMessageSegment;

3> store the received warningAreaCoordinatesSegment (if any);

3> if all segments of a warning message and geographical area coordinates (if any) have been received:

4> assemble the warning message from the received warningMessageSegment;

4> assemble the geographical area coordinates from the received warningAreaCoordinatesSegment (if any);

4> forward the received warning message, messageIdentifier, serialNumber, dataCodingScheme and geographical area coordinates (if any) to upper layers;

4> stop assembling a warning message and warning area coordinates (if any) for this messageIdentifier and serialNumber and delete all stored information held for it;

3> continue reception of SystemInformationBlockType12;

2> else if the received values of messageIdentifier and/or serialNumber are not the same as any of the pairs for which a warning message is currently being assembled:

3> start assembling a warning message for this messageIdentifier and serialNumber pair;

3> start assembling the geographical area coordinates (if any) for this messageIdentifier and serialNumber pair;

3> store the received warningMessageSegment;

3> store the received warningAreaCoordinatesSegment (if any);

3> continue reception of SystemInformationBlockType12;

The UE should discard warningMessageSegment and warningAreaCoordinatesSegment (if any) and the associated values of messageIdentifier and serialNumber for SystemInformationBlockType12 if the complete warning message and the warning area coordinates (if any) have not been assembled within a period of 3 hours.

NOTE: The number of warning messages that a UE can re-assemble simultaneously is a function of UE implementation.
5.2.2.20 Actions upon reception of SystemInformationBlockType13

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.21 Actions upon reception of SystemInformationBlockType14

No UE requirements related to the contents of this SystemInformationBlock (SystemInformationBlockType14 or SystemInformationBlockType14-NB) apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.22 Actions upon reception of SystemInformationBlockType15

No UE requirements related to the contents of this SystemInformationBlock (SystemInformationBlockType15 or SystemInformationBlockType15-NB) apply other than those specified elsewhere e.g. within procedures using the concerned system information, and/or within the corresponding field descriptions.

5.2.2.23 Actions upon reception of SystemInformationBlockType16

Upon receiving SystemInformationBlockType16 with timeReferenceInfo, the UE may perform the related actions as specified in subclause 5.6.1.3.

5.2.2.24 Actions upon reception of SystemInformationBlockType17

Upon receiving SystemInformationBlockType17, the UE shall:

1> if wlan-OffloadConfigCommon corresponding to the RPLMN is included:

2> if the UE is not configured with rclwi-Configuration with command set to steerToWLAN:

3> apply the wlan-Id-List corresponding to the RPLMN;

2> if not configured with the wlan-OffloadConfigDedicated:

3> apply the wlan-OffloadConfigCommon corresponding to the RPLMN;

5.2.2.25 Actions upon reception of SystemInformationBlockType18

Upon receiving SystemInformationBlockType18, the UE shall:

1> if SystemInformationBlockType18 message includes the commConfig:

2> if configured to receive sidelink communication:

3> from the next SC period, as defined by sc-Period, use the resource pool indicated by commRxPool for sidelink communication monitoring, as specified in 5.10.3;

2> if configured to transmit sidelink communication:

3> from the next SC period, as defined by sc-Period, use the resource pool indicated by commTxPoolNormalCommon, commTxPoolNormalCommonExt or bycommTxPoolExceptional for sidelink communication transmission, as specified in 5.10.4;

5.2.2.26 Actions upon reception of SystemInformationBlockType19

Upon receiving SystemInformationBlockType19, the UE shall:

1> if SystemInformationBlockType19 message includes the discConfig or discConfigPS:

2> from the next discovery period, as defined by discPeriod, use the resources indicated by discRxPool, discRxResourcesInterFreq or discRxPoolPS for sidelink discovery monitoring, as specified in 5.10.5;

2> if SystemInformationBlockType19 message includes the discTxPoolCommon or discTxPoolPS-Common; and the UE is in RRC_IDLE:
3> from the next discovery period, as defined by discPeriod, use the resources indicated by
discTxPoolCommon or discTxPoolPSCommon for sidelink discovery announcement, as specified in
5.10.6;

2> if the SystemInformationBlockType19 message includes the discTxPowerInfo:

3> use the power information included in discTxPowerInfo for sidelink discovery transmission on the
serving frequency, as specified in TS 36.213 [23];

1> if SystemInformationBlockType19 message includes the discConfigRelay:

2> if the SystemInformationBlockType19 message includes the txPowerInfo:

3> use the power information included in txPowerInfo for sidelink discovery transmission on the

5.2.2.27 Actions upon reception of SystemInformationBlockType20

No UE requirements related to the contents of this SystemInformationBlock (SystemInformationBlockType20 or
SystemInformationBlockType20-NB) apply other than those specified elsewhere e.g. within procedures using the
concerned system information, and/ or within the corresponding field descriptions.

5.2.2.28 Actions upon reception of SystemInformationBlockType21

Upon receiving SystemInformationBlockType21, the UE shall:

1> if SystemInformationBlockType21 message includes sl-V2X-ConfigCommon:

2> if configured to receive V2X sidelink communication:

3> use the resource pool indicated by v2x-CommRxPool in sl-V2X-ConfigCommon for V2X sidelink
communication monitoring, as specified in 5.10.12;

2> if configured to transmit V2X sidelink communication:

3> use the resource pool indicated by v2x-CommTxPoolNormalCommon, p2x-CommTxPoolNormalCommon,
v2x-CommTxPoolNormal, p2x-CommTxPoolNormal or by v2x-CommTxPoolExceptional for V2X
sidelink communication transmission, as specified in 5.10.13;

3> perform CBR measurement on the transmission resource pool(s) indicated by v2x-
CommTxPoolNormalCommon, v2x-CommTxPoolNormal and v2x-CommTxPoolExceptional for V2X
sidelink communication transmission, as specified in 5.5.3;

5.2.2.29 Actions upon reception of SystemInformationBlockType22-NB

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere
e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.2.30 Actions upon reception of SystemInformationBlockType23-NB

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere
e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.2.31 Actions upon reception of SystemInformationBlockType24

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere
e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.2.32 Actions upon reception of SystemInformationBlockType25

No UE requirements related to the contents of this SystemInformationBlock apply other than those specified elsewhere
e.g. within procedures using the concerned system information, and/ or within the corresponding field descriptions.

5.2.2.33 Actions upon reception of SystemInformationBlockType26

Upon receiving SystemInformationBlockType26, the UE shall:
1> if configured to receive V2X sidelink communication:

2> use the resource pool indicated by \( v2x-CommRxPool \) for V2X sidelink communication monitoring, as specified in 5.10.12;

1> if configured to transmit V2X sidelink communication:

2> use the resource pool indicated by \( v2x-CommTxPoolNormal \), \( p2x-CommTxPoolNormal \) or by \( v2x-CommTxPoolExceptional \) for V2X sidelink communication transmission, as specified in 5.10.13;

2> perform CBR measurement on the transmission resource pool(s) indicated by \( v2x-CommTxPoolNormal \) and \( v2x-CommTxPoolExceptional \) for V2X sidelink communication transmission, as specified in 5.5.3;

5.2.2.34 Actions upon reception of \texttt{SystemInformationBlockPos}

No UE requirements related to the contents of the \texttt{SystemInformationBlockPos} apply other than those specified elsewhere e.g. within 3GPP TS 36.355 [54], and/or within the corresponding field descriptions.

5.2.3 Acquisition of an SI message

When acquiring an SI message, the UE shall:

1> determine the start of the SI-window for the concerned SI message as follows:

2> for the concerned SI message, determine the number \( n \) which corresponds to the order of entry in the concatenated list of SI messages configured by \texttt{schedulingInfoList} and \texttt{pos-schedulingInfoList} in \texttt{SystemInformationBlockType1};

2> determine the integer value \( x = (n-1) \times w \), where \( w \) is the \texttt{si-WindowLength};

2> the SI-window starts at the subframe \( a \), where \( a = x \mod 10 \), in the radio frame for which \( \text{SFN} \mod T = \text{FLOOR}(x/10) \), where \( T \) is the \texttt{si-Periodicity} of the concerned SI message;

NOTE: E-UTRAN should configure an SI-window of 1 ms only if all SIs are scheduled before subframe #5 in radio frames for which \( \text{SFN} \mod 2 = 0 \).

1> receive DL-SCH using the SI-RNTI from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by \texttt{si-WindowLength}, or until the SI message was received, excluding the following subframes:

2> subframe #5 in radio frames for which \( \text{SFN} \mod 2 = 0 \);

2> any MBSFN subframes;

2> any uplink subframes in TDD;

1> if the SI message was not received by the end of the SI-window, repeat reception at the next SI-window occasion for the concerned SI message;

5.2.3a Acquisition of an SI message by BL UE or UE in CE or a NB-IoT UE

When acquiring an SI message, the BL UE or UE in CE or NB-IoT UE shall:

1> determine the start of the SI-window for the concerned SI message as follows:

2> for the concerned SI message, determine the number \( n \) which corresponds to the order of entry in the concatenated list of SI messages configured by \texttt{schedulingInfoList} and \texttt{pos-schedulingInfoList} in \texttt{SystemInformationBlockType1-BR} (or \texttt{SystemInformationBlockType1-NB} in NB-IoT);

2> determine the integer value \( x = (n-1) \times w \), where \( w \) is the \texttt{si-WindowLength-BR} (or \texttt{si-WindowLength} in NB-IoT);

2> if the UE is a NB-IoT UE:
the SI-window starts at the subframe #0 in the radio frame for which \( (H\cdot\text{SFN} \times 1024 + \text{SFN}) \mod T = \text{FLOOR}(x/10) + \text{Offset} \), where \( T \) is the \( si\text{-Periodicity} \) of the concerned SI message and, Offset is the offset of the start of the SI-Window \((si\text{-RadioFrameOffset})\);

else:

the SI-window starts at the subframe #0 in the radio frame for which \( \text{SFN} \mod T = \text{FLOOR}(x/10) \), where \( T \) is the \( si\text{-Periodicity} \) of the concerned SI message;

1> if the UE is a NB-IoT UE:

2> receive and accumulate SI message transmissions on DL-SCH from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by \( si\text{-WindowLength} \), starting from the radio frames as provided in \( si\text{-RepetitionPattern} \) and in subframes as provided in \( downlink\text{Bitmap} \), or until successful decoding of the accumulated SI message transmissions excluding the subframes used for transmission of NPSS, NSSS, \( \text{MasterInformationBlock-NB} / \text{MasterInformationBlock-TDD-NB} \) and \( \text{SystemInformationBlock\text{-Type1-NB}} \). If there are not enough subframes for one SI message transmission in the radio frames as provided in \( si\text{-RepetitionPattern} \), the UE shall continue to receive the SI message transmission in the radio frames following the radio frame indicated in \( si\text{-RepetitionPattern} \);

else:

2> receive and accumulate SI message transmissions on DL-SCH on narrowband provided by \( si\text{-Narrowband} \), from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by \( si\text{-WindowLength-BR} \), only in radio frames as provided in \( fdd\text{-DownlinkOrTddSubframeBitmapBR} \) in \( bandwidth\text{Reduction Related Info} \), or until successful decoding of the accumulated SI message transmissions;

1> if the SI message was not possible to decode from the accumulated SI message transmissions by the end of the SI-window, continue reception and accumulation of SI message transmissions on DL-SCH in the next SI-window occasion for the concerned SI message;

5.2.3b Acquisition of an SI message from MBMS-dedicated cell

When acquiring an SI message, the UE shall:

1> determine the start of the SI-window for the concerned SI message as follows:

2> for the concerned SI message, determine the number \( n \) which corresponds to the order of entry in the list of SI messages configured by \( scheduling\text{InfoList} \) in \( System\text{InformationBlock\text{-Type1-MBMS}} \);

2> determine the integer value \( x = (n - 1) \times w \), where \( w \) is the \( si\text{-WindowLength} \);

2> the SI-window starts always at the subframe \( #a \), where \( a = x \mod 10 \), in the radio frame for which \( \text{SFN} \mod T = \text{FLOOR}(x/10) \), where \( T \) is the \( si\text{-Periodicity} \) of the concerned SI message;

1> receive DL-SCH using SI-RNTI with value in accordance with 36.321 [6] from the start of the SI-window and continue until the end of the SI-window whose absolute length in time is given by \( si\text{-WindowLength} \), or until the SI message was received, excluding the following subframes:

2> any MBSFN subframes;

1> if the SI message was not received by the end of the SI-window, repeat reception at the next SI-window occasion for the concerned SI message;

5.3 Connection control

5.3.1 Introduction

5.3.1.1 RRC connection control

RRC connection establishment involves the establishment of SRB1. Except for EDT, E-UTRAN completes RRC connection establishment prior to completing the establishment of the S1 connection, i.e. prior to receiving the UE context information from the EPC. Consequently, AS security is not activated during the initial phase of the RRC
connection. During this initial phase of the RRC connection, the E-UTRAN may configure the UE to perform measurement reporting, but the UE only sends the corresponding measurement reports after successful security activation. However, the UE only accepts a handover message when security has been activated.

NOTE 1: In case the serving frequency broadcasts multiple overlapping bands, E-UTRAN can only configure measurements after having obtained the UE capabilities, as the measurement configuration needs to be set according to the band selected by the UE.

Upon receiving the UE context from the EPC, E-UTRAN activates security (both ciphering and integrity protection) using the initial security activation procedure. The RRC messages to activate security (command and successful response) are integrity protected, while ciphering is started only after completion of the procedure. That is, the response to the message used to activate security is not ciphered, while the subsequent messages (e.g. used to establish SRB2 and DRBs) are both integrity protected and ciphered.

After having initiated the initial security activation procedure, E-UTRAN initiates the establishment of SRB2 and DRBs, i.e. E-UTRAN may do this prior to receiving the confirmation of the initial security activation from the UE. In any case, E-UTRAN will apply both ciphering and integrity protection for the RRC connection reconfiguration messages used to establish SRB2 and DRBs. E-UTRAN should release the RRC connection if the initial security activation and/or the radio bearer establishment fails (i.e. security activation and DRB establishment are triggered by a joint S1-procedure, which does not support partial success).

For SRB2 and DRBs, security is always activated from the start, i.e. the E-UTRAN does not establish these bearers prior to activating security.

For some radio configuration fields, a critical extension has been defined. A switch from the original version of the field to the critically extended version is allowed using any connection reconfiguration. The UE reverts to the original version of some critically extended fields upon handover and re-establishment as specified elsewhere in this specification. Otherwise, switching a field from the critically extended version to the original version is only possible using the handover or re-establishment procedure with the full configuration option. This also applies for fields that are critically extended within a release (i.e. original and extended version defined in same release).

After having initiated the initial security activation procedure, E-UTRAN may configure a UE that supports CA, with one or more SCells in addition to the PCell that was initially configured during connection establishment. The PCell is used to provide the security inputs and upper layer system information (i.e. the NAS mobility information e.g. TAI). SCells are used to provide additional downlink and optionally uplink radio resources. When not configured with any kind of DC, all SCells the UE is configured with, if any, are part of the MCG.

When configured with DC, some of the SCells are part of a SCG. In this case, user data carried by a DRB may either be transferred via MCG (i.e. MCG-DRB), via SCG (SCG-DRB) or via both MCG and SCG in DL while E-UTRAN configures the CG used in UL (split DRB). An RRC connection reconfiguration message may be used to change the DRB type from MCG-DRB to SCG-DRB or to split DRB, as well as from SCG-DRB or split DRB to MCG-DRB.

DC employs SCG change, which is a synchronous SCG reconfiguration procedure (i.e. involving RA to the PCell) including reset/re-establishment of layer 2 and, if SCG DRBs are configured, refresh of security. The procedure is used in a number of different scenarios e.g. SCG establishment, PCell change, Key refresh, change of DRB type. The UE performs the SCG change related actions upon receiving an RRConnectionReconfiguration message including mobilityControlInfoSCG, see 5.3.10.10.

In case of EN-DC, the SCG cells use another RAT, namely NR. The configuration of an NR SCG, as used in case of EN-DC, is specified in TS 38.331 [82]. When configured with EN-DC, user data carried by a DRB may either be transferred via MCG, via NR SCG or via both MCG and NR SCG. Also RRC signalling carried by a SRB may either be transferred via MCG or via both MCG and NR SCG. When DRBs and SRBs are configured with transmission via both MCG and SCG, duplication may be used in both DL and UL.

Change to NR PDCP or vice versa, for both SRBs and DRBs, can be performed using an RRConnectionReconfiguration message including the mobilityControlInfo (handover) by release and addition of the concerned RB (for DRBs) or of the concerned PDCP entity (for SRBs). The same RRConnectionReconfiguration message may be used to make changes regarding the CG(s) used for transmission. For SRBs, change from E-UTRA PDCP to NR PDCP type may, before initial security activation, also be performed using an RRConnectionReconfiguration message not including the mobilityControlInfo.

In case of EN-DC, there are three types of NR SCG reconfigurations:
- Reconfiguration with sync and key change i.e. a procedure involving RA to the PSCell, including NR MAC reset, re-establishment of NR RLC and NR PDCP and refresh of NR SCG security; and
- Reconfiguration with sync but without key change i.e. a procedure involving RA to the PSCell, including NR MAC reset and NR RLC re-establishment and PDCP data recovery (for AM DRB); and
- Regular NR SCG reconfiguration neither involving refresh of NR SCG security, nor RA to the PSCell, NR MAC reset or NR RLC re-establishment;

The network is only required to use the NR SCG reconfiguration with sync and key change in case the NR SCG security key changes (i.e. handover, change of SNs, S-KgNB refresh). Further details are specified in NR RRC TS 38.331 [82].

NOTE 2: In case of EN-DC, E-UTRA RRC configuration parameters should only affect E-UTRA operation. E.g., s-Measure only affects measurements configured by parameters defined in this specification. Should an E-UTRA RRC configuration change require a change of NR RRC configuration, the network should indicate such NR change by NR RRC signalling. E.g. a specific indication is used to trigger RLC re-establishment upon reconfigurations changing the CG(s) used for transmission (in DL or UL) that otherwise would only involve NR RRC signalling.

In this release of the specification, change between DC and EN-DC is not supported (i.e. neither the direct reconfiguration nor specific measurement events). Likewise, the direct transition between EN-DC and NR DC is not supported in this release of the specification.

The release of the RRC connection normally is initiated by E-UTRAN. The procedure may be used to re-direct the UE to an E-UTRA frequency or an inter-RAT carrier frequency. Only in exceptional cases, as specified within this specification, TS 36.300 [9], TS 36.304 [4] or TS 24.301 [35], may the UE abort the RRC connection, i.e. move to RRC_IDLE without notifying E-UTRAN.

The suspension of the RRC connection is initiated by E-UTRAN. When the RRC connection is suspended, the UE stores the UE AS context and the resumeIdentity, and transitions to RRC_IDLE state. The RRC message to suspend the RRC connection is integrity protected and ciphered. Suspension can only be performed when at least 1 DRB is successfully established.

The resumption of a suspended RRC connection is initiated by upper layers when the UE has a stored UE AS context, RRC connection resume is permitted by E-UTRAN and the UE needs to transit from RRC_IDLE state to RRC_CONNECTED state. When the RRC connection is resumed, RRC configures the UE according to the RRC connection resume procedure based on the stored UE AS context and any RRC configuration received from E-UTRAN. The RRC connection resume procedure re-activates security and re-establishes SRB(s) and DRB(s). The request to resume the RRC connection includes the resumeIdentity. The request is not ciphered, but protected with a message authentication code.

In response to a request to resume the RRC connection, E-UTRAN may resume the suspended RRC connection, reject the request to resume and instruct the UE to either keep or discard the stored context, or setup a new RRC connection.

In case of CP-EDT, the data are appended in the RRCEarlyDataRequest and RRCEarlyDataComplete messages, if available, and sent over SRB0. In case of UP-EDT, security is re-activated prior to transmission of RRC message using the nextHopChainingCount provided in the RRCConnectionRelease message with suspend indication during the preceding suspend procedure and the radio bearers are re-established. The uplink data are transmitted ciphered on DTCH multiplexed with the RRCConnectionResumeRequest message on CCCH. In the downlink, the data, if available, are transmitted on DTCH multiplexed with the RRCConnectionRelease message on DCCH. In response to a request for EDT, E-UTRAN may also choose to establish or resume the RRC connection.

A UE in RRC_CONNECTED enters RRC_INACTIVE when the network indicates RRC connection suspension in RRCConnectionRelease message. When entering RRC_INACTIVE, the UE stores the UE AS context and any RRC configuration received from the network.

The resumption of an RRC connection from RRC_INACTIVE is initiated by upper layers when the UE needs to transit from RRC_INACTIVE state to RRC_CONNECTED state or by RRC layer for, e.g. RNAU or reception of RAN paging. When the RRC connection is resumed, network configures the UE according to the RRC connection resume procedure based on the stored UE AS context and any RRC configuration received from the network. The RRC connection resume procedure re-activates security and re-establishes SRB(s) and DRB(s).
In response to a request to resume the RRC connection from RRC_INACTIVE, the network may resume the suspended RRC connection and UE enters to RRC_CONNECTED, or reject the request to resume using RRC message without security protection and send UE to RRC_INACTIVE with wait time, or directly re-suspend the RRC connection and send UE to RRC_INACTIVE, or directly release the RRC connection and send UE to RRC_IDLE, or instruct the UE to discard the stored context and initiate NAS level recovery.

5.3.1.2 Security

AS security comprises of the integrity protection of RRC signalling (SRBs) as well as the ciphering of RRC signalling (SRBs) and user data (DRBs).

RRC handles the configuration of the security parameters which are part of the AS configuration: the integrity protection algorithm, the ciphering algorithm and two parameters, namely the keyChangeIndicator and the nextHopChainingCount, which are used by the UE to determine the AS security keys upon handover, connection re-establishment and/or connection resume.

The integrity protection algorithm is common for signalling radio bearers SRB1, SRB2 and SRB4. When configured with MCG only, the ciphering algorithm is common for all radio bearers (i.e. SRB1, SRB2, SRB4 and DRBs). Neither integrity protection nor ciphering applies for SRB0.

RRC integrity and ciphering are always activated together, i.e. in one message/procedure. RRC integrity and ciphering are never de-activated. However, it is possible to switch to a 'NULL' ciphering algorithm (eea0).

The 'NULL' integrity protection algorithm (eia0) is used only for the UE in limited service mode [32, TS33.401]. In case the 'NULL' integrity protection algorithm is used, 'NULL' ciphering algorithm is also used.

NOTE 1: Lower layers discard RRC messages for which the integrity check has failed and indicate the integrity verification check failure to RRC.

The AS applies three different security keys: one for the integrity protection of RRC signalling (KRRCint), one for the ciphering of RRC signalling (KRRCenc) and one for the ciphering of user data (KUPenc). All three AS keys are derived from the K_NB key. The K_NB is based on the K_ASM key for E-UTRA connected to EPC, or K_AMF for E-UTRA connected to 5GC, which is handled by upper layers.

Upon connection establishment new AS keys are derived. No AS-parameters are exchanged to serve as inputs for the derivation of the new AS keys at connection establishment.

The integrity and ciphering of the RRC message used to perform handover is based on the security configuration used prior to the handover and is performed by the source eNB.

The integrity and ciphering algorithms can only be changed upon handover. The four AS keys (K_NB, KRRCint, KRRCenc and K_UPenc) change upon every handover, connection re-establishment and connection resume. The keyChangeIndicator is used upon handover and indicates whether the UE should use the keys associated with the K_ASM key for E-UTRA connected to EPC or K_AMF for E-UTRA connected to 5GC, taken into use with the latest successful NAS SMC procedure. The nextHopChainingCount parameter is used upon handover, connection re-establishment and connection resume by the UE when deriving the new K_NB that is used to generate KRRCint, KRRCenc and K_UPenc (see TS 33.401 [32]). An intra cell handover procedure may be used to change the keys in RRC_CONNECTED.

For each radio bearer an independent counter (COUNT, as specified in TS 36.323 [8] for E-UTRA connected to EPC, and TS 38.323 [83] for E-UTRA connected to 5GC) is maintained for each direction. For each DRB, the COUNT is used as input for ciphering. For each SRB, the COUNT is used as input for both ciphering and integrity protection. It is not allowed to use the same COUNT value more than once for a given security key. At connection resume the COUNT is reset. In order to limit the signalling overhead, individual messages/packets include a short sequence number (PDCP SN, as specified in TS 36.323 [8] for E-UTRA connected to EPC, and TS 38.323 [83] for E-UTRA connected to 5GC). In addition, an overflow counter mechanism is used: the hyper frame number (TX_HFN and RX_HFN, as specified in TS 36.323 [8] for E-UTRA connected to EPC, and TS 38.323 [83] for E-UTRA connected to 5GC). The HFN needs to be synchronized between the UE and the eNB. The eNB is responsible for avoiding reuse of the COUNT with the same RB identity and with the same K_NB, e.g. due to the transfer of large volumes of data, release and establishment of new RBs. In order to avoid such re-use, the eNB may e.g. use different RB identities for successive RB establishments, trigger an intra cell handover or by triggering a transition from RRC_CONNECTED to RRC_IDLE or RRC_INACTIVE and then back to RRC_CONNECTED.

For each SRB, the value provided by RRC to lower layers to derive the 5-bit BEARER parameter used as input for ciphering and for integrity protection is the value of the corresponding srb-Identity with the MSBs padded with zeroes.
In case of DC, a separate K_{NB} is used for SCG-DRBs (S-K_{NB}). This key is derived from the key used for the MCG (K_{NB}) and an SCG counter that is used to ensure freshness. To refresh the S-K_{NB} e.g. when the COUNT will wrap around, E-UTRAN employs an SCG change, i.e. an RRCConnectionReconfiguration message including mobilityControlInfoSCG. When performing handover, while at least one SCG-DRB remains configured, both K_{NB} and S-K_{NB} are refreshed. In such case E-UTRAN performs handover with SCG change i.e. an RRCConnectionReconfiguration message including both mobilityControlInfo and mobilityControlInfoSCG. The ciphering algorithm is common for all radio bearers within a CG but may be different between MCG and SCG. The ciphering algorithm for SCG DRBs can only be changed upon SCG change.

In case of EN-DC, the network indicates whether the UE shall use either K_{NB} or S-K_{NB} for a particular DRB. S-K_{NB} is derived in the same way as S-K_{NB} as defined in 33.501[86], uses a different counter (sk-Counter) and is used only for DRBs using NR PDCP. Whenever there is a need to refresh S-K_{NB}, e.g. upon change of MN or SN, the NR SCG reconfiguration with sync and key change is used (see 5.3.1.1). E-UTRAN provides a UE configured with EN-DC with an sk-Counter even when no DRB is setup using S-K_{NB} i.e. to facilitate configuration of SRB3. The same ciphering algorithm is used for all radio bearers using the same key (i.e. K_{NB} or S-K_{NB}). Likewise, the same integrity algorithm is used for all SRBs using the same key. Although NR RRC uses different values for the security algorithms than E-UTRA, the actual algorithms are the same in case of EN-DC in this version of the specification. Hence, for such algorithms, the security capabilities supported by a UE are consistent across these RATs.

NOTE 2: The network ensures that different values are used for the SCG counter and for the sk-Counter when deriving S-K_{NB} and/or S-K_{NB} from the same K_{NB}.

5.3.1.2a RN security

For RNs, AS security follows the procedures in 5.3.1.2. Furthermore, E-UTRAN may configure per DRB whether or not integrity protection is used. The use of integrity protection may be configured only upon DRB establishment and reconfigured only upon handover or upon the first reconfiguration following RRC connection re-establishment.

To provide integrity protection on DRBs between the RN and the E-UTRAN, the K_{UPlnr} key is derived from the K_{NB} key as described in TS33.401 [32]. The same integrity protection algorithm used for SRBs also applies to the DRBs. The K_{UPlnr} changes at every handover and RRC connection re-establishment and is based on an updated K_{NB} which is derived by taking into account the nextHopChainingCount. The COUNT value maintained for DRB ciphering is also used for integrity protection, if the integrity protection is configured for the DRB.

5.3.1.3 Connected mode mobility

In RRC_CONNECTED, the network controls UE mobility, i.e. the network decides when the UE shall connect to which E-UTRA cell(s), or inter-RAT cell. For network controlled mobility in RRC_CONNECTED, the PCell can be changed using an RRCConnectionReconfiguration message including the mobilityControlInfo (handover), whereas the SCell(s) can be changed using the RRCConnectionReconfiguration message either with or without the mobilityControlInfo.

In DC, an SCG can be established, reconfigured or released by using an RRCConnectionReconfiguration message with or without the mobilityControlInfo. In case Random Access to the PSCell or initial PUSCH transmission to the PSCell if rach-SkipSCG is configured is required upon SCG reconfiguration, E-UTRAN employs the SCG change procedure (i.e. an RRCConnectionReconfiguration message including the mobilityControlInfoSCG). The PSCell can only be changed using the SCG change procedure and by release and addition of the PSCell.

In EN-DC, an NR SCG can be established or reconfigured by using an RRCConnectionReconfiguration message containing nr-secondaryCellGroupConfig and nr-RadioBearerConfig. The contents of nr-secondaryCellGroupConfig and nr-RadioBearerConfig, of other EN-DC fields as well as the associated procedures are specified in TS 38.331 [82].

The network triggers the handover procedure e.g. based on radio conditions, load. To facilitate this, the network may configure the UE to perform measurement reporting (possibly including the configuration of measurement gaps). The network may also initiate handover blindly, i.e. without having received measurement reports from the UE.

Before sending the handover message to the UE, the source eNB prepares one or more target cells. The source eNB selects the target PCell. The source eNB may also provide the target eNB with a list of best cells on each frequency for which measurement information is available, in order of decreasing RSRP. The source eNB may also include available measurement information for the cells provided in the list. The target eNB decides which SCells are configured for use after handover, which may include cells other than the ones indicated by the source eNB. If an SCG is configured, handover involves either SCG release or either SCG change (in case of DC) or an NR SCG reconfiguration with sync and key change (in case of EN-DC). In case the UE was configured with (EN-) DC, the target eNB indicates in the handover message whether the UE shall release the entire (NR) SCG configuration. Upon connection re-establishment,
the UE releases the entire SCG configuration except for the DRB configuration, while E-UTRAN in the first reconfiguration message following the re-establishment either releases the DRB(s) or reconfigures the DRB(s) to MCG DRB(s).

The target eNB generates the message used to perform the handover, i.e. the message including the AS-configuration to be used in the target cell(s). The source eNB transparently (i.e. does not alter values/content) forwards the handover message/ information received from the target to the UE. When appropriate, the source eNB may initiate data forwarding for (a subset of) the DRBs.

After receiving the handover message, the UE attempts to access the target PCell at the first available RACH occasion according to Random Access resource selection defined in TS 36.321 [6], i.e. the handover is asynchronous, or at the first available PUSCH occasion if rach-Skip is configured. Consequently, when allocating a dedicated preamble for the random access in the target PCell, E-UTRA shall ensure it is available from the first RACH occasion the UE may use. The first available PUSCH occasion is provided by ul-ConfigInfo, if configured, otherwise UE shall monitor the PDCCH of target eNB. Upon successful completion of the handover, the UE sends a message used to confirm the handover.

If the target eNB does not support the release of RRC protocol which the source eNB used to configure the UE, the target eNB may be unable to comprehend the UE configuration provided by the source eNB. In this case, the target eNB should use the full configuration option to reconfigure the UE for Handover and Re-establishment. Full configuration option includes an initialization of the radio configuration, which makes the procedure independent of the configuration used in the source cell(s) with the exception that the security algorithms are continued for the RRC re-establishment.

The same behavior applies in EN-DC, if upon handover the target eNB is unable to comprehend the MCG part of the UE configuration i.e. the target eNB uses the full configuration option which involves release and configuration of (most of the) MCG and NR SCG configuration. In case of EN-DC, the target SgNB may be unable to comprehend the NR SCG configuration provided by the source SgNB. In such a case, release and addition may be applied for the NR SCG part of the configuration.

**NOTE 1:** When using release and addition for the NR SCG configuration, E-UTRAN includes drb-ToReleaseList for the SN terminated RBs.

After the successful completion of handover, PDCP SDUs may be re-transmitted in the target cell(s). This only applies for DRBs using RLC-AM mode and for handovers not involving full configuration option. The further details are specified in TS 36.323 [8]. After the successful completion of handover not involving full configuration option, the SN and the HFN are reset except for the DRBs using RLC-AM mode (for which both SN and HFN continue). For reconfigurations involving the full configuration option, the PDCP entities are newly established (SN and HFN do not continue) for all DRBs irrespective of the RLC mode. The further details are specified in TS 36.323 [8].

One UE behaviour to be performed upon handover is specified, i.e. this is regardless of the handover procedures used within the network (e.g. whether the handover includes X2 or S1 signalling procedures).

The source eNB should, for some time, maintain a context to enable the UE to return in case of handover failure. After having detected handover failure, the UE attempts to resume the RRC connection either in the source PCell or in another cell using the RRC re-establishment procedure. This connection resumption succeeds only if the accessed cell is prepared, i.e. concerns a cell of the source eNB or of another eNB towards which handover preparation has been performed. The cell in which the re-establishment procedure succeeds becomes the PCell while SCells and STAGs, if configured, are released.

Normal measurement and mobility procedures are used to support handover to cells broadcasting a CSG identity. In addition, E-UTRAN may configure the UE to report that it is entering or leaving the proximity of cell(s) included in its CSG whitelist. Furthermore, E-UTRAN may request the UE to provide additional information broadcast by the handover candidate cell e.g. global cell identity, CSG identity, CSG membership status.

**NOTE 2:** E-UTRAN may use the 'proximity report' to configure measurements as well as to decide whether or not to request additional information broadcast by the handover candidate cell. The additional information is used to verify whether or not the UE is authorised to access the target PCell and may also be needed to identify handover candidate cell (PCI confusion i.e. when the physical layer identity that is included in the measurement report does not uniquely identify the cell).

### 5.3.1.4 Connection control in NB-IoT

In NB-IoT, during the RRC connection establishment procedure, SRB1bis is established implicitly with SRB1. SRB1bis uses the logical channel identity defined in 9.1.2a, with the same configuration as SRB1 but no PDCP entity.
SRB1bis is used until security is activated. The RRC messages to activate security (command and successful response) are sent over SRB1 being integrity protected and ciphering is started after completion of the procedure. In case of unsuccessful security activation, the failure message is sent over SRB1 and subsequent messages are sent over SRB1bis. Once security is activated, new RRC messages shall be transmitted using SRB1. A NB-IoT UE that only supports the Control Plane CIoT EPS optimisation (see TS 24.301 [35]) only establishes SRB1bis.

A NB-IoT UE only supports 0, 1 or 2 DRBs, depending on its capability. A NB-IoT UE that only supports the Control Plane CIoT EPS optimisation (see TS 24.301 [35]) does not need to support any DRBs and associated procedures.

Table 5.3.1.4-1 lists the procedures that are applicable for NB-IoT. All other procedures are not applicable; this is not further stated in the corresponding procedures.

### Table 5.3.1.4-1: Connection control procedures applicable to a NB-IoT UE

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**NOTE:** Not applicable for a UE that only supports the Control Plane CIoT EPS optimisation (see TS 24.301 [35]).

### 5.3.2 Paging

#### 5.3.2.1 General

![Figure 5.3.2.1-1: Paging](image)

The purpose of this procedure is:

- to transmit CN initiated paging information to a UE in RRC_IDLE or RRC_INACTIVE and/or;
- to transmit RAN initiated paging information to a UE in RRC_INACTIVE and/or;
- to inform UEs in RRC_IDLE, UEs in RRC_INACTIVE and UEs in RRC_CONNECTED other than NB-IoT UEs, BL UEs and UEs in CE, about a system information change and/or;
- to inform UEs in RRC_IDLE other than NB-IoT UEs, UEs in RRC_INACTIVE and UEs in RRC_CONNECTED other than NB-IoT UEs, BL UEs and UEs in CE, about an ETWS primary notification and/or ETWS secondary notification and/or;
- to inform UEs other than NB-IoT UEs in RRC_IDLE, and other than UEs connected to 5GC about an EAB parameters modification and/or;
- to inform UEs other than NB-IoT UEs in RRC_IDLE, and other than UEs connected to 5GC about an EAB parameters modification and/or;
- to inform UEs other than NB-IoT UEs in RRC_IDLE, and UEs in RRC_INACTIVE to perform E-UTRAN inter-frequency redistribution procedure.

The paging information of CN initiated paging is provided to upper layers, which in response may initiate RRC connection establishment, e.g. to receive an incoming call.

### 5.3.2.2 Initiation

E-UTRAN initiates the paging procedure by transmitting the *Paging* message at the UE's paging occasion as specified in TS 36.304 [4]. E-UTRAN may address multiple UEs within a *Paging* message by including one *PagingRecord* for each UE. E-UTRAN may also indicate a change of system information, and/or provide an ETWS notification or a CMAS notification in the *Paging* message.

### 5.3.2.3 Reception of the *Paging* message by the UE

Upon receiving the *Paging* message, the UE shall:

1. if in RRC_IDLE, for each of the *PagingRecord*, if any, included in the *Paging* message:
   2. if the *ue-Identity* included in the *PagingRecord* matches one of the UE identities allocated by upper layers:
      3. forward the *ue-Identity, accessType* (if present) and, except for NB-IoT, the *cn-Domain* to the upper layers;
   1. if in RRC_INACTIVE, for each of the *PagingRecord*, if any, included in the *Paging* message:
      2. if the *ue-Identity* included in the *PagingRecord* matches the stored I-RNTI:
         3. if UE is configured with one or more access identities equal to 1, 2 or 11-15 applicable in the selected PLMN:
            4. initiate RRC connection resume procedure in 5.3.3.2 with cause value set to 'highPriorityAccess';
         3. else:
            4. initiate the RRC connection resumption procedure according to 5.3.3.2 with cause value set to 'mt-access';
      2. else if the *ue-Identity* included in the *PagingRecord* matches one of the UE identities allocated by upper layers:
         3. forward the *ue-Identity, accessType* (if present) and the *cn-Domain* to the upper layers;
         3. perform the actions upon leaving RRC_INACTIVE as specified in 5.3.12, with release cause 'other';
   1. if the UE is not configured with a DRX cycle longer than the modification period and the *systemInfoModification* is included; or
   1. if the UE is configured with a DRX cycle longer than the modification period and the *systemInfoModification-eDRX* is included:
      2. re-acquire the required system information using the system information acquisition procedure as specified in 5.2.2.
   1. if the *etws-Indication* is included and the UE is ETWS capable:
      2. re-acquire *SystemInformationBlockType1* immediately, i.e., without waiting until the next system information modification period boundary;
      2. if the *schedulingInfoList* indicates that *SystemInformationBlockType10* is present:
         3. acquire *SystemInformationBlockType10*;

**NOTE:** If the UE is in CE, it is up to UE implementation when to start acquiring *SystemInformationBlockType10*.

2. if the *schedulingInfoList* indicates that *SystemInformationBlockType11* is present:
3> acquire SystemInformationBlockType11;
1> if the cmas-Indication is included and the UE is CMAS capable:
2> re-acquire SystemInformationBlockType1 immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.5;
2> if the schedulingInfoList indicates that SystemInformationBlockType12 is present:
3> acquire SystemInformationBlockType12;
1> if in RRC_IDLE, the eab-ParamModification is included and the UE is EAB capable:
2> consider previously stored SystemInformationBlockType14 as invalid;
2> re-acquire SystemInformationBlockType1 immediately, i.e., without waiting until the next system information modification period boundary as specified in 5.2.1.6;
2> re-acquire SystemInformationBlockType14 using the system information acquisition procedure as specified in 5.2.2.4;
1> if in RRC_IDLE, the redistributionIndication is included and the UE is redistribution capable:
2> Perform E-UTRAN inter-frequency redistribution procedure as specified in TS 36.304 (5.2.4.10, [4]);

5.3.3 RRC connection establishment

5.3.3.1 General

Figure 5.3.3.1-1: RRC connection establishment, successful

Figure 5.3.3.1-2: RRC connection establishment, network reject
Figure 5.3.3.1-3: RRC connection resume (suspended RRC connection or RRC_INACTIVE), or UP-EDT fallback to RRC connection resume, successful

Figure 5.3.3.1-4: RRC connection resume (suspended RRC connection or RRC_INACTIVE) or UP-EDT fallback to RRC connection establishment, successful

Figure 5.3.3.1-5: RRC connection resume or UP-EDT, network reject (suspended RRC connection or RRC_INACTIVE) or release (suspended RRC connection)
The purpose of this procedure is to establish an RRC connection, to resume a suspended RRC connection, to move the UE from RRC_INACTIVE to RRC_CONNECTED or to perform EDT. RRC connection establishment involves SRB1.
(and SRB1bis for NB-IoT) establishment. The procedure is also used to transfer the initial NAS dedicated information/message from the UE to E-UTRAN.

E-UTRAN applies the procedure as follows:

- When establishing an RRC connection:
  - to establish SRB1 and, for NB-IoT, SRB1bis;
- When resuming an RRC connection from a suspended RRC connection or from RRC_INACTIVE:
  - to restore the AS configuration from a stored context including resuming SRB(s) and DRB(s);
- When performing EDT.

5.3.3.1a Conditions for establishing RRC Connection for sidelink communication/discovery/ V2X sidelink communication

For sidelink communication an RRC connection is initiated only in the following case:

1> if configured by upper layers to transmit non-relay related sidelink communication and related data is available for transmission:
   
2> if SystemInformationBlockType18 is broadcast by the cell on which the UE camps; and if the valid version of SystemInformationBlockType18 does not include commTxPoolNormalCommon;

1> if configured by upper layers to transmit relay related sidelink communication:

2> if the UE is acting as sidelink relay UE; and if SystemInformationBlockType18 is broadcast by the cell on which the UE camps; or

2> if the UE has a selected sidelink relay UE; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met and if SystemInformationBlockType18 is broadcast by the cell on which the UE camps; and if the valid version of SystemInformationBlockType18 does not include commTxPoolNormalCommon or commTxAllowRelayCommon;

For V2X sidelink communication an RRC connection is initiated only in the following case:

1> if configured by upper layers to transmit non-P2X related V2X sidelink communication and related data is available for transmission:

2> if the frequency on which the UE is configured to transmit non-P2X related V2X sidelink communication concerns the camped frequency; and if SystemInformationBlockType21 is broadcast by the cell on which the UE camps; and if the valid version of SystemInformationBlockType21 includes sl-V2X-ConfigCommon; and sl-V2X-ConfigCommon does not include v2x-CommTxPoolNormalCommon; or

2> if the frequency on which the UE is configured to transmit non-P2X related V2X sidelink communication is included in v2x-InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26 broadcast by the cell on which the UE camps; and if neither the valid version of SystemInformationBlockType21 nor that of SystemInformationBlockType26 includes v2x-CommTxPoolNormal for the concerned frequency;

1> if configured by upper layers to transmit P2X related V2X sidelink communication and related data is available for transmission:

2> if the frequency on which the UE is configured to transmit P2X related V2X sidelink communication concerns the camped frequency; and if SystemInformationBlockType21 is broadcast by the cell on which the UE camps; and if the valid version of SystemInformationBlockType21 includes sl-V2X-ConfigCommon; and sl-V2X-ConfigCommon does not include p2x-CommTxPoolNormalCommon; or

2> if the frequency on which the UE is configured to transmit P2X related V2X sidelink communication is included in v2x-InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26 broadcast by the cell on which the UE camps; and if neither the valid version of SystemInformationBlockType21 nor that of SystemInformationBlockType26 includes p2x-CommTxPoolNormal for the concerned frequency;
For sidelink discovery an RRC connection is initiated only in the following case:

1> if configured by upper layers to transmit non-PS related sidelink discovery announcements:
   2> if the frequency on which the UE is configured to transmit non-PS related sidelink discovery announcements concerns the camped frequency; and SystemInformationBlockType19 of the cell on which the UE camps does not include discTxPoolCommon-r12; or
   2> if the frequency on which the UE is configured to transmit non-PS related sidelink discovery announcements is included in discInterFreqList in SystemInformationBlockType19 broadcast by the cell on which the UE camps, with discTxResourcesInterFreq included within discResourcesNonPS and set to requestDedicated;

1> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements:
   2> if the frequency on which the UE is configured to transmit non-relay PS related sidelink discovery announcements concerns the camped frequency; and SystemInformationBlockType19 of the cell on which the UE camps includes discConfigPS but does not include discTxPoolPS-Common; or
   2> if the frequency on which the UE is configured to transmit non-relay PS related sidelink discovery announcements (e.g. group member discovery) is included in discInterFreqList in SystemInformationBlockType19 broadcast by the cell on which the UE camps, with discTxResourcesInterFreq within discResourcesPS included and set to requestDedicated;

1> if configured by upper layers to transmit relay PS related sidelink discovery announcements:
   2> if the UE is acting as sidelink relay UE; and if the sidelink relay UE threshold conditions as specified in 5.10.10.4 are met; or
   2> if the UE is selecting a sidelink relay UE / has a selected sidelink relay UE; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met:
       3> if the frequency on which the UE is configured to transmit relay PS related sidelink discovery announcements concerns the camped frequency; and SystemInformationBlockType19 of the cell on which the UE camps includes discConfigRelay and discConfigPS but does not include discTxPoolPS-Common;

NOTE: Upper layers initiate an RRC connection. The interaction with NAS is left to UE implementation.

5.3.3.1b Conditions for initiating EDT

A BL UE, UE in CE or NB-IoT UE can initiate EDT when all of the following conditions are fulfilled:

1> for CP-EDT, the upper layers request establishment of an RRC connection, the UE supports CP-EDT, and SystemInformationBlockType2 (SystemInformationBlockType2-NB in NB-IoT) includes cp-EDT; or
1> for UP-EDT, the upper layers request resumption of an RRC connection, the UE supports UP-EDT, SystemInformationBlockType2 (SystemInformationBlockType2-NB in NB-IoT) includes up-EDT; and the UE has a stored value of the nextHopChainingCount provided in the RRCConnectionRelease message with suspend indication during the preceding suspend procedure;

1> the establishment or resumption request is for mobile originating calls and the establishment cause is mo-Data or mo-ExceptionData or delayTolerantAccess;

1> SystemInformationBlockType2 (SystemInformationBlockType2-NB in NB-IoT) includes edt-Parameters;

1> the size of the resulting MAC PDU including the total UL data is expected to be smaller than or equal to the TBS signalled in edt-TBS as specified in TS 36.321 [6, 5.1.1];

1> EDT fallback indication has not been received from lower layers for this establishment or resumption procedure;

NOTE 1: Upper layers request or resume an RRC connection. The interaction with NAS is up to UE implementation.

NOTE 2: It is up to UE implementation how the UE determines whether the size of UL data is suitable for EDT.
5.3.3.2 Initiation

The UE initiates the procedure when upper layers request establishment or resume of an RRC connection while the UE is in RRC_IDLE or when upper layers request resume of an RRC connection or RRC layer requests resume of an RRC connection for, e.g. RNAU or reception of RAN paging while the UE is in RRC_INACTIVE.

Except for NB-IoT, upon initiation of the procedure, if the UE is connected to EPC, the UE shall:

1> if SystemInformationBlockType2 includes ac-BarringPerPLMN-List and the ac-BarringPerPLMN-List contains an AC-BarringPerPLMN entry with the plmn-IdentityIndex corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]):

2> select the AC-BarringPerPLMN entry with the plmn-IdentityIndex corresponding to the PLMN selected by upper layers;

2> in the remainder of this procedure, use the selected AC-BarringPerPLMN entry (i.e. presence or absence of access barring parameters in this entry) irrespective of the common access barring parameters included in SystemInformationBlockType2;

1> else

2> in the remainder of this procedure use the common access barring parameters (i.e. presence or absence of these parameters) included in SystemInformationBlockType2;

1> if SystemInformationBlockType2 contains acdc-BarringPerPLMN-List and the acdc-BarringPerPLMN-List contains an ACDC-BarringPerPLMN entry with the plmn-IdentityIndex corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]):

2> select the ACDC-BarringPerPLMN entry with the plmn-IdentityIndex corresponding to the PLMN selected by upper layers;

2> in the remainder of this procedure, use the selected ACDC-BarringPerPLMN entry for ACDC barring check (i.e. presence or absence of access barring parameters in this entry) irrespective of the acdc-BarringForCommon parameters included in SystemInformationBlockType2;

1> else:

2> in the remainder of this procedure use the acdc-BarringForCommon (i.e. presence or absence of these parameters) included in SystemInformationBlockType2 for ACDC barring check;

1> if upper layers indicate that the RRC connection is subject to EAB (see TS 24.301 [35]):

2> if the result of the EAB check, as specified in 5.3.3.12, is that access to the cell is barred:

3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that EAB is applicable, upon which the procedure ends;

1> if upper layers indicate that the RRC connection is subject to ACDC (see TS 24.301 [35]), SystemInformationBlockType2 contains BarringPerACDC-CategoryList, and acdc-HPLMNonly indicates that ACDC is applicable for the UE:

2> if the BarringPerACDC-CategoryList contains a BarringPerACDC-Category entry corresponding to the ACDC category selected by upper layers:

3> select the BarringPerACDC-Category entry corresponding to the ACDC category selected by upper layers;

2> else:

3> select the last BarringPerACDC-Category entry in the BarringPerACDC-CategoryList;

2> stop timer T308, if running;

2> perform access barring check as specified in 5.3.3.13, using T308 as "Tbarring" and acdc-BarringConfig in the BarringPerACDC-Category as "ACDC barring parameter";
2> if access to the cell is barred:
   3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC
      connection with suspend indication and that access barring is applicable due to ACDC, upon which the
      procedure ends;

1> else if the UE is establishing the RRC connection for mobile terminating calls:
   2> if timer T302 is running:
      3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC
         connection with suspend indication and that access barring for mobile terminating calls is applicable,
         upon which the procedure ends;
   1> else if the UE is establishing the RRC connection for emergency calls:
      2> if SystemInformationBlockType2 includes the ac-BarringInfo:
         3> if the ac-BarringForEmergency is set to TRUE:
            4> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15,
               which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11]:
               
               NOTE 1: ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the
               HPLMN/ EHPLMN.
               5> if the ac-BarringInfo includes ac-BarringForMO-Data, and for all of these valid Access Classes
                  for the UE, the corresponding bit in the ac-BarringForSpecialAC contained in ac-BarringForMO-
                  Data is set to one:
                  6> consider access to the cell as barred;
            4> else:
               5> consider access to the cell as barred;
      2> if access to the cell is barred:
         3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC
            connection with suspend indication, upon which the procedure ends;
   1> else if the UE is establishing the RRC connection for mobile originating calls:
      2> perform access barring check as specified in 5.3.3.11, using T303 as “Tbarring” and ac-BarringForMO-Data
         as "AC barring parameter";
      2> if access to the cell is barred:
         3> if SystemInformationBlockType2 includes ac-BarringForCSFB or the UE does not support CS fallback:
            4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC
               connection with suspend indication and that access barring for mobile originating calls is applicable,
               upon which the procedure ends;
         3> else (SystemInformationBlockType2 does not include ac-BarringForCSFB and the UE supports CS
            fallback):
            4> if timer T306 is not running, start T306 with the timer value of T303;
            4> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC
               connection with suspend indication and that access barring for mobile originating calls and mobile
               originating CS fallback is applicable, upon which the procedure ends;
   1> else if the UE is establishing the RRC connection for mobile originating signalling:
      2> perform access barring check as specified in 5.3.3.11, using T305 as "Tbarring” and ac-BarringForMO-
         Signalling as "AC barring parameter";
if access to the cell is barred:

inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating signalling is applicable, upon which the procedure ends;

else if the UE is establishing the RRC connection for mobile originating CS fallback:

if SystemInformationBlockType2 includes ac-BarringForCSFB:

perform access barring check as specified in 5.3.3.11, using T306 as "Tbarring" and ac-BarringForCSFB as "AC barring parameter";

if access to the cell is barred:

inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating CS fallback is applicable, due to ac-BarringForCSFB, upon which the procedure ends;

else:

perform access barring check as specified in 5.3.3.11, using T306 as "Tbarring" and ac-BarringForMO-Data as "AC barring parameter";

if access to the cell is barred:

if timer T303 is not running, start T303 with the timer value of T306;

inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating CS fallback and mobile originating calls is applicable, due to ac-BarringForMO-Data, upon which the procedure ends;

else if the UE is establishing the RRC connection for mobile originating MMTEL voice, mobile originating MMTEL video, mobile originating SMS/SIP or mobile originating SMS:

if the UE is establishing the RRC connection for mobile originating MMTEL voice and SystemInformationBlockType2 includes ac-BarringSkipForMMTELVoice; or

if the UE is establishing the RRC connection for mobile originating MMTEL video and SystemInformationBlockType2 includes ac-BarringSkipForMMTELVideo; or

if the UE is establishing the RRC connection for mobile originating SMS/SIP or SMS and SystemInformationBlockType2 includes ac-BarringSkipForSMS:

consider access to the cell as not barred;

else:

if establishmentCause received from higher layers is set to mo-Signalling (including the case that mo-Signalling is replaced by highPriorityAccess according to 3GPP TS 24.301 [35] or by mo-VoiceCall according to the subclause 5.3.3.3):

perform access barring check as specified in 5.3.3.11, using T305 as "Tbarring" and ac-BarringForMO-Signalling as "AC barring parameter";

if access to the cell is barred:

inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating signalling is applicable, upon which the procedure ends;

else if establishmentCause received from higher layers is set to mo-Data (including the case that mo-Data is replaced by highPriorityAccess according to 3GPP TS 24.301 [35] or by mo-VoiceCall according to the subclause 5.3.3.3):

perform access barring check as specified in 5.3.3.11, using T303 as "Tbarring" and ac-BarringForMO-Data as "AC barring parameter";
if access to the cell is barred:

if SystemInformationBlockType2 includes ac-BarringForCSFB or the UE does not support CS fallback:

inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls is applicable, upon which the procedure ends;

else (SystemInformationBlockType2 does not include ac-BarringForCSFB and the UE supports CS fallback):

if timer T306 is not running, start T306 with the timer value of T303;

inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls and mobile originating CS fallback is applicable, upon which the procedure ends;

Upon initiation of the procedure, if the UE is connected to 5GC, the UE shall:

if the upper layers provide an Access Category and one or more Access Identities upon requesting establishment of an RRC connection:

perform the unified access control procedure as specified in 5.3.16 using the Access Category and Access Identities provided by upper layers;

if the access attempt is barred, the procedure ends;

if the upper layers provide an Access Category and one or more Access Identities upon requesting the resumption of an RRC connection:

perform the unified access control procedure as specified in 5.3.16 using the Access Category and Access Identities provided by upper layers;

if the access attempt is barred, the procedure ends;

if the resumption of the RRC connection is triggered due to an RNAU:

if an emergency service is ongoing:

select ‘2’ as the Access Category;

else:

select [the standardised RAN specific access category] as the Access Category;

Editor's Note: Which value to use for the standardised RAN specific access category needs to be confirmed by SA1.

perform the unified access control procedure as specified in 5.3.16 using the selected Access Category and one or more Access Identities provided by upper layers;

if the access attempt is barred:

set the variable pendingRnaUpdate to ‘TRUE’;

the procedure ends;

if the resumption of the RRC connection is triggered by response to NG-RAN paging:

select ‘0’ as the Access Category;

perform the unified access control procedure as specified in 5.3.16 using the selected Access Category and one or more Access Identities provided by upper layers;

if the access attempt is barred, the procedure ends;

Except for NB-IoT, upon initiating the procedure, if connected to EPC or 5GC, the UE shall:
1> if the UE is resuming an RRC connection from a suspended RRC connection or from RRC_INACTIVE:

2> if the UE is resuming an RRC connection from a suspended RRC connection:

3> if the UE was configured with EN-DC:

4> perform EN-DC release, as specified in TS 38.331 [82, 5.3.5.10];

2> release the MCG SCell(s), if configured, in accordance with 5.3.10.3a;

2> release powerPrefIndicationConfig, if configured and stop timer T340, if running;

2> release reportProximityConfig and clear any associated proximity status reporting timer;

2> release obtainLocationConfig, if configured;

2> release idc-Config, if configured;

2> release sps-AssistanceInfoReport, if configured;

2> release measSubframePatternPCell, if configured;

2> release the entire SCG configuration, if configured, except for the DRB configuration (as configured by drb-ToAddModListSCG);

2> release naics-Info for the PCell, if configured;

2> release the LWA configuration, if configured, as described in 5.6.14.3;

2> release the LWIP configuration, if configured, as described in 5.6.17.3;

2> release bw-PreferenceIndicationTimer, if configured and stop timer T341, if running;

2> release delayBudgetReportingConfig, if configured and stop timer T342, if running;

2> release aicc-BitConfig, if configured;

2> release uplinkDataCompression, if configured;

1> apply the default physical channel configuration as specified in 9.2.4;

1> apply the default semi-persistent scheduling configuration as specified in 9.2.3;

1> apply the default MAC main configuration as specified in 9.2.2;

1> apply the CCCH configuration as specified in 9.1.1.2;

1> apply the timeAlignmentTimerCommon included in SystemInformationBlockType2;

1> start timer T300;

1> if the UE is resuming an RRC connection from a suspended RRC connection or from RRC_INACTIVE:

2> stop T380 if the UE is resuming from RRC_INACTIVE;

2> initiate transmission of the RRCConnectionResumeRequest message in accordance with 5.3.3.3a;

1> else:

2> if stored, discard the UE AS context, resumeIdentity and I-RNTI;

2> if the UE is initiating CP-EDT in accordance with conditions in 5.3.3.1b:

3> initiate transmission of the RRCEarlyDataRequest message in accordance with 5.3.3.3b;

2> else:

3> initiate transmission of the RRCConnectionRequest message in accordance with 5.3.3.3;
NOTE 2: Upon initiating the connection establishment procedure, the UE is not required to ensure it maintains up to date system information applicable only for UEs in RRC_IDLE state or UEs in RRC_INACTIVE. However, the UE needs to perform system information acquisition upon cell re-selection.

For NB-IoT, upon initiation of the procedure, the UE shall:

1> if the UE is establishing or resuming the RRC connection for mobile originating exception data; or
1> if the UE is establishing or resuming the RRC connection for mobile originating data; or
1> if the UE is establishing or resuming the RRC connection for delay tolerant access; or
1> if the UE is establishing or resuming the RRC connection for mobile originating signalling;

2> perform access barring check as specified in 5.3.3.14;
2> if access to the cell is barred:
3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication and that access barring is applicable, upon which the procedure ends;

1> apply the default physical channel configuration as specified in 9.2.4;
1> apply the default MAC main configuration as specified in 9.2.2;
1> apply the CCCH configuration as specified in 9.1.1.2;
1> start timer T300;
1> if the UE is establishing an RRC connection:
2> if the UE is initiating CP-EDT in accordance with conditions in 5.3.3.1b:
3> initiate transmission of the RRCEarlyDataRequest message in accordance with 5.3.3.3b;
2> else:
3> initiate transmission of the RRCConnectionRequest message in accordance with 5.3.3.3;
1> else if the UE is resuming an RRC connection:
2> initiate transmission of the RRCConnectionResumeRequest message in accordance with 5.3.3.3a;

NOTE 3: Upon initiating the connection establishment or resumption procedure, the UE is not required to ensure it maintains up to date system information applicable only for UEs in RRC_IDLE state. However, the UE needs to perform system information acquisition upon cell re-selection.

NOTE 4: For EDT, upon initiating the connection establishment or resumption procedure, it is up to UE implementation whether to continue cell re-selection related measurements as well as cell re-selection evaluation and, if the conditions for cell re-selection are fulfilled, whether to perform cell re-selection as specified in 5.3.3.5.

5.3.3.3 Actions related to transmission of RRCConnectionRequest message

The UE shall set the contents of RRCConnectionRequest message as follows:

1> set the ue-Identity as follows:
2> if upper layers provide an S-TMSI:
3> set the ue-Identity to the value received from upper layers;
2> else if upper layers provide a 5G-S-TMSI:
3> set the ue-Identity to the rightmost 40 bits of the value received from upper layers;
2> else:
3> draw a random value in the range 0 .. 2^{40}-1 and set the ue-Identity to this value;

NOTE 1: Upper layers provide the S-TMSI if the UE is registered in the TA of the current cell.

1> if the UE is connected to EPC:

2> if the UE supports mo-VoiceCall establishment cause and UE is establishing the RRC connection for mobile originating MMTEL voice and SystemInformationBlockType2 includes voiceServiceCauseIndication and the establishment cause received from upper layers is not set to highPriorityAccess:

3> set the establishmentCause to mo-VoiceCall;

2> else if the UE supports mo-VoiceCall establishment cause for mobile originating MMTEL video and UE is establishing the RRC connection for mobile originating MMTEL video and SystemInformationBlockType2 includes videoServiceCauseIndication and the establishment cause received from upper layers is not set to highPriorityAccess:

3> set the establishmentCause to mo-VoiceCall;

2> else:

3> set the establishmentCause in accordance with the information received from upper layers;

1> if the UE is connected to 5GC:

2> set the establishmentCause in accordance with the information received from upper layers;

1> if the UE is a NB-IoT UE:

2> if the UE supports multi-tone transmission, include multiToneSupport;

2> if the UE supports multi-carrier operation, include multiCarrierSupport;

2> if the UE supports DL channel quality reporting and cqi-Reporting is present in SystemInformationBlockType2-NB:

3> set the cqi-NPDCCH to include the latest results of the downlink channel quality measurements of the serving cell as specified in TS 36.133 [16];

NOTE 2: The downlink channel quality measurements may use measurement period T1 or T2, as defined in TS 36.133 [16]. In case period T2 is used the RRC-MAC interactions are left to UE implementation.

2> set earlyContentionResolution to TRUE;

The UE shall submit the RRCConnectionRequest message to lower layers for transmission.

The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.5.

5.3.3.3a Actions related to transmission of RRCConnectionResumeRequest message

If the UE is resuming the RRC connection from a suspended RRC connection, the UE shall set the contents of RRCConnectionResumeRequest message as follows:

1> if the UE is a NB-IoT UE; or

1> if the UE is initiating UP-EDT in accordance with conditions in 5.3.3.1b; or

1> if field useFullResumeID is signalled in SystemInformationBlockType2:

2> set the resumeID to the stored resumeIdentity;

1> else:

2> set the truncatedResumeID to include bits in bit position 9 to 20 and 29 to 40 from the left in the stored resumeIdentity.
if the UE supports `mo-VoiceCall` establishment cause and UE is resuming the RRC connection for mobile originating MMTEL voice and `SystemInformationBlockType2` includes `voiceServiceCauseIndication` and the establishment cause received from upper layers is not set to `highPriorityAccess`:

1> set the `resumeCause` to `mo-VoiceCall`;

else if the UE supports `mo-VoiceCall` establishment cause for mobile originating MMTEL video and UE is resuming the RRC connection for mobile originating MMTEL video and `SystemInformationBlockType2` includes `videoServiceCauseIndication` and the establishment cause received from upper layers is not set to `highPriorityAccess`:

1> set the `resumeCause` to `mo-VoiceCall`;

else:

2> set the `resumeCause` in accordance with the information received from upper layers;

1> set the `shortResumeMAC-I` to the 16 least significant bits of the MAC-I calculated:

2> over the ASN.1 encoded as per section 8 (i.e., a multiple of 8 bits) `VarShortResumeMAC-Input` (or `VarShortResumeMAC-Input-NB` in NB-IoT);

2> with the KRRCint key and the previously configured integrity protection algorithm; and

2> with all input bits for COUNT, BEARER and DIRECTION set to binary ones;

1> if the UE is a NB-IoT UE:

2> if the UE supports DL channel quality reporting and `cqi-Reporting` is present in `SystemInformationBlockType2-NB`:

3> set the `cqi-NPDCCH` to include the latest results of the downlink channel quality measurements of the serving cell as specified in TS 36.133 [16];

NOTE 0: The downlink channel quality measurements may use measurement period T1 or T2, as defined in TS 36.133 [16]. In case period T2 is used the RRC-MAC interactions are left to UE implementation.

2> set `earlyContentionResolution` to TRUE;

1> restore the RRC configuration and security context from the stored UE AS context;

1> if the UE is initiating UP-EDT in accordance with conditions in 5.3.3.1b:

2> restore the PDCP state and re-establish PDCP entities for all SRBs and all DRBs;

2> if `drb-ContinueROHC` has been provided in immediately preceding RRC connection release message, and the UE is requesting to resume RRC connection in the same cell:

3> indicate to lower layers that stored UE AS context is used and that `drb-ContinueROHC` is configured;

3> continue the header compression protocol context for the DRBs configured with the header compression protocol;

2> else:

3> indicate to lower layers that stored UE AS context is used;

3> reset the header compression protocol context for the DRBs configured with the header compression protocol;

2> resume all SRBs and all DRBs;

2> derive the K_{NB} key based on the K_{ASME} key to which the current K_{NB} is associated, using the stored value of `nextHopChainingCount`, as specified in TS 33.401 [32];

2> derive the KRRCint key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32];
2> derive the \( K_{\text{RRCenc}} \) key and the \( K_{\text{UPenc}} \) key associated with the previously configured ciphering algorithm, as specified in TS 33.401 [32];

2> configure lower layers to resume integrity protection using the previously configured algorithm and the \( K_{\text{RRCint}} \) key derived in this subclause to all subsequent messages received and sent by the UE;

2> configure lower layers to resume ciphering and to apply the ciphering algorithm and the \( K_{\text{RRCenc}} \) key derived in this subclause to all subsequent messages received and sent by the UE;

2> configure lower layers to resume ciphering and to apply the ciphering algorithm and the \( K_{\text{UPenc}} \) key derived in this subclause immediately to the user data sent and received by the UE;

2> configure the lower layers to use EDT;

1> else:

2> if SRB1 was configured with NR PDCP:

3> for SRB1, release the NR PDCP entity and establish an E-UTRA PDCP entity with the current (MCG) security configuration;

NOTE 1: The UE applies the LTE ciphering and integrity protection algorithms that are equivalent to the previously configured NR security algorithms.

2> else:

3> for SRB1, restore the PDCP state and re-establish the PDCP entity;

If the UE is resuming the RRC connection from RRC_INACTIVE, the UE shall set the contents of \( \text{RRCConnectionResumeRequest} \) message as follows:

2> if field useFullResumeID is signalled in SystemInformationBlockType2:

3> set the \( \text{fullI-RNTI} \) to the stored \( \text{fullI-RNTI} \) value provided in suspend;

2> else:

3> set the \( \text{shortI-RNTI} \) to the stored \( \text{shortI-RNTI} \) value provided in suspend;

2> set the \( \text{resumeCause} \) in accordance with the information received from upper layers or from AS layer;

NOTE 1a: if the resume is triggered by upper layers and AS layer simultaneously, set the \( \text{resumeCause} \) in accordance with the information received from upper layers.

2> set the \( \text{shortResumeMAC-I} \) to the 16 least significant bits of the MAC-I calculated:

3> over the ASN.1 encoded as per section 8 (i.e., a multiple of 8 bits) \( \text{VarINACTIVE-MAC-Input} \);

3> with the \( K_{\text{RRCint}} \) key and the previously configured integrity protection algorithm; and

3> with all input bits for COUNT, BEARER and DIRECTION set to binary ones;

2> restore the RRC configuration and security context from the stored UE AS context except physical layer and MAC configuration;

2> update the \( K_{\text{eNB}} \) key based on the current \( K_{\text{eNB}} \) or the NH, using the stored \( \text{nextHopChainingCount} \) value, as specified in TS 33.501 [86];

2> derive the \( K_{\text{RRCenc}} \) key, the \( K_{\text{RRCint}} \) and the \( K_{\text{UPenc}} \) key;

2> configure lower layers to resume integrity protection for all SRBs except SRB0 using the previously configured algorithm and the \( K_{\text{RRCint}} \) key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE;

2> configure lower layers to resume ciphering for all radio bearers except SRB0 and to apply the previously configured ciphering algorithm, the \( K_{\text{RRCenc}} \) key and the \( K_{\text{UPenc}} \) key, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE;
2> apply the default configuration for SRB1 as specified in 9.2.1.1;

2> apply the default NR PDCP configuration as specified in TS 38.331 [82], clause 9.2.1.1 for SRB1;

Following procedures are applied for both suspended RRC connection and RRC_INACTIVE:

2> resume SRB1;

NOTE 2: Until successful connection resumption, the default physical layer configuration and the default MAC Main configuration are applied for the transmission of SRB0 and SRB1, and SRB1 is used only for the transfer of RRCConectionResume message.

The UE shall submit the RRCConectionResumeRequest message to lower layers for transmission.

The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.5.

5.3.3.3b Actions related to transmission of RRCEarlyDataRequest message

The UE shall set the contents of RRCEarlyDataRequest message as follows:

1> set the s-TMSI to the value received from upper layers;

1> set the establishmentCause in accordance with the information received from upper layers;

1> if the UE is a NB-IoT UE:

2> if the UE supports DL channel quality reporting and cqi-Reporting is present in SystemInformationBlockType2-NB:

3> set the cqi-NPDCCH to include the latest results of the downlink channel quality measurements of the serving cell as specified in TS 36.133 [16];

NOTE: The downlink channel quality measurements may use measurement period T1 or T2, as defined in TS 36.133 [16]. In case period T2 is used the RRC-MAC interactions are left to UE implementation.

1> set the dedicatedInfoNAS to include the information received from upper layers;

The UE shall configure the lower layers to use EDT and submit the RRCEarlyDataRequest message to the lower layers for transmission.

5.3.3.3c UE actions upon receiving EDT fallback indication from lower layers

Upon indication from lower layers that EDT is cancelled, the UE shall:

1> start or restart timer T300;

1> if the fallback is indicated by lower layers in response to the RRCEarlyDataRequest:

2> initiate transmission of RRCConectionRequest message in accordance with 5.3.3.3;

1> else if the fallback is indicated by lower layers in response to the RRCConectionResumeRequest for EDT and the fallback is not due to the UL grant provided in Random Access Response not being for EDT:

2> perform the actions upon abortion of UP-EDT as specified in 5.3.3.9a;

2> initiate transmission of the RRCConectionResumeRequest message in accordance with 5.3.3.3a;

5.3.3.4 Reception of the RRCConectionSetup by the UE

NOTE 1: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];

The UE shall:

1> if the RRCConectionSetup is received in response to an RRCConectionResumeRequest from a suspended RRC connection:
2> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity for all established or suspended RBs, except for SRB0;

2> discard the stored UE AS context and resumeIdentity;

2> if stored, discard the stored nextHopChainingCount;

2> if stored, discard the stored drb-ContinueROHC;

2> indicate to upper layers fallback of the RRC connection;

1> if the RRCConnectionSetup is received in response to an RRCConnectionResumeRequest from RRC_INACTIVE:

2> set the variable pendingRnaUpdate to 'FALSE', if that is set to TRUE;

2> discard the stored UE AS context, the fullI-RNTI and the shortI-RNTI;

2> indicate to upper layers fallback of the RRC connection;

1> perform the radio resource configuration procedure in accordance with the received radioResourceConfigDedicated and as specified in 5.3.10;

1> if stored, discard the cell reselection priority information provided by the idleModeMobilityControlInfo or inherited from another RAT;

1> if stored, discard the dedicated offset provided by the redirectedCarrierOffsetDedicated;

1> stop timer T300;

1> stop timer T302, if running;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> stop timer T306, if running;

1> stop timer T308, if running;

1> perform the actions as specified in 5.3.3.7;

1> stop timer T320, if running;

1> stop timer T350, if running;

1> perform the actions as specified in 5.6.12.4;

1> release rclwi-Configuration, if configured, as specified in 5.6.16.2;

1> stop timer T360, if running;

1> stop timer T322, if running;

1> enter RRC_CONNECTED;

1> stop the cell re-selection procedure;

1> consider the current cell to be the PCell;

1> set the content of RRCConnectionSetupComplete message as follows:

2> if the RRCConnectionSetup is received in response to an RRCConnectionResumeRequest:

3> if upper layers provide an S-TMSI:

4> set the s-TMSI to the value received from upper layers;

3> else if upper layers provide a 5G-S-TMSI:
4> set the ng-5G-S-TMSI-Bits to ng-5G-S-TMSI with the value received from upper layers;

2> else if upper layers provide a 5G-S-TMSI:

3> set the ng-5G-S-TMSI-Bits to ng-5G-S-TMSI-Part2 to the leftmost 8 bits of 5G-S-TMSI received from upper layers;

2> set the selectedPLMN-Identity to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]) from the PLMN(s) included in the plmn-IdentityList in SystemInformationBlockType1 (or SystemInformationBlockType1-NB in NB-IoT);

2> if upper layers provide the 'Registered MME', include and set the registeredMME as follows:

3> if the PLMN identity of the 'Registered MME' is different from the PLMN selected by the upper layers:

4> include the plmnIdentity in the registeredMME and set it to the value of the PLMN identity in the 'Registered MME' received from upper layers;

3> set the mmegi and the mmec to the value received from upper layers;

2> if upper layers provided the 'Registered MME':

3> include and set the gummei-Type to the value provided by the upper layers;

Editor's Note: FFS Whether the gummei-Type is applicable for E-UTRA5GC

2> if upper layers provide the 'Registered AMF', include and set the registeredAMF as follows:

3> if the PLMN identity of the 'Registered AMF' is different from the PLMN selected by the upper layers:

4> include the plmnIdentity in the registeredAMF and set it to the value of the PLMN identity in the 'Registered AMF' received from upper layers;

3> set the amf-Identifier to the value received from upper layers;

2> if upper layers provide one or more S-NSSAI (see TS 23.003 [27]):

3> include the s-NSSAI-list and set the content to the values provided by the upper layers;

2> if the UE supports CIoT EPS optimisation(s):

3> include attachWithoutPDN-Connectivity if received from upper layers;

3> include up-CIoT-EPS-Optimisation if received from upper layers;

3> except for NB-IoT, include cp-CIoT-EPS-Optimisation if received from upper layers;

2> if the upper layers indicate the selected core network type as 5GC:

3> include the connectTo5GC;

2> if connecting as an RN:

3> include the rn-SubframeConfigReq;

2> if the RRConnectionSetup is received in response to RRCEarlyDataRequest:

3> set the dedicatedInfoNAS to a zero-length octet string;

2> else:

3> set the dedicatedInfoNAS to include the information received from upper layers;

2> if the UE has flight path information available:

3> include flightPathInfoAvailable;

2> except for NB-IoT and the UE connected to EPC:
3> if the UE has radio link failure or handover failure information available in VarRLF-Report and if the RPLMN is included in plmn-IdentityList stored in VarRLF-Report:
   4> include rlf-InfoAvailable;

3> if the UE has MBSFN logged measurements available for E-UTRA and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:
   4> include logMeasAvailableMBSFN;

3> else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:
   4> include logMeasAvailable;

3> if the UE has Bluetooth logged measurements available and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:
   4> include logMeasAvailableBT;

3> if the UE has WLAN logged measurements available and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:
   4> include logMeasAvailableWLAN;

3> if the UE has connection establishment failure information available in VarConnEstFailReport and if the RPLMN is equal to plmn-Identity stored in VarConnEstFailReport:
   4> include connEstFailInfoAvailable;

3> include the mobilityState and set it to the mobility state (as specified in TS 36.304 [4]) of the UE just prior to entering RRC_CONNECTED state;

3> if the UE supports storage of mobility history information and the UE has mobility history information available in VarMobilityHistoryReport:
   4> include the mobilityHistoryAvail;

3> if the SIB2 contains idleModeMeasurements, and the UE has IDLE mode measurement information available in VarMeasIdleReport:
   4> include the idleMeasAvailable;
   4> stop T331 (if running);

2> for NB-IoT:

3> if the UE supports serving cell idle mode measurements reporting and servingCellMeasInfo is present in SystemInformationBlockType2-NB:
   4> set the measResultServCell to include the measurements of the serving cell;

NOTE 2: The UE includes the latest results of the serving cell measurements as used for cell selection/ reselection evaluation, which are performed in accordance with the performance requirements as specified in TS 36.133 [16].

2> include dcn-ID if a DCN-ID value (see TS 23.401 [41]) is received from upper layers;

2> if UE needs UL gaps during continuous uplink transmission:
   3> include ue-CE-NeedULGaps;

2> submit the RRCConnectionSetupComplete message to lower layers for transmission;

1> if the UE is connected to 5GC:

2> apply the default NR PDCP configuration as specified in TS 38.331 [82, 9.2.1.1] for SRB1;
2> use NR PDCP for all subsequent messages received and sent by the UE via SRB1;

1> the procedure ends:

5.3.3.4a Reception of the $RRCConnectionResume$ by the UE

The UE shall:

1> stop timer T300;

1> except if the $RRCConnectionResume$ is received in response to an $RRCConnectionResumeRequest$ for EDT:

2> if resuming an RRC connection from a suspended RRC connection:

3> restore the PDCP state and re-establish PDCP entities for SRB2, if configured with E-UTRA PDCP, and for all DRBs that are configured with E-UTRA PDCP;

3> if $drb-ContinueROHC$ is included:

4> indicate to lower layers that stored UE AS context is used and that $drb-ContinueROHC$ is configured;

4> continue the header compression protocol context for the DRBs configured with the header compression protocol;

3> else:

4> discard the stored UE AS context and $resumeIdentity$;

2> else if the $RRCConnectionResume$ message includes the $fullConfig$ (for resuming an RRC connection from RRC_INACTIVE):

3> perform the radio configuration procedure as specified in 5.3.5.8;

2> else (for resuming an RRC connection from RRC_INACTIVE)

3> restore the PDCP state, reset COUNT value and re-establish PDCP entities for SRB2 and all DRBs;

3> restore the physical layer configuration, the MAC configuration, the RLC configuration and the PDCP configuration from the stored UE AS context;

3> if $drb-ContinueROHC$ is included:

4> indicate to lower layers that stored UE AS context is used and that $drb-ContinueROHC$ is configured;

4> continue the header compression protocol context for the DRBs configured with the header compression protocol;

3> else:

4> discard the stored UE AS context, the $fullI-RNTI$ and the $shortI-RNTI$ except $ran-NotificationAreaInfo$;

1> perform the radio resource configuration procedure in accordance with the received $radioResourceConfigDedicated$ and as specified in 5.3.10;

NOTE: When performing the radio resource configuration procedure, for the physical layer configuration and the MAC Main configuration, the restored RRC configuration from the stored UE AS context is used as basis for the reconfiguration.
1> if the received \textit{RRCConnectionResume} message includes the \textit{sk-Counter}:
    2> perform key update procedure as specified in TS 38.331 [82, 5.3.5.8];
1> if the received \textit{RRCConnectionResume} message includes the \textit{nr-RadioBearerConfig1}:
    2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6];
1> if the received \textit{RRCConnectionResume} message includes the \textit{nr-RadioBearerConfig2}:
    2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6];
1> except if the \textit{RRCConnectionResume} is received in response to an \textit{RRCConnectionResumeRequest} for EDT:
    2> resume SRB2 and all DRBs, if any, including RBs configured with NR PDCP;
1> if stored, discard the cell reselection priority information provided by the \textit{idleModeMobilityControlInfo} or inherited from another RAT;
1> if stored, discard the dedicated offset provided by the \textit{redirectedCarrierOffsetDedicated};
1> if the \textit{RRCConnectionResume} message includes the \textit{measConfig}:
    2> perform the measurement configuration procedure as specified in 5.5.2;
1> stop timer T302, if running;
1> stop timer T303, if running;
1> stop timer T305, if running;
1> stop timer T306, if running;
1> stop timer T308, if running;
1> perform the actions as specified in 5.3.3.7;
1> stop timer T320, if running;
1> stop timer T350, if running;
1> perform the actions as specified in 5.6.12.4;
1> stop timer T360, if running;
1> stop timer T322, if running;
1> if the \textit{RRCConnectionResume} is received in response to an \textit{RRCConnectionResumeRequest} for EDT:
    2> ignore the \textit{nextHopChainingCount} value indicated in the \textit{RRCConnectionResume} message;
1> else:
    2> if resuming an RRC connection from a suspended RRC connection:
            3> update the $K_{\text{NB}}$ key based on the $K_{\text{ASME}}$ key to which the current $K_{\text{NB}}$ is associated, using the \textit{nextHopChainingCount} value indicated in the \textit{RRCConnectionResume} message, as specified in TS 33.401 [32];
            3> store the \textit{nextHopChainingCount} value;
            3> derive the $K_{\text{RRCint}}$ key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32];
            3> request lower layers to verify the integrity protection of the \textit{RRCConnectionResume} message, using the previously configured algorithm and the $K_{\text{RRCint}}$ key;
    2> if the integrity protection check of the \textit{RRCConnectionResume} message fails:
1> perform the actions upon leaving RRC_CONNECTED or RRC_INACTIVE as specified in 5.3.12, with release cause 'other' for the resume from a suspended RRC connection, with release cause 'RRC Resume failure' for the resume from RRC_INACTIVE, upon which the procedure ends;

2> if resuming an RRC connection from a suspended RRC connection:

3> derive the $K_{RRCenc}$ key and the $K_{UPenc}$ key associated with the previously configured ciphering algorithm, as specified in TS 33.401 [32];

3> configure lower layers to resume integrity protection using the previously configured algorithm and the $K_{RRCint}$ key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE;

3> configure lower layers to resume ciphering and to apply the ciphering algorithm, the $K_{RRCenc}$ key and the $K_{UPenc}$ key, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE;

1> enter RRC_CONNECTED;

1> indicate to upper layers that the suspended RRC connection has been resumed;

1> stop the cell re-selection procedure;

1> consider the current cell to be the PCell;

1> set the content of $RRC_{ConnectionResumeComplete}$ message as follows:

2> set the $selectedPLMN-Identity$ to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]) from the PLMN(s) included in the $plmn-IdentityList$ in $SystemInformationBlockType1$;

2> set the $dedicatedInfoNAS$ to include the information received from upper layers;

3> if the UE has flight path information available:

4> include $flightPathInfoAvailable$;

2> except for NB-IoT:

3> if resuming an RRC connection from a suspended RRC connection:

4> if the UE has radio link failure or handover failure information available in $VarRLF-Report$ and if the RPLMN is included in $plmn-IdentityList$ stored in $VarRLF-Report$:

5> include $rlf-InfoAvailable$;

4> if the UE has MBSFN logged measurements available for E-UTRA and if the RPLMN is included in $plmn-IdentityList$ stored in $VarLogMeasReport$:

5> include $logMeasAvailableMBSFN$;

4> else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in $plmn-IdentityList$ stored in $VarLogMeasReport$:

5> include $logMeasAvailable$;

4> if the UE has Bluetooth logged measurements available and if the RPLMN is included in $plmn-IdentityList$ stored in $VarLogMeasReport$:

5> include $logMeasAvailableBT$;

4> if the UE has WLAN logged measurements available and if the RPLMN is included in $plmn-IdentityList$ stored in $VarLogMeasReport$:

5> include $logMeasAvailableWLAN$;

4> if the UE has connection establishment failure information available in $VarConnEstFailReport$ and if the RPLMN is equal to $plmn-Identity$ stored in $VarConnEstFailReport$:
5> include connEstFailInfoAvailable;

4> include the mobilityState and set it to the mobility state (as specified in TS 36.304 [4]) of the UE just prior to entering RRC_CONNECTED state;

3> if the UE supports storage of mobility history information and the UE has mobility history information available in VarMobilityHistoryReport:

4> include mobilityHistoryAvail;

3> if the SIB2 contains idleModeMeasurements, and the UE has IDLE mode measurement information available in VarMeasIdleReport:

4> include the idleMeasAvailable;

4> stop T331 (if running);

for NB-IoT:

3> if the UE supports serving cell idle mode measurements reporting and servingCellMeasInfo is present in SystemInformationBlockType2-NB:

4> set the measResultServCell to include the measurements of the serving cell;

NOTE: The UE includes the latest results of the serving cell measurements as used for cell selection/ reselection evaluation, which are performed in accordance with the performance requirements as specified in TS 36.133 [16].

1> submit the RRCConnectionResumeComplete message to lower layers for transmission;

1> the procedure ends.

5.3.3.4b Reception of the RRCEarlyDataComplete by the UE

The UE shall:

1> if stored, discard the cell reselection priority information provided by the idleModeMobilityControlInfo or inherited from another RAT;

1> if stored, discard the dedicated offset provided by the redirectedCarrierOffsetDedicated;

1> stop timer T300;

1> stop timer T302, if running;

1> stop timer T303, if running;

1> stop timer T305, if running;

1> stop timer T306, if running;

1> stop timer T308, if running;

1> perform the actions as specified in 5.3.3.7;

1> stop timer T320, if running;

1> stop timer T322, if running;

1> forward the dedicatedInfoNAS, if received, to the upper layers;

1> reset MAC and release the MAC configuration;

1> if the RRCEarlyDataComplete message includes redirectedCarrierInfo indicating redirection to geran; and

1> if upper layers indicate that redirect to GERAN without AS security is not allowed:
5.3.3.5 Cell re-selection while T300, T302, T303, T305, T306, or T308 is running

The UE shall:

1> if in RRC_INACTIVE:
   2> if cell reselection occurs while T300 or T302 is running:
      3> set the variable pendingRnaUpdate to 'FALSE', if that is set to TRUE;
      4> perform the actions upon leaving RRC_INACTIVE as specified in 5.3.12 with release cause 'RRC Resume failure';
   1> else if cell reselection occurs while T300, T302, T303, T305, T306, or T308 is running:
      2> if UE has initiated UP-EDT:
         3> perform the actions upon abortion of UP-EDT as specified in 5.3.3.9a;
      2> if timer T302, T303, T305, T306, and/or T308 is running and if the UE is connected to EPC:
         3> stop timer T302, T303, T305, T306, and T308, whichever ones were running;
         3> perform the actions as specified in 5.3.3.7;
      2> else if timer T302 is running and if the UE is connected to 5GC:
         3> stop timer T302;
         3> perform the actions as specified in 5.3.16.4;
      2> if timer T300 is running:
         3> stop timer T300;
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3> if UE has sent RRCConnectionResumeRequest message and has not received RRCConnectionResume message:
4> reset MAC and re-establish RLC for all RBs that are established;
4> suspend SRB1;
3> else:
4> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;
3> inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication;

5.3.3.6 T300 expiry

The UE shall:
1> if timer T300 expires:
2> if UE has sent RRCConnectionResumeRequest message and has not received RRCConnectionResume message:
3> reset MAC and re-establish RLC for all RBs that are established;
3> suspend SRB1;
2> else:
3> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;
2> if the UE is a NB-IoT UE:
3> if connEstFailOffset is included in SystemInformationBlockType2-NB:
4> use connEstFailOffset for the parameter Qoffsettemp for the concerned cell when performing cell selection and reselection according to TS 36.304 [4];
3> else:
4> use value of infinity for the parameter Qoffsettemp for the concerned cell when performing cell selection and reselection according to TS 36.304 [4];

NOTE 0: For NB-IoT, the number of times that the UE detects T300 expiry on the same cell before applying connEstFailOffset and the amount of time that the UE applies connEstFailOffset before removing the offset from evaluation of the cell is up to UE implementation.

2> else if the UE supports RRC Connection Establishment failure temporary Qoffset and T300 has expired a consecutive connEstFailCount times on the same cell for which txFailParams is included in SystemInformationBlockType2:
3> for a period as indicated by connEstFailOffsetValidity:
4> use connEstFailOffset for the parameter Qoffsettemp for the concerned cell when performing cell selection and reselection according to TS 36.304 [4] and TS 25.304 [40];

NOTE 1: When performing cell selection, if no suitable or acceptable cell can be found, it is up to UE implementation whether to stop using connEstFailOffset for the parameter Qoffsettemp during connEstFailOffsetValidity for the concerned cell.

2> except for NB-IoT, store the following connection establishment failure information in the VarConnEstFailReport by setting its fields as follows:
3> clear the information included in VarConnEstFailReport, if any;
3> set the plmn-Identity to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]) from the PLMN(s) included in the plmn-IdentityList in SystemInformationBlockType1;
3> set the \textit{failedCellId} to the global identity of the cell where connection establishment failure is detected;

3> set the \textit{measResultFailedCell} to include the RSRP and RSRQ, if available, of the cell where connection establishment failure is detected and based on measurements collected up to the moment the UE detected the failure;

3> if available, set the \textit{measResultNeighCells}, in order of decreasing ranking-criterion as used for cell re-selection, to include neighbouring cell measurements for at most the following number of neighbouring cells: 6 intra-frequency and 3 inter-frequency neighbours per frequency as well as 3 inter-RAT neighbours, per frequency/ set of frequencies (GERAN) per RAT and according to the following:

4> for each neighbour cell included, include the optional fields that are available;

\textbf{NOTE 2:} The UE includes the latest results of the available measurements as used for cell reselection evaluation, which are performed in accordance with the performance requirements as specified in TS 36.133 \[16\].

3> if available, set the \textit{logMeasResultListWLAN} to include the WLAN measurement results, in order of decreasing RSSI for WLAN APs;

3> if available, set the \textit{logMeasResultListBT} to include the Bluetooth measurement results, in order of decreasing RSSI for Bluetooth beacons;

3> if detailed location information is available, set the content of the \textit{locationInfo} as follows:

4> include the \textit{locationCoordinates};

4> include the \textit{horizontalVelocity}, if available;

3> set the \textit{numberOfPreamblesSent} to indicate the number of preambles sent by MAC for the failed random access procedure;

3> set \textit{contentionDetected} to indicate whether contention resolution was not successful as specified in TS 36.321 [6] for at least one of the transmitted preambles for the failed random access procedure;

3> set \textit{maxTxPowerReached} to indicate whether or not the maximum power level was used for the last transmitted preamble, see TS 36.321 [6];

2> if UE has initiated UP-EDT:

3> perform the actions upon abortion of UP-EDT as specified in 5.3.3.9a;

2> if in RRC\_INACTIVE:

3> perform the actions upon leaving RRC\_INACTIVE as specified in 5.3.12, with release cause 'RRC connection failure';

2> else inform upper layers about the failure to establish the RRC connection or failure to resume the RRC connection with suspend indication, upon which the procedure ends;

The UE may discard the connection establishment failure information, i.e. release the UE variable \textit{VarConnEstFailReport}, 48 hours after the failure is detected, upon power off or upon detach.

\textbf{5.3.3.7 T302, T303, T305, T306, or T308 expiry or stop}

If the UE is connected to EPC, the UE shall:

1> if timer T302 expires or is stopped:

2> inform upper layers about barring alleviation for mobile terminating access;

2> if timer T303 is not running:

3> inform upper layers about barring alleviation for mobile originating calls;

2> if timer T305 is not running:
3> inform upper layers about barring alleviation for mobile originating signalling;
2> if timer T306 is not running:
3> inform upper layers about barring alleviation for mobile originating CS fallback;
2> if timer T308 is not running:
3> inform upper layers about barring alleviation for ACDC;
1> if timer T303 expires or is stopped:
2> if timer T302 is not running:
3> inform upper layers about barring alleviation for mobile originating calls;
1> if timer T305 expires or is stopped:
2> if timer T302 is not running:
3> inform upper layers about barring alleviation for mobile originating signalling;
1> if timer T306 expires or is stopped:
2> if timer T302 is not running:
3> inform upper layers about barring alleviation for mobile originating CS fallback;
1> if timer T308 expires or is stopped:
2> if timer T302 is not running:
3> inform upper layers about barring alleviation for ACDC;

5.3.3.8 Reception of the **RRCConnectionReject** by the UE

The UE shall:
1> stop timer T300;
1> reset MAC;
1> except for NB-IoT, start timer T302, with the timer value set to the *waitTime*;
1> if the UE is a NB-IoT UE; or
1> if the *extendedWaitTime* is present and the UE supports delay tolerant access:
2> forward the *extendedWaitTime* to upper layers;
1> if *deprioritisationReq* is included and the UE supports RRC Connection Reject with deprioritisation:
2> start or restart timer T325 with the timer value set to the *deprioritisationTimer* signalled;
2> store the *deprioritisationReq* until T325 expiry;

NOTE: The UE stores the deprioritisation request irrespective of any cell reselection absolute priority assignments (by dedicated or common signalling) and regardless of RRC connections in E-UTRAN or other RATs unless specified otherwise.

1> if the **RRCConnectionReject** is received in response to an **RRCConnectionResumeRequest** sent to resume a suspended RRC connection:
2> if the *rrc-SuspendIndication* is not present:
3> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity for all established or suspended RBs;
3> discard the stored UE AS context and resumeIdentity;
3> inform upper layers about the failure to resume the RRC connection without suspend indication and that access barring for mobile originating calls, mobile originating signalling, mobile terminating access and except for NB-IoT for mobile originating CS fallback is applicable, upon which the procedure ends;

2> else:
3> if the \textit{RRCConnectionReject} is received in response to an \textit{RRCConnectionResumeRequest} for EDT:
   4> perform the actions upon abortion of UP-EDT as specified in 5.3.3.9a;
3> else:
   4> suspend SRB1;
3> inform upper layers about the failure to resume the RRC connection with suspend indication and that access barring for mobile originating calls, mobile originating signalling, mobile terminating access and except for NB-IoT for mobile originating CS fallback is applicable, upon which the procedure ends;

1> else if the \textit{RRCConnectionReject} is received in response to an \textit{RRCConnectionResumeRequest} sent while in RRC\textunderscore INACTIVE:
   2> set the variable \textit{pendingRnaUpdate} to 'FALSE';
   2> if \textit{RRCConnectionReject} is received in response to a request from upper layers:
      3> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2';
   2> if \textit{RRCConnectionReject} is received in response to an \textit{RRCConnectionResumeRequest}:
      3> if resume is triggered by upper layers:
         4> inform upper layers about the failure to resume the RRC connection;
      3> if resume is triggered by RRC:
         4> set the variable \textit{pendingRnaUpdate} to 'TRUE';
         3> discard the security context including the $K_{\text{RRCenc}}$ key, the $K_{\text{RRCint}}$, the $K_{\text{UPint}}$ key and the $K_{\text{UPenc}}$ key;
         3> suspend SRB1, upon which the procedure ends;

\textit{Editor's note: 'FS Handling of timer T380 upon Reject e.g. stop, re-start, etc.}

2> The UE shall continue to monitor RAN and CN paging while the timer T302 is running.

1> else:
   2> release the MAC configuration;
   2> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating calls, mobile originating signalling, mobile terminating access and except for NB-IoT, for mobile originating CS fallback is applicable, upon which the procedure ends;

\textbf{5.3.3.9 Abortion of RRC connection establishment}

If upper layers abort the RRC connection establishment procedure while the UE has not yet entered RRC\textunderscore CONNECTED, the UE shall:

1> stop timer T300, if running;
1> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

\textbf{5.3.3.9a Abortion of UP-EDT}

The UE shall:
1> delete the $K_{\text{CNB}}$, $K_{\text{RRCint}}$, $K_{\text{RRCCenc}}$ and $K_{\text{UPenc}}$ keys derived in accordance with 5.3.3.3a;
1> re-establish RLC entities for all SRBs and DRBs;
1> suspend all SRB(s) and DRB(s) except SRBO;
1> configure lower layers to suspend integrity protection and ciphering.

5.3.3.10 Handling of SSAC related parameters

Upon request from the upper layers, the UE shall:

1> if SystemInformationBlockType2 includes $ac$-$BarringPerPLMN$-$List$ and the $ac$-$BarringPerPLMN$-$List$ contains an $AC$-$BarringPerPLMN$ entry with the $plmn$-$IdentityIndex$ corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]):

2> select the $AC$-$BarringPerPLMN$ entry with the $plmn$-$IdentityIndex$ corresponding to the PLMN selected by upper layers;
2> in the remainder of this procedure, use the selected $AC$-$BarringPerPLMN$ entry (i.e. presence or absence of access barring parameters in this entry) irrespective of the common access barring parameters included in SystemInformationBlockType2;
1> else:

2> in the remainder of this procedure use the common access barring parameters (i.e. presence or absence of these parameters) included in SystemInformationBlockType2;
1> set the local variables $BarringFactorForMMTEL$-$Voice$ and $BarringTimeForMMTEL$-$Voice$ as follows:

2> if $ssac$-$BarringForMMTEL$-$Voice$ is present:

3> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

NOTE: ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

3> if, for at least one of these Access Classes, the corresponding bit in the $ac$-$BarringForSpecialAC$ contained in $ssac$-$BarringForMMTEL$-$Voice$ is set to zero:

4> set $BarringFactorForMMTEL$-$Voice$ to one and $BarringTimeForMMTEL$-$Voice$ to zero;
3> else:

4> set $BarringFactorForMMTEL$-$Voice$ and $BarringTimeForMMTEL$-$Voice$ to the value of $ac$-$BarringFactor$ and $ac$-$BarringTime$ included in $ssac$-$BarringForMMTEL$-$Voice$, respectively;
2> else set $BarringFactorForMMTEL$-$Voice$ to one and $BarringTimeForMMTEL$-$Voice$ to zero;
1> set the local variables $BarringFactorForMMTEL$-$Video$ and $BarringTimeForMMTEL$-$Video$ as follows:

2> if $ssac$-$BarringForMMTEL$-$Video$ is present:

3> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

3> if, for at least one of these Access Classes, the corresponding bit in the $ac$-$BarringForSpecialAC$ contained in $ssac$-$BarringForMMTEL$-$Video$ is set to zero:

4> set $BarringFactorForMMTEL$-$Video$ to one and $BarringTimeForMMTEL$-$Video$ to zero;
3> else:

4> set $BarringFactorForMMTEL$-$Video$ and $BarringTimeForMMTEL$-$Video$ to the value of $ac$-$BarringFactor$ and $ac$-$BarringTime$ included in $ssac$-$BarringForMMTEL$-$Video$, respectively;
2> else set BarringFactorForMMTEL-Video to one and BarringTimeForMMTEL-Video to zero;

1> forward the variables BarringFactorForMMTEL-Voice, BarringTimeForMMTEL-Voice, BarringFactorForMMTEL-Video and BarringTimeForMMTEL-Video to the upper layers;

5.3.3.11 Access barring check

1> if timer T302 or "Tbarring" is running:

2> consider access to the cell as barred;

1> else if SystemInformationBlockType2 includes "AC barring parameter":

2> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11], and

NOTE: ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

2> for at least one of these valid Access Classes the corresponding bit in the ac-BarringForSpecialAC contained in "AC barring parameter" is set to zero:

3> consider access to the cell as not barred;

2> else:

3> draw a random number 'rand' uniformly distributed in the range: $0 \leq rand < 1$;

3> if 'rand' is lower than the value indicated by ac-BarringFactor included in "AC barring parameter":

4> consider access to the cell as not barred;

3> else:

4> consider access to the cell as barred;

1> else:

2> consider access to the cell as not barred;

1> if access to the cell is barred and both timers T302 and "Tbarring" are not running:

2> draw a random number 'rand' that is uniformly distributed in the range $0 \leq rand < 1$;

2> start timer "Tbarring" with the timer value calculated as follows, using the ac-BarringTime included in "AC barring parameter":

"Tbarring" = (0.7+ 0.6 * rand) * ac-BarringTime;

5.3.3.12 EAB check

The UE shall:

1> if SystemInformationBlockType14 is present:

2> if eab-PerRSRP is included:

3> if the establishmentCause received from higher layers is set to a value other than emergency; and

3> if the UE has no Access Class, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11] :

4> if eab-PerRSRP is set to thresh0:

5> consider access to the cell as barred when in enhanced coverage as specified in TS 36.304 [4];

4> else if eab-PerRSRP is set to thresh1:
if the measured RSRP is less than the first entry in $rsrp\text{-}ThresholdsPrachInfoList$:

consider access to the cell as barred;

else:

consider that only the resources indicated for the first CE level are configured;

else if $eab\text{-}PerRSRP$ is set to $thresh2$:

if the measured RSRP is less than the second entry in $rsrp\text{-}ThresholdsPrachInfoList$:

consider access to the cell as barred;

else:

consider that only the resources indicated for the first and second CE levels are configured;

else if $eab\text{-}PerRSRP$ is set to $thresh3$:

if the measured RSRP is less than the third entry in $rsrp\text{-}ThresholdsPrachInfoList$:

consider access to the cell as barred;

else:

consider that only the resources indicated for the first, second, and third CE levels are configured;

if access to the cell is not barred due to $eab\text{-}PerRSRP$ and $eab\text{-}Param$ is included:

if the $eab\text{-}Common$ is included in the $eab\text{-}Param$:

if the UE belongs to the category of UEs as indicated in the $eab\text{-}Category$ contained in $eab\text{-}Common$; and

if for the Access Class of the UE, as stored on the USIM and with a value in the range 0..9, the corresponding bit in the $eab\text{-}BarringBitmap$ contained in $eab\text{-}Common$ is set to one:

consider access to the cell as barred;

else:

consider access to the cell as not barred due to EAB;

else (the $eab\text{-}PerPLMN\text{-}List$ is included in the $eab\text{-}Param$):

select the entry in the $eab\text{-}PerPLMN\text{-}List$ corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]);

if the $eab\text{-}Config$ for that PLMN is included:

if the UE belongs to the category of UEs as indicated in the $eab\text{-}Category$ contained in $eab\text{-}Config$; and

if for the Access Class of the UE, as stored on the USIM and with a value in the range 0..9, the corresponding bit in the $eab\text{-}BarringBitmap$ contained in $eab\text{-}Config$ is set to one:

consider access to the cell as barred;

else:

consider access to the cell as not barred due to EAB;

else:

consider access to the cell as not barred due to EAB;
5.3.3.13 Access barring check for ACDC

The UE shall:

1> if timer T302 is running:
   2> consider access to the cell as barred;

1> else if SystemInformationBlockType2 includes "ACDC barring parameter":
   2> draw a random number \( \text{rand} \) uniformly distributed in the range \( 0 \leq \text{rand} < 1 \);
   2> if \( \text{rand} \) is lower than the value indicated by \( \text{ac-BarringFactor} \) included in "ACDC barring parameter":
      3> consider access to the cell as not barred;
   2> else:
      3> consider access to the cell as barred;

1> else:
   2> consider access to the cell as not barred;

1> if access to the cell is barred and timer T302 is not running:
   2> draw a random number \( \text{rand} \) that is uniformly distributed in the range \( 0 \leq \text{rand} < 1 \);
   2> start timer "Tbarring" with the timer value calculated as follows, using the \( \text{ac-BarringTime} \) included in "ACDC barring parameter":
      "Tbarring" = (0.7 + 0.6 \( \cdot \text{rand} \)) \( \cdot \text{ac-BarringTime} \).

5.3.3.14 Access Barring check for NB-IoT

The UE shall:

1> if \( \text{ab-Enabled} \) included in MasterInformationBlock-NB is set to \( \text{TRUE} \) and SystemInformationBlockType14-NB is broadcast:
   2> if \( \text{ab-PerNRSRP} \) is included:
      3> if the establishmentCause received from higher layers is set to a value other than \( \text{mo-ExceptionData} \); and
      3> if the UE has no Access Class, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11]:
         4> if \( \text{ab-PerNRSRP} \) is set to \( \text{thresh1} \):
            5> if the measured RSRP is less than the first entry in \( \text{rsrp-ThresholdsPrachInfoList} \);
               6> consider access to the cell as barred;
            5> else:
               6> consider that only the resources indicated for the first NPRACH repetition level are configured;
         4> if \( \text{ab-PerNRSRP} \) is set to \( \text{thresh2} \):
            5> if the measured RSRP is less than the second entry in \( \text{rsrp-ThresholdsPrachInfoList} \);
               6> consider access to the cell as barred;
            5> else:
6> consider that only the resources indicated for the first and second NPRACH repetition levels are configured;

2> if access to the cell is not barred due to *ab-PerNRSRP* and *ab-Param* is included:

3> if the *ab-Common* is included in *ab-Param*:

4> if the UE belongs to the category of UEs as indicated in the *ab-Category* contained in *ab-Common*; and

4> if for the Access Class of the UE, as stored on the USIM and with a value in the range 0..9, the corresponding bit in the *ab-BarringBitmap* contained in *ab-Common* is set to one:

5> if the *establishmentCause* received from higher layers is set to *mo-ExceptionData* and *ab-BarringForExceptionData* is set to *FALSE* in the *ab-Common*:

6> consider access to the cell as not barred;

5> else:

6> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11] and for at least one of these valid Access Classes for the UE, the corresponding bit in the *ab-BarringForSpecialAC* contained in *ab-Common* is set to *zero*:

**NOTE 1:** ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

7> consider access to the cell as not barred;

6> else:

7> consider access to the cell as barred;

4> else:

5> consider access to the cell as not barred;

3> else (the *ab-PerPLMN-List* is included in the *ab-Param*):

4> select the *ab-PerPLMN* entry in *ab-PerPLMN-List* corresponding to the PLMN selected by upper layers (see TS 23.122 [11], TS 24.301 [35]);

4> if the *ab-Config* for that PLMN is included:

5> if the UE belongs to the category of UEs as indicated in the *ab-Category* contained in *ab-Config*; and

5> if for the Access Class of the UE, as stored on the USIM and with a value in the range 0..9, the corresponding bit in the *ab-BarringBitmap* contained in *ab-Config* is set to one:

6> if the *establishmentCause* received from higher layers is set to *mo-ExceptionData* and *ab-BarringForExceptionData* is set to *FALSE* in the *ab-Config*:

7> consider access to the cell as not barred;

6> else:

7> if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11] and for at least one of these valid Access Classes for the UE, the corresponding bit in the *ab-BarringForSpecialAC* contained in *ab-Config* is set to *zero*:

**NOTE 2:** ACs 12, 13, 14 are only valid for use in the home country and ACs 11, 15 are only valid for use in the HPLMN/ EHPLMN.

8> consider access to the cell as not barred;
7> else:
8> consider access to the cell as barred;
5> else:
6> consider access to the cell as not barred;
4> else:
5> consider access to the cell as not barred;
1> else:
2> consider access to the cell as not barred;

5.3.3.15 Failure to deliver NAS information in RRCConnectionSetupComplete message

The UE shall:

1> if the UE is a NB-IoT UE and radio link failure occurs before the successful delivery of RRCConnectionSetupComplete message has been confirmed by lower layers:
2> inform upper layers about the possible failure to deliver the NAS information contained in the RRCConnectionSetupComplete message;

5.3.3.16 Integrity check failure from lower layers while T300 is running for UP-EDT

The UE shall:

1> upon receiving integrity check failure indication from lower layers concerning SRB1 or SRB2 while T300 is running for UP-EDT:
2> discard the stored UE AS context and resumeIdentity;
2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause ‘other’;

5.3.4 Initial security activation

5.3.4.1 General

![SecurityModeCommand](image)

![SecurityModeComplete](image)

**Figure 5.3.4.1-1: Security mode command, successful**
The purpose of this procedure is to activate AS security upon RRC connection establishment.

### 5.3.4.2 Initiation

E-UTRAN initiates the security mode command procedure to a UE in RRC_CONNECTED. Moreover, E-UTRAN applies the procedure as follows:

- when only SRB1, or for NB-IoT SRB1 and SRB1bis, is established, i.e. prior to establishment of SRB2 and/or DRBs.

### 5.3.4.3 Reception of the **SecurityModeCommand** by the UE

The UE shall:

1. derive the $K_{SNB}$ key, as specified in TS 33.401 [32] for E-UTRA connected to EPC, and TS 33.501 [86] for E-UTRA connected to 5GC;

2. derive the $K_{RRCint}$ key associated with the `integrityProtAlgorithm` indicated in the `SecurityModeCommand` message, as specified in TS 33.401 [32];

3. request lower layers to verify the integrity protection of the `SecurityModeCommand` message, using the algorithm indicated by the `integrityProtAlgorithm` as included in the `SecurityModeCommand` message and the $K_{RRCint}$ key;

4. if the `SecurityModeCommand` message passes the integrity protection check:

   1. derive the $K_{RRCenc}$ key and the $K_{UPenc}$ key associated with the `cipheringAlgorithm` indicated in the `SecurityModeCommand` message, as specified in TS 33.401 [32];

   2. if connected as an RN:

      1. derive the $K_{UPint}$ key associated with the `integrityProtAlgorithm` indicated in the `SecurityModeCommand` message, as specified in TS 33.401 [32];

   2. configure lower layers to apply integrity protection using the indicated algorithm and the $K_{RRCint}$ key immediately, i.e. integrity protection shall be applied to all subsequent messages received and sent by the UE, including the `SecurityModeComplete` message;

   3. configure lower layers to apply ciphering using the indicated algorithm, the $K_{RRCenc}$ key and the $K_{UPenc}$ key after completing the procedure, i.e. ciphering shall be applied to all subsequent messages received and sent by the UE, except for the `SecurityModeComplete` message which is sent unciphered;

   4. if connected as an RN:

      1. configure lower layers to apply integrity protection using the indicated algorithm and the $K_{UPint}$ key, for DRBs that are subsequently configured to apply integrity protection, if any;

   2. consider AS security to be activated;

   3. upon RRC connection establishment, if UE does not need UL gaps during continuous uplink transmission:
3> configure lower layers to stop using UL gaps during continuous uplink transmission in FDD for SecurityModeComplete message and subsequent uplink transmission in RRC_CONNECTED except for UL transmissions as specified in TS36.211 [21];

2> submit the SecurityModeComplete message to lower layers for transmission, upon which the procedure ends;

1> else:

2> continue using the configuration used prior to the reception of the SecurityModeCommand message, i.e. neither apply integrity protection nor ciphering.

2> submit the SecurityModeFailure message to lower layers for transmission, upon which the procedure ends;

5.3.5 RRC connection reconfiguration

5.3.5.1 General

5.3.5.2 Initiation

E-UTRAN may initiate the RRC connection reconfiguration procedure to a UE in RRC_CONNECTED. E-UTRAN applies the procedure as follows:

- the mobilityControlInfo is included only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;
- the establishment of RBs (other than SRB1, that is established during RRC connection establishment) is included only when AS security has been activated;
- the addition of SCells is performed only when AS security has been activated;
5.3.5.3 Reception of an **RRCConnectionReconfiguration** not including the **mobilityControlInfo** by the UE

If the **RRCConnectionReconfiguration** message does not include the **mobilityControlInfo** and the UE is able to comply with the configuration included in this message, the UE shall:

1> if this is the first **RRCConnectionReconfiguration** message after successful completion of the RRC connection re-establishment procedure:

2> re-establish PDCP for SRB2 configured with E-UTRA PDCP entity and for all DRBs that are established and configured with E-UTRA PDCP, if any;

2> re-establish RLC for SRB2 and for all DRBs that are established and configured with E-UTRA RLC, if any;

2> if the **RRCConnectionReconfiguration** message includes the **fullConfig**:

3> perform the radio configuration procedure as specified in 5.3.5.8;

2> if the **RRCConnectionReconfiguration** message includes the **radioResourceConfigDedicated**:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 1: Void

NOTE 2: Void

1> else:

2> if the **RRCConnectionReconfiguration** message includes the **radioResourceConfigDedicated**:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 3: If the **RRCConnectionReconfiguration** message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the **SecurityModeComplete** message.

1> if the received **RRCConnectionReconfiguration** includes the **sCellToReleaseList**:

2> perform SCell release as specified in 5.3.10.3a;

1> if the received **RRCConnectionReconfiguration** includes the **sCellToAddModList**:

2> perform SCell addition or modification as specified in 5.3.10.3b;

1> if the received **RRCConnectionReconfiguration** includes the **scg-Configuration**; or

1> if the current UE configuration includes one or more split DRBs configured with **pdcp-Config** and the received **RRCConnectionReconfiguration** includes **radioResourceConfigDedicated** including **drb-ToAddModList**:

2> perform SCG reconfiguration as specified in 5.3.10.10;

1> if the received **RRCConnectionReconfiguration** includes the **nr-Config** and it is set to **release**; or

1> if the received **RRCConnectionReconfiguration** includes **endc-ReleaseAndAdd** and it is set to **TRUE**:

2> perform EN-DC release as specified in TS 38.331 [82], clause 5.3.5.10;

1> if the received **RRCConnectionReconfiguration** includes the **sk-Counter**:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received **RRCConnectionReconfiguration** includes the **nr-SecondaryCellGroupConfig**:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received **RRCConnectionReconfiguration** includes the **nr-RadioBearerConfig1**:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;
1> if the received `RRCConnectionReconfiguration` includes the `nr-RadioBearerConfig2`:
   2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if this is the first `RRCConnectionReconfiguration` message after successful completion of the RRC connection re-establishment procedure:
   2> resume SRB2 and all DRBs that are suspended, if any, including RBs configured with NR PDCP;

NOTE 4: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

NOTE 5: The UE may discard SRB2 messages and data that it receives prior to completing the reconfiguration used to resume these bearers.

1> if the received `RRCConnectionReconfiguration` includes the `systemInformationBlockType1Dedicated`:
   2> perform the actions upon reception of the `SystemInformationBlockType1` message as specified in 5.2.2.7;

1> if the `RRCConnectionReconfiguration` message includes the `dedicatedInfoNASList`:
   2> forward each element of the `dedicatedInfoNASList` to upper layers in the same order as listed;

1> if the `RRCConnectionReconfiguration` message includes the `measConfig`:
   2> perform the measurement configuration procedure as specified in 5.5.2;

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

1> if the `RRCConnectionReconfiguration` message includes the `otherConfig`:
   2> perform the other configuration procedure as specified in 5.3.10.9;

1> if the `RRCConnectionReconfiguration` message includes the `sl-DiscConfig` or `sl-CommConfig`:
   2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;

1> if the `RRCConnectionReconfiguration` message includes the `sl-V2X-ConfigDedicated`:
   2> perform the V2X sidelink communication dedicated configuration procedure as specified in 5.3.10.15a;

1> if the `RRCConnectionReconfiguration` message includes `wlan-OffloadInfo`:
   2> perform the dedicated WLAN offload configuration procedure as specified in 5.6.12.2;

1> if the `RRCConnectionReconfiguration` message includes `rlwsi-Configuration`:
   2> perform the WLAN traffic steering command procedure as specified in 5.6.16.2;

1> if the `RRCConnectionReconfiguration` message includes `lwa-Configuration`:
   2> perform the LWA configuration procedure as specified in 5.6.14.2;

1> if the `RRCConnectionReconfiguration` message includes `lwip-Configuration`:
   2> perform the LWIP reconfiguration procedure as specified in 5.6.17.2;

1> upon RRC connection establishment, if UE does not need UL gaps during continuous uplink transmission:
   2> configure lower layers to stop using UL gaps during continuous uplink transmission in FDD for `RRCConnectionReconfigurationComplete` message and subsequent uplink transmission in RRC_CONNECTED except for UL transmissions as specified in TS36.211 [21];

1> set the content of `RRCConnectionReconfigurationComplete` message as follows:
   2> if the `RRCConnectionReconfiguration` message includes `perCC-GapIndicationRequest`:
3> include perCC-GapIndicationList and numFreqEffective;

2> if the frequencies are configured for reduced measurement performance:

3> include numFreqEffectiveReduced;

2> if the received RRCConectionReconfiguration message included nr-SecondaryCellGroupConfig:

3> include scg-ConfigResponseNR in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the RRCConectionReconfigurationComplete message to lower layers for transmission using the new configuration, upon which the procedure ends;

5.3.5.4 Reception of an RRCConectionReconfiguration including the mobilityControlInfo by the UE (handover)

If the RRCConectionReconfiguration message includes the mobilityControlInfo and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> start timer T304 with the timer value set to t304, as included in the mobilityControlInfo;

1> stop timer T370, if running;

1> if the carrierFreq is included:

2> consider the target PCell to be one on the frequency indicated by the carrierFreq with a physical cell identity indicated by the targetPhysCellId;

1> else:

2> consider the target PCell to be one on the frequency of the source PCell with a physical cell identity indicated by the targetPhysCellId;

1> start synchronising to the DL of the target PCell;

NOTE 1: The UE should perform the handover as soon as possible following the reception of the RRC message triggering the handover, which could be before confirming successful reception (HARQ and ARQ) of this message.

1> if BL UE or UE in CE:

2> if sameSFN-Indication is not present in mobilityControlInfo:

3> acquire the MasterInformationBlock in the target PCell;

1> if makeBeforeBreak is configured:

2> perform the remainder of this procedure including and following resetting MAC after the UE has stopped the uplink transmission/downlink reception with the source cell(s);

NOTE 1a: It is up to UE implementation when to stop the uplink transmission/downlink reception with the source cell(s) to initiate re-tuning for connection to the target cell [16], if makeBeforeBreak is configured.

1> reset MCG MAC and SCG MAC, if configured;

1> release uplinkDataCompression, if configured;

1> re-establish PDCP for all RBs configured with pdcp-config that are established;

NOTE 2: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].
NOTE 2a: At handover the pdcp-reestablish flag will be set for all RBs configured with NR PDCP in nr-RadioBearerConfig TS 38.331 [82] which will cause the PDCP entity to be re-established also for these RBs.

1> re-establish MCG RLC and SCG RLC, if configured, for all RBs that are established;

1> for each SCell configured for the UE other than the PSCell:
   2> if sCellState is configured for the SCell and indicates activated:
      3> configure lower layers to consider the SCell to be in activated state;
   2> else if sCellState is configured for the SCell and indicates dormant:
      3> configure lower layers to consider the SCell to be in dormant state;
   2> else:
      3> configure lower layers to consider the SCell to be in deactivated state;

1> apply the value of the newUE-Identity as the C-RNTI;

1> if the RRCConnectionReconfiguration message includes the fullConfig:
   2> perform the radio configuration procedure as specified in 5.3.5.8;

1> configure lower layers in accordance with the received radioResourceConfigCommon;

1> if the received RRCConnectionReconfiguration message includes the rach-Skip:
   2> configure lower layers to apply the rach-Skip for the target MCG, as specified in TS 36.213 [23] and 36.321 [6];

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received mobilityControlInfo;

1> if the received RRCConnectionReconfiguration includes the sCellToReleaseList:
   2> perform SCell release as specified in 5.3.10.3a;

1> if the received RRCConnectionReconfiguration includes the scg-Configuration; or

1> if the current UE configuration includes one or more split DRBs and the received RRCConnectionReconfiguration includes radioResourceConfigDedicated including drb-ToAddModList:
   2> perform SCG reconfiguration as specified in 5.3.10.10;

1> if the RRCConnectionReconfiguration message includes the radioResourceConfigDedicated:
   2> perform the radio resource configuration procedure as specified in 5.3.10;

1> if the securityConfigHO (without suffix) is included in the RRCConnectionReconfiguration:
   2> if the keyChangeIndicator received in the securityConfigHO is set to TRUE:
      3> update the K_{NB} key based on the K_{AMF} key taken into use with the latest successful NAS SMC procedure, as specified in TS 33.401 [32];
   2> else:
      3> update the K_{NB} key based on the current K_{NB} or the NH, using the nextHopChainingCount value indicated in the securityConfigHO, as specified in TS 33.401 [32];
   2> store the nextHopChainingCount value;
   2> if the securityAlgorithmConfig is included in the securityConfigHO:
      3> derive the K_{RRCint} key associated with the integrityProtAlgorithm, as specified in TS 33.401 [32];
3> if connected as an RN:
   4> derive the $K_{\text{UPint}}$ key associated with the *integrityProtAlgorithm*, as specified in TS 33.401 [32];
3> derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the *cipheringAlgorithm*, as specified in TS 33.401 [32];
2> else:
3> derive the $K_{\text{RRCint}}$ key associated with the current integrity algorithm, as specified in TS 33.401 [32];
3> if connected as an RN:
   4> derive the $K_{\text{UPint}}$ key associated with the current integrity algorithm, as specified in TS 33.401 [32];
3> derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the current ciphering algorithm, as specified in TS 33.401 [32];
1> else if the *securityConfigHO-v1530* is included in the *RRCConnectionReconfiguration*:
2> if the *nas-Container* is received:
   3> forward the *nas-Container* to upper layers;
2> if the *keyChangeIndicator-r15* is received and is set to *TRUE*:
   3> update the $K_{\text{NB}}$ key based on the $K_{\text{AMF}}$ key, as specified in TS 33.501 [86];
2> else:
   3> update the $K_{\text{NB}}$ key based on the current $K_{\text{NB}}$ or the NH, using the received *nextHopChainingCount-r15*, as specified in TS 33.501 [86];
2> store the *nextHopChainingCount-r15* value;
2> if the *securityAlgorithmConfig-r15* is received:
   3> derive the $K_{\text{RRCint}}$ key associated with the *integrityProtAlgorithm*, as specified in TS 33.401 [32];
   3> derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the *cipheringAlgorithm*, as specified in TS 33.401 [32];
2> else:
   3> derive the $K_{\text{RRCint}}$ key associated with the current integrity algorithm, as specified in TS 33.401 [32];
   3> derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the current ciphering algorithm, as specified in TS 33.401 [32];
1> configure lower layers to apply the integrity protection algorithm and the $K_{\text{RRCint}}$ key, i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
1> configure lower layers to apply the ciphering algorithm, the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
1> if the received *RRCConnectionReconfiguration* includes the *nr-Config* and it is set to *release*; or
1> if the received *RRCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:
2> perform EN-DC release as specified in TS 38.331 [82], clause 5.3.5.10;
1> if the received *RRCConnectionReconfiguration* includes the *sk-Counter*:
2> perform key update procedure as specified in in TS 38.331 [82], clause 5.3.5.7;
1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:
2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3.
1> if the received RRCConnectionReconfiguration includes the nr-RadioBearerConfig1:
2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;
1> if the received RRCConnectionReconfiguration includes the nr-RadioBearerConfig2:
2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6.
1> if connected as an RN:
2> configure lower layers to apply the integrity protection algorithm and the K_{UPint} key, for current or subsequently established DRBs that are configured to apply integrity protection, if any;
1> if the received RRCConnectionReconfiguration includes the sCellToAddModList:
2> perform SCell addition or modification as specified in 5.3.10.3b;
1> if the received RRCConnectionReconfiguration includes the systemInformationBlockType1Dedicated:
2> perform the actions upon reception of the SystemInformationBlockType1 message as specified in 5.2.2.7;
1> perform the measurement related actions as specified in 5.5.6.1;
1> if the RRCConnectionReconfiguration message includes the measConfig:
2> perform the measurement configuration procedure as specified in 5.5.2;
1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;
1> release reportProximityConfig and clear any associated proximity status reporting timer;
1> if the RRCConnectionReconfiguration message includes the otherConfig:
2> perform the other configuration procedure as specified in 5.3.10.9;
1> if the RRCConnectionReconfiguration message includes the sl-DiscConfig or sl-CommConfig:
2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;
1> if the RRCConnectionReconfiguration message includes wlan-OffloadInfo:
2> perform the dedicated WLAN offload configuration procedure as specified in 5.6.12.2;
1> if handoverWithoutWT-Change is not configured:
2> release the LWA configuration, if configured, as described in 5.6.14.3;
1> release the LWIP configuration, if configured, as described in 5.6.17.3;
1> if the RRCConnectionReconfiguration message includes rclwi-Configuration:
2> perform the WLAN traffic steering command procedure as specified in 5.6.16.2;
1> if the RRCConnectionReconfiguration message includes lwa-Configuration:
2> perform the LWA configuration procedure as specified in 5.6.14.2;
1> if the RRCConnectionReconfiguration message includes lwip-Configuration:
2> perform the LWIP reconfiguration procedure as specified in 5.6.17.2;
1> if the RRCConnectionReconfiguration message includes the sl-V2X-ConfigDedicated or mobilityControlInfoV2X:
2> perform the V2X sidelink communication dedicated configuration procedure as specified in 5.3.10.15a;
1> set the content of RRCConnectionReconfigurationComplete message as follows:
2> if the UE has radio link failure or handover failure information available in VarRLF-Report and if the RPLMN is included in plmn-IdentityList stored in VarRLF-Report:

3> include rlf-InfoAvailable;

2> if the UE has MBSFN logged measurements available for E-UTRA and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport and if T330 is not running:

3> include logMeasAvailableMBSFN;

2> else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:

3> include the logMeasAvailable;

2> if the UE has Bluetooth logged measurements available and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:

3> include logMeasAvailableBT;

2> if the UE has WLAN logged measurements available and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport:

3> include logMeasAvailableWLAN;

2> if the UE has connection establishment failure information available in VarConnEstFailReport and if the RPLMN is equal to plmn-Identity stored in VarConnEstFailReport:

3> include connEstFailInfoAvailable;

2> if the RRCConnectionReconfiguration message includes perCC-GapIndicationRequest:

3> include perCC-GapIndicationList and numFreqEffective;

2> if the frequencies are configured for reduced measurement performance:

3> include numFreqEffectiveReduced;

2> if the UE has flight path information available:

3> include flightPathInfoAvailable;

2> if the received RRCConnectionReconfiguration message included nr-SecondaryCellGroupConfig:

3> include scg-ConfigResponseNR in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the RRCConnectionReconfigurationComplete message to lower layers for transmission;

1> if MAC successfully completes the random access procedure; or

1> if MAC indicates the successful reception of a PDCCH transmission addressed to C-RNTI and if rach-Skip is configured:

2> stop timer T304;

2> release rach-Skip;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target PCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target PCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target PCell;

NOTE 3: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

2> if the UE is configured to provide IDC indications:
3> if the UE has transmitted an InDeviceCoexIndication message during the last 1 second preceding reception of the RRCConnectionReconfiguration message including mobilityControlInfo:
4> initiate transmission of the InDeviceCoexIndication message in accordance with 5.6.9.3;

2> if the UE is configured to provide power preference indications, overheating assistance information, SPS assistance information, delay budget report or maximum bandwidth preference indications:
3> if the UE has transmitted a UEAssistanceInformation message during the last 1 second preceding reception of the RRCConnectionReconfiguration message including mobilityControlInfo:
4> initiate transmission of the UEAssistanceInformation message in accordance with 5.6.10.3;

2> if SystemInformationBlockType15 is broadcast by the PCell:
3> if the UE has transmitted a MBMSInterestIndication message during the last 1 second preceding reception of the RRCConnectionReconfiguration message including mobilityControlInfo:
4> ensure having a valid version of SystemInformationBlockType15 for the PCell;
4> determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;
4> determine the set of MBMS services of interest in accordance with 5.8.5.3a;
4> initiate transmission of the MBMSInterestIndication message in accordance with 5.8.5.4;

2> if SystemInformationBlockType18 is broadcast by the target PCell; and the UE transmitted a SidelinkUEInformation message indicating a change of sidelink communication related parameters relevant in target PCell (i.e. change of commRxInterestedFreq or commTxResourceReq, commTxResourceReqUC if SystemInformationBlockType18 includes commTxResourceReqUC-ReqAllowed or commTxResourceInfoReqRelay if PCell broadcasts SystemInformationBlockType19 including discConfigRelay during the last 1 second preceding reception of the RRCConnectionReconfiguration message including mobilityControlInfo; or

2> if SystemInformationBlockType19 is broadcast by the target PCell; and the UE transmitted a SidelinkUEInformation message indicating a change of sidelink discovery related parameters relevant in target PCell (i.e. change of discRxInterest or discTxResourceReq, discTxResourceReqPS if SystemInformationBlockType19 includes discTxResourceReqPS or discRxGapReq or discTxGapReq if the UE is configured with gapRequestsAllowedDedicated set to true or if the UE is not configured with gapRequestsAllowedDedicated and SystemInformationBlockType19 includes gapRequestsAllowedCommon) during the last 1 second preceding reception of the RRCConnectionReconfiguration message including mobilityControlInfo; or

2> if SystemInformationBlockType21 is broadcast by the target PCell; and the UE transmitted a SidelinkUEInformation message indicating a change of V2X sidelink communication related parameters relevant in target PCell (i.e. change of v2x-CommRxInterestedFreqList or v2x-CommTxResourceReq) during the last 1 second preceding reception of the RRCConnectionReconfiguration message including mobilityControlInfo:
3> initiate transmission of the SidelinkUEInformation message in accordance with 5.10.2.3;

2> the procedure ends;

NOTE 4: The UE is not required to determine the SFN of the target PCell by acquiring system information from that cell before performing RACH access in the target PCell, except for BL UEs or UEs in CE when sameSFN-Indication is not present in mobilityControlInfo.

5.3.5.5 Reconfiguration failure

The UE shall:

1> if the UE is unable to comply with (part of) the configuration included in the RRCConnectionReconfiguration message:
2> continue using the configuration used prior to the reception of RRCConnectionReconfiguration message;
2> if security has not been activated:
   3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause other;
2> else:
   3> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the connection
      reconfiguration procedure ends;

NOTE 1: The UE may apply above failure handling also in case the RRCConnectionReconfiguration message
causes a protocol error for which the generic error handling as defined in 5.7 specifies that the UE shall
ignore the message.

NOTE 2: If the UE is unable to comply with part of the configuration, it does not apply any part of the
configuration, i.e. there is no partial success/ failure.

NOTE 3: The compliance also covers the NR configuration carried within octet strings e.g. field nr-
SecondaryCellGroupConfig. I.e. the failure behaviour defined also applies in case the UE cannot comply
with the NR configuration or with the combination of (parts of) the LTE and NR configurations.

5.3.5.6 T304 expiry (handover failure)

The UE shall:

1> if T304 expires (handover failure):

   NOTE 1: Following T304 expiry any dedicated preamble, if provided within the rach-ConfigDedicated, is not
      available for use by the UE anymore.

   2> revert back to the configuration used in the source PCell, excluding the configuration configured by the
      physicalConfigDedicated, the mac-MainConfig and the sps-Config;

   NOTE 1a: In the context above, "the configuration" includes state variables and parameters of each radio bearer.
PDCP entities associated with RLC UM and SRB bearers are reset after the successful RRC connection
re-establishment procedure according to Section 5.2 in TS 36.323 [8]. In EN-DC, "the configuration" includes
the RB configuration using NR PDCP (i.e. as configured by nr-RadioBearerConfig1 and nr-
RadioBearerConfig2).

   2> store the following handover failure information in VarRLF-Report by setting its fields as follows:

      3> clear the information included in VarRLF-Report, if any;

      3> set the plmn-IdentityList to include the list of EPLMNs stored by the UE (i.e. includes the RPLMN);

      3> set the measResultLastServCell to include the RSRP and RSRQ, if available, of the source PCell based on
         measurements collected up to the moment the UE detected handover failure and in accordance with the
         following;

         4> if the UE includes rsrqResult, include the lastServCellRSRQ-Type;

      3> set the measResultNeighCells to include the best measured cells, other than the source PCell, ordered such
         that the best cell is listed first, and based on measurements collected up to the moment the UE detected
         handover failure, and set its fields as follows;

         4> if the UE was configured to perform measurements for one or more EUTRA frequencies, include the
            measResultListEUTRA;

         4> if the UE includes rsrqResult, include the rsrq-Type;

         4> if the UE was configured to perform measurement reporting for one or more neighbouring UTRA
            frequencies, include the measResultListUTRA;

         4> if the UE was configured to perform measurement reporting for one or more neighbouring GERAN
            frequencies, include the measResultListGERAN;
4> if the UE was configured to perform measurement reporting for one or more neighbouring CDMA2000 frequencies, include the measResultsCDMA2000;

4> for each neighbour cell included, include the optional fields that are available;

NOTE 2: The measured quantities are filtered by the L3 filter as configured in the mobility measurement configuration. The measurements are based on the time domain measurement resource restriction, if configured. Blacklisted cells are not required to be reported.

3> if available, set the logMeasResultListWLAN to include the WLAN measurement results, in order of decreasing RSSI for WLAN APs;

3> if available, set the logMeasResultListBT to include the Bluetooth measurement results, in order of decreasing RSSI for Bluetooth beacons;

3> if detailed location information is available, set the content of the locationInfo as follows:

4> include the locationCoordinates;

4> include the horizontalVelocity, if available;

3> set the failedPCellId to the global cell identity, if available, and otherwise to the physical cell identity and carrier frequency of the target PCell of the failed handover;

3> include previousPCellId and set it to the global cell identity of the PCell where the last RRCConnectionReconfiguration message including mobilityControlInfo was received;

3> set the timeConnFailure to the elapsed time since reception of the last RRCConnectionReconfiguration message including the mobilityControlInfo;

3> set the connectionFailureType to 'hof';

3> set the c-RNTI to the C-RNTI used in the source PCell;

2> initiate the connection re-establishment procedure as specified in 5.3.7, upon which the RRC connection reconfiguration procedure ends;

The UE may discard the handover failure information, i.e. release the UE variable VarRLF-Report, 48 hours after the failure is detected, upon power off or upon detach.

NOTE 3: E-UTRAN may retrieve the handover failure information using the UE information procedure with rlf-ReportReq set to true, as specified in 5.6.5.3.

5.3.5.7 Void

5.3.5.7a T307 expiry (SCG change failure)

The UE shall:

1> if T307 expires:

NOTE 1: Following T307 expiry any dedicated preamble, if provided within the rach-ConfigDedicatedSCG, is not available for use by the UE anymore.

2> initiate the SCG failure information procedure as specified in 5.6.13 to report SCG change failure;

5.3.5.8 Radio Configuration involving full configuration option

The UE shall:

1> if the UE is connected to EPC:

2> release/ clear all current dedicated radio configurations except the MCG C-RNTI, the MCG security configuration and the PDCP, RLC, logical channel configurations for the RBs and the logged measurement configuration;

1> else if the UE is connected to 5GC:
release/ clear all current dedicated radio configurations except the MCG C-RNTI, the MCG security configuration and the configuration (PDCP, RLC and logical channel) for the SRBs;

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like MeasConfig and OtherConfig. In case EN-DC is configured, this also includes the entire NR SCG configuration. Such NR SCG configuration does not include the DRB configuration as configured by nr-RadioBearerConfig1 and nr-RadioBearerConfig2.

if the RRCConnectionReconfiguration message includes the mobilityControlInfo:
  release/ clear all current common radio configurations;
  use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;
else:
  use values for timers T301, T310, T311 and constants N310, N311, as included in ue-TimersAndConstants received in SystemInformationBlockType2 (or SystemInformationBlockType2-NB in NB-IoT);

apply the default physical channel configuration as specified in 9.2.4;
apply the default semi-persistent scheduling configuration as specified in 9.2.3;
apply the default MAC main configuration as specified in 9.2.2;
if the UE is a NB-IoT UE; or
for each srb-Identity value included in the srb-ToAddModList (SRB reconfiguration):
  apply the specified configuration defined in 9.1.2 for the corresponding SRB;
  apply the corresponding default RLC configuration for the SRB specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;
  apply the corresponding default logical channel configuration for the SRB as specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;
  if the corresponding SRB was configured with NR PDCP and the UE is connected to EPC:
    release the NR PDCP entity and establish it with an E-UTRA PDCP entity and with the current (MCG) security configuration;

NOTE 1a: The UE applies the LTE ciphering and integrity protection algorithms that are equivalent to the previously configured NR security algorithms.

associate the RLC bearer of this SRB with the established PDCP entity;

NOTE 2: This is to get the SRBs (SRB1 and SRB2 for handover and SRB2 for reconfiguration after reestablishment) to a known state from which the reconfiguration message can do further configuration.
else if the UE is connected to 5GC:
  apply the corresponding default PDCP configuration for the SRB as specified in TS 38.331 [82], clause 9.2.1;
for each eps-BearerIdentity value included in the drb-ToAddModList or nr-RadioBearerConfig1 or nr-RadioBearerConfig2 that is part of the current E-UTRA and NR UE configuration:
  release the E-UTRA or NR PDCP entity;
  release the RLC entity or entities;
  release the DTCH logical channel;
  release the drb-identity;
NOTE 3: This will retain the eps-bearerIdentity but remove the DRBs including drb-identity of these bearers from the current UE configuration and trigger the setup of the DRBs within the AS in Section 5.3.10.3 using the new configuration. The eps-bearerIdentity acts as the anchor for associating the released and re-setup DRB. In the AS the DRB re-setup is equivalent with a new DRB setup (including new PDCP and logical channel configurations).

1> for each eps-BearerIdentity value that is part of the current E-UTRA and NR UE configuration but not added with same eps-BearerIdentity in drb-ToAddModList nor in nr-RadioBearerConfig1 nor in nr-RadioBearerConfig2:

2> perform DRB release as specified in 5.3.10.2;

5.3.6 Counter check

5.3.6.1 General

![Counter check procedure diagram]

The counter check procedure is used by E-UTRAN to request the UE to verify the amount of data sent/ received on each DRB. More specifically, the UE is requested to check if, for each DRB, the most significant bits of the COUNT match with the values indicated by E-UTRAN.

NOTE: The procedure enables E-UTRAN to detect packet insertion by an intruder (a 'man in the middle').

5.3.6.2 Initiation

E-UTRAN initiates the procedure by sending a CounterCheck message.

NOTE: E-UTRAN may initiate the procedure when any of the COUNT values reaches a specific value.

5.3.6.3 Reception of the CounterCheck message by the UE

Upon receiving the CounterCheck message, the UE shall:

1> for each DRB that is established:

2> if no COUNT exists for a given direction (uplink or downlink) because it is a uni-directional bearer configured only for the other direction:

3> assume the COUNT value to be 0 for the unused direction;

2> else if, for at least one direction, the most significant bits of the COUNT are different from the value indicated in the drb-CountMSB-InfoList:

3> include the DRB in the drb-CountInfoList in the CounterCheckResponse message by including the drb-Identity, the count-Uplink and the count-Downlink set to the value of the corresponding COUNT;
1> for each DRB that is included in the drb-CountMSB-InfoList in the CounterCheck message that is not established:

2> include the DRB in the drb-CountInfoList in the CounterCheckResponse message by including the drb-Identity, the count-Uplink and the count-Downlink with the most significant bits set identical to the corresponding values in the drb-CountMSB-InfoList and the least significant bits set to zero;

1> submit the CounterCheckResponse message to lower layers for transmission upon which the procedure ends;

5.3.7 RRC connection re-establishment

5.3.7.1 General

The purpose of this procedure is to re-establish the RRC connection, which involves the resumption of SRB1 (SRB1bis for a NB-IoT UE for which AS security has not been activated) operation, the re-activation of security (except for a NB-IoT UE for which AS security has not been activated) and the configuration of only the PCell.

Except for a NB-IoT UE for which AS security has not been activated, a UE in RRC_CONNECTED, for which security has been activated, may initiate the procedure in order to continue the RRC connection. The connection re-establishment succeeds only if the concerned cell is prepared i.e. has a valid UE context. In case E-UTRAN accepts the re-establishment, SRB1 operation resumes while the operation of other radio bearers remains suspended. If AS security has not been activated, the UE does not initiate the procedure but instead moves to RRC_IDLE directly.

When AS security has not been activated, a NB-IoT UE supporting RRC connection re-establishment for the Control Plane CIoT EPS optimisation in RRC_CONNECTED may initiate the procedure in order to continue the RRC connection.

E-UTRAN applies the procedure as follows:

- When AS security has been activated:
  - to reconfigure SRB1 and to resume data transfer only for this RB;
  - to re-activate AS security without changing algorithms.
For a NB-IoT UE supporting RRC connection re-establishment for the Control Plane CIoT EPS optimisation, when AS security has not been activated:
- to re-establish SRB1bis and to continue data transfer for this RB.

### 5.3.7.2 Initiation

The UE shall only initiate the procedure either when AS security has been activated or for a NB-IoT UE supporting RRC connection re-establishment for the Control Plane CIoT EPS optimisation. The UE initiates the procedure when one of the following conditions is met:

1. upon detecting radio link failure, in accordance with 5.3.11; or
2. upon handover failure, in accordance with 5.3.5.6; or
3. upon mobility from E-UTRA failure, in accordance with 5.4.3.5; or
4. upon integrity check failure indication from lower layers concerning SRB1 or SRB2; or
5. upon an RRC connection reconfiguration failure, in accordance with 5.3.5.5; or
6. upon an RRC connection reconfiguration failure, in accordance with TS38.331 [82, 5.3.5.5].

Upon initiation of the procedure, the UE shall:

1. stop timer T310, if running;
2. stop timer T312, if running;
3. stop timer T313, if running;
4. stop timer T307, if running;
5. start timer T311;
6. stop timer T370, if running;
7. release uplinkDataCompression, if configured;
8. suspend all RBs, including RBs configured with NR PDCP, except SRB0;
9. reset MAC;
10. release the MCG SCell(s), if configured, in accordance with 5.3.10.3a;
11. apply the default physical channel configuration as specified in 9.2.4;
12. except for NB-IoT, for the MCG, apply the default semi-persistent scheduling configuration as specified in 9.2.3;
13. for the MCG, apply the default MAC main configuration as specified in 9.2.2;
14. release powerPrefIndicationConfig, if configured and stop timer T340, if running;
15. release reportProximityConfig, if configured and clear any associated proximity status reporting timer;
16. release obtainLocationConfig, if configured;
17. release idc-Config, if configured;
18. release sps-AssistanceInfoReport, if configured;
19. release measSubframePatternPCell, if configured;
20. release the entire SCG configuration, if configured, except for the DRB configuration (as configured by drb-ToAddModListSCG);
21. if EN-DC is configured:
2> perform EN-DC release, as specified in TS 38.331[82, 5.3.5.10];
1> release naics-Info for the PCell, if configured;
1> if connected as an RN and configured with an RN subframe configuration:
2> release the RN subframe configuration;
1> release the LWA configuration, if configured, as described in 5.6.14.3;
1> release the LWIP configuration, if configured, as described in 5.6.17.3;
1> release delayBudgetReportingConfig, if configured and stop timer T342, if running;
1> perform cell selection in accordance with the cell selection process as specified in TS 36.304 [4];
1> release bw-PreferenceIndicationTimer, if configured and stop timer T341, if running;
1> release overheatingAssistanceConfig, if configured and stop timer T345, if running;
1> release ailc-BitConfig, if configured;

5.3.7.3 Actions following cell selection while T311 is running

Upon selecting a suitable E-UTRA cell, the UE shall:
1> if the UE is connected to 5GC and the selected cell is only connected to EPC; or
1> if the UE is connected to EPC and the selected cell is only connected to 5GC:
   2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';
1> else:
   2> stop timer T311;
   2> start timer T301;
   2> apply the timeAlignmentTimerCommon included in SystemInformationBlockType2;
   2> if the UE is a NB-IoT UE supporting RRC connection re-establishment for the Control Plane CIoT EPS optimisation and AS security has not been activated; and
   2> if cp-reestablishment is not included in SystemInformationBlockType2-NB:
      3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';
   2> else:
      3> initiate transmission of the RRCConnectionReestablishmentRequest message in accordance with 5.3.7.4;

NOTE: This procedure applies also if the UE returns to the source PCell.

Upon selecting an inter-RAT cell, the UE shall:
1> if the selected cell is a UTRA cell, and if the UE supports Radio Link Failure Report for Inter-RAT MRO, include selectedUTRA-CellId in the VarRLF-Report and set it to the physical cell identity and carrier frequency of the selected UTRA cell;
1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.4 Actions related to transmission of RRCConnectionReestablishmentRequest message

Except for NB-IoT, if the procedure was initiated due to radio link failure or handover failure, the UE shall:
1> set the reestablishmentCellId in the VarRLF-Report to the global cell identity of the selected cell;

The UE shall set the contents of RRCConnectionReestablishmentRequest message as follows:

1> except for a NB-IoT UE for which AS security has not been activated, set the ue-Identity as follows:

2> set the c-RNTI to the C-RNTI used in the source PCell (handover and mobility from E-UTRA failure) or used in the PCell in which the trigger for the re-establishment occurred (other cases);

2> set the physCellId to the physical cell identity of the source PCell (handover and mobility from E-UTRA failure) or of the PCell in which the trigger for the re-establishment occurred (other cases);

2> set the shortMAC-I to the 16 least significant bits of the MAC-I calculated:

3> over the ASN.1 encoded as per section 8 (i.e., a multiple of 8 bits) VarShortMAC-Input (or VarShortMAC-Input-NB in NB-IoT);

3> with the KRRCint key and integrity protection algorithm that was used in the source PCell (handover and mobility from E-UTRA failure) or of the PCell in which the trigger for the re-establishment occurred (other cases); and

3> with all input bits for COUNT, BEARER and DIRECTION set to binary ones;

1> for a NB-IoT UE for which AS security has not been activated, set the ue-Identity as follows:

2> request upper layers for calculated ul-NAS-MAC and ul-NAS-Count using the cellIdentity indicated in SystemInformationBlockType1-NB of the current cell;

2> set the s-TMSI to the S-TMSI provided by upper layers;

2> set the ul-NAS-MAC to the ul-NAS-MAC value provided by upper layers;

2> set the ul-NAS-Count to the ul-NAS-Count value provided by upper layers;

1> set the reestablishmentCause as follows:

2> if the re-establishment procedure was initiated due to reconfiguration failure as specified in 5.3.5.5 (the UE is unable to comply with the reconfiguration):

3> set the reestablishmentCause to the value reconfigurationFailure;

2> else if the re-establishment procedure was initiated due to handover failure as specified in 5.3.5.6 (intra-LTE handover failure) or 5.4.3.5 (inter-RAT mobility from EUTRA failure):

3> set the reestablishmentCause to the value handoverFailure;

2> else:

3> set the reestablishmentCause to the value otherFailure;

1> if the UE is a NB-IoT UE:

2> if the UE supports DL channel quality reporting and cqi-Reporting is present in SystemInformationBlockType2-NB:

3> set the cqi-NPDCCH to include the latest results of the downlink channel quality measurements of the serving cell as specified in TS 36.133 [16];

NOTE: The downlink channel quality measurements may use measurement period T1 or T2, as defined in TS 36.133 [16]. In case period T2 is used the RRC-MAC interactions are left to UE implementation.

2> set earlyContentionResolution to TRUE;

The UE shall submit the RRCConnectionReestablishmentRequest message to lower layers for transmission.

5.3.7.5 Reception of the RRCConnectionReestablishment by the UE

NOTE 1: Prior to this, lower layer signalling is used to allocate a C-RNTI. For further details see TS 36.321 [6];
The UE shall:

1> stop timer T301;
1> consider the current cell to be the PCell;
1> except for a NB-IoT UE for which AS security has not been activated:
   2> if SRB1 was configured with NR PDCP and the UE is connected to EPC:
      3> for SRB1, release the NR PDCP entity and establish an E-UTRA PDCP entity with the current (MCG)
         security configuration;
   
   NOTE 1a: The UE applies the LTE ciphering and integrity protection algorithms that are equivalent to the
   previously configured NR security algorithms.

2> else:
   3> for SRB1, re-establish the PDCP entity;
2> re-establish RLC for SRB1;
2> perform the radio resource configuration procedure in accordance with the received
   radioResourceConfigDedicated and as specified in 5.3.10;
2> resume SRB1;

NOTE 2: E-UTRAN should not transmit any message on SRB1 prior to receiving the
RRCConnectionReestablishmentComplete message.

2> if UE is connected to EPC, update the $K_{\text{SNB}}$ key based on the $K_{\text{ASME}}$ key to which the current $K_{\text{SNB}}$ is
   associated, using the nextHopChainingCount value indicated in the RRCConnectionReestablishment
   message, as specified in TS 33.401 [32];
2> else if UE is connected to 5GC, update the $K_{\text{SNB}}$ key based on the $K_{\text{AMF}}$ key to which the current $K_{\text{SNB}}$ is
   associated, using the nextHopChainingCount value indicated in the RRCConnectionReestablishment
   message, as specified in TS 33.501 [86];
2> store the nextHopChainingCount value;

2> derive the $K_{\text{RRCint}}$ key associated with the previously configured integrity algorithm, as specified in TS
   33.401 [32];
2> derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the previously configured ciphering algorithm, as
   specified in TS 33.401 [32];
2> if connected as an RN:
   3> derive the $K_{\text{UPint}}$ key associated with the previously configured integrity algorithm, as specified in TS
      33.401 [32];
2> configure lower layers to activate integrity protection using the previously configured algorithm and the
   $K_{\text{RRCint}}$ key immediately, i.e., integrity protection shall be applied to all subsequent messages received and
   sent by the UE, including the message used to indicate the successful completion of the procedure;
2> if connected as an RN:
   3> configure lower layers to apply integrity protection using the previously configured algorithm and the
      $K_{\text{UPint}}$ key, for subsequently resumed or subsequently established DRBs that are configured to apply
      integrity protection, if any;
2> configure lower layers to apply ciphering using the previously configured algorithm, the $K_{\text{RRCenc}}$ key and the
   $K_{\text{UPenc}}$ key immediately, i.e., ciphering shall be applied to all subsequent messages received and sent by the
   UE, including the message used to indicate the successful completion of the procedure;
2> if the UE is not a NB-IoT UE:
If the UE is connected to EPC:

1. Set the content of \textit{RRCConnectionReestablishmentComplete} message as follows:

- If the UE has radio link failure or handover failure information available in \textit{VarRLF-Report} and if the RPLMN is included in \textit{plmn-IdentityList} stored in \textit{VarRLF-Report}:
  - Include the \textit{rlf-InfoAvailable};

- If the UE has MBSFN logged measurements available for E-UTRA and if the RPLMN is included in \textit{plmn-IdentityList} stored in \textit{VarLogMeasReport} and if T330 is not running:
  - Include \textit{logMeasAvailableMBSFN};

- Else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in \textit{plmn-IdentityList} stored in \textit{VarLogMeasReport}:
  - Include \textit{logMeasAvailable};

- If the UE has Bluetooth logged measurements available and if the RPLMN is included in \textit{plmn-IdentityList} stored in \textit{VarLogMeasReport}:
  - Include \textit{logMeasAvailableBT};

- If the UE has WLAN logged measurements available and if the RPLMN is included in \textit{plmn-IdentityList} stored in \textit{VarLogMeasReport}:
  - Include \textit{logMeasAvailableWLAN};

- If the UE has connection establishment failure information available in \textit{VarConnEstFailReport} and if the RPLMN is equal to \textit{plmn-Identity} stored in \textit{VarConnEstFailReport}:
  - Include \textit{connEstFailInfoAvailable};

- If the UE has flight path information available:
  - Include \textit{flightPathInfoAvailable};

2. Perform the measurement related actions as specified in 5.5.6.1;

3. Perform the measurement identity autonomous removal as specified in 5.5.2.2a;

4. Else:

- If the UE supports serving cell idle mode measurements reporting and \textit{servingCellMeasInfo} is present in \textit{SystemInformationBlockType2-NB}:
  - Set the \textit{measResultServCell} to include the measurements of the serving cell;

**NOTE 2a:** The UE includes the latest results of the serving cell measurements as used for cell selection/reselection evaluation, which are performed in accordance with the performance requirements as specified in TS 36.133 [16].

2. Submit the \textit{RRCConnectionReestablishmentComplete} message to lower layers for transmission;

2. If \textit{SystemInformationBlockType15} is broadcast by the PCell:

- If the UE has transmitted an \textit{MBMSInterestIndication} message during the last 1 second preceding detection of radio link failure:
  - Ensure having a valid version of \textit{SystemInformationBlockType15} for the PCell;

- Determine the set of MBMS frequencies of interest in accordance with 5.8.5.3;

- Determine the set of MBMS services of interest in accordance with 5.8.5.3a;

- Initiate transmission of the \textit{MBMSInterestIndication} message in accordance with 5.8.5.4;
2> if SystemInformationBlockType18 is broadcast by the PCell; and the UE transmitted a SidelinkUEInformation message indicating a change of sidelink communication related parameters relevant in PCell (i.e. change of commRxInterestedFreq or commTxResourceReq, commTxResourceReqUC if SystemInformationBlockType18 includes commTxResourceUC-ReqAllowed or commTxResourceInfoReqRelay if PCell broadcasts SystemInformationBlockType19 including discConfigRelay) during the last 1 second preceding detection of radio link failure; or

2> if SystemInformationBlockType19 is broadcast by the PCell; and the UE transmitted a SidelinkUEInformation message indicating a change of sidelink discovery related parameters relevant in PCell (i.e. change of discRxInterest or discTxResourceReq, discTxResourceReqPS if SystemInformationBlockType19 includes discConfigPS or discRxGapReq or discTxGapReq if the UE is configured with gapRequestsAllowedDedicated set to true or if the UE is not configured with gapRequestsAllowedDedicated and SystemInformationBlockType19 includes gapRequestsAllowedCommon) during the last 1 second preceding detection of radio link failure; or

2> if SystemInformationBlockType21 including sl-V2X-ConfigCommon is broadcast by the PCell; and the UE transmitted a SidelinkUEInformation message indicating a change of V2X sidelink communication related parameters relevant in PCell (i.e. change of v2x-CommRxInterestedFreqList or v2x-CommTxResourceReq) during the last 1 second preceding detection of radio link failure:

3> initiate transmission of the SidelinkUEInformation message in accordance with 5.10.2.3;

1> for a NB-IoT UE for which AS security has not been activated:

2> validate dl-NAS-MAC, as specified in TS 33.401 [32];

2> if dl-NAS-MAC check fails:

3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause ‘RRC connection failure’, upon which the procedure ends;

2> except for a UE that only supports the Control Plane CIoT EPS optimisation:

3> re-establish PDCP for SRB1;

3> re-establish RLC for SRB1;

2> re-establish RLC for SRB1bis;

2> perform the radio resource configuration procedure in accordance with the received radioResourceConfigDedicated and as specified in 5.3.10;

2> except for a UE that only supports the Control Plane CIoT EPS optimisation:

3> resume SRB1;

2> resume SRB1bis;

NOTE 3: E-UTRAN should not transmit any message on SRB1bis prior to receiving the RRCConnectionReestablishmentComplete message.

2> if the UE supports serving cell idle mode measurements reporting and servingCellMeasInfo is present in SystemInformationBlockType2-NB:

3> set the measResultServCell to include the measurements of the serving cell;

NOTE 4: The UE includes the latest results of the serving cell measurements as used for cell selection/ reselection evaluation, which are performed in accordance with the performance requirements as specified in TS 36.133 [16].

2> submit the RRCConnectionReestablishmentComplete message to lower layers for transmission;

1> the procedure ends;
5.3.7.6 T311 expiry
Upon T311 expiry, the UE shall:
1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.7 T301 expiry or selected cell no longer suitable
The UE shall:
1> if timer T301 expires; or
1> if the selected cell becomes no longer suitable according to the cell selection criteria as specified in TS 36.304 [4]:
2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.7.8 Reception of RRCConnectionReestablishmentReject by the UE
Upon receiving the RRCConnectionReestablishmentReject message, the UE shall:
1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.8 RRC connection release
5.3.8.1 General
The purpose of this procedure is:
- to release the RRC connection, which includes the release of the established radio bearers as well as all radio resources; or
- to suspend the RRC connection for both suspended RRC connection or RRC_INACTIVE, which includes the suspension of the established radio bearers.

5.3.8.2 Initiation
E-UTRAN initiates the RRC connection release procedure to a UE in RRC_CONNECTED or in RRC_INACTIVE.

5.3.8.3 Reception of the RRCConnectionRelease by the UE
The UE shall:
1> except for NB-IoT, BL UEs or UEs in CE, delay the following actions defined in this sub-clause 60 ms from the moment the RRCConnectionRelease message was received or optionally when lower layers indicate that the receipt of the RRCConnectionRelease message has been successfully acknowledged, whichever is earlier;
1> for BL UEs or UEs in CE, delay the following actions defined in this sub-clause 1.25 seconds from the moment the RRCConnectionRelease message was received or optionally when lower layers indicate that the receipt of the RRCConnectionRelease message has been successfully acknowledged, whichever is earlier;
1> for NB-IoT, delay the following actions defined in this sub-clause 10 seconds from the moment the 
**RRCConnectionRelease** message was received or optionally when lower layers indicate that the receipt of the 
**RRCConnectionRelease** message has been successfully acknowledged, whichever is earlier.

**NOTE:** For BL UEs, UEs in CE and NB-IoT, when STATUS reporting, as defined in TS 36.322 [7], has not been triggered and the UE has sent positive HARQ feedback (ACK), as defined in TS 36.321 [6], the lower layers can be considered to have indicated that the receipt of the **RRCConnectionRelease** message has been successfully acknowledged.

1> if the **RRCConnectionRelease** message is received in response to an **RRCConnectionResumeRequest** for EDT:

2> discard the stored UE AS context and **resumeIdentity**;

2> stop timer T300;

2> stop timer T302, if running;

2> stop timer T303, if running;

2> stop timer T305, if running;

2> stop timer T306, if running;

2> stop timer T308, if running;

2> perform the actions as specified in 5.3.3.7;

2> stop timer T320, if running;

2> stop timer T322, if running;

1> if the **RRCConnectionRelease** message includes **redirectedCarrierInfo** indicating redirection to **geran**; or

1> if the **RRCConnectionRelease** message includes **idleModeMobilityControlInfo** including **freqPriorityListGERAN**:

2> if AS security has not been activated; and

2> if upper layers indicate that redirect to GERAN without AS security is not allowed or if the UE is connected to 5GC:

3> ignore the content of the **RRCConnectionRelease**;

3> perform the actions upon leaving RRC_CONNECTED or RRC_INACTIVE as specified in 5.3.12, with release cause ‘other’, upon which the procedure ends;

1> if the **RRCConnectionRelease** message includes **idleModeMobilityControlInfo**:

2> if AS security has not been activated:

2> ignore the content of **redirectedCarrierInfo**, if included and indicating redirection to **nr**;

2> ignore the content of **idleModeMobilityControlInfo**, if included and including **freqPriorityListNR**;

2> if the UE ignores the content of **redirectedCarrierInfo** or of **idleModeMobilityControlInfo**:

3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause ‘other’, upon which the procedure ends;

1> if the **RRCConnectionRelease** message includes **redirectedCarrierInfo** indicating redirection to **eutra** and if UE is connected to 5GC:

2> if **cn-Type** is included:

3> the received **cn-Type** is provided to upper layers;

**NOTE 1:** Handling the case if the E-UTRA cell selected after the redirection does not support the core network type specified by the **cn-Type**, is up to UE implementation.

1> if the **RRCConnectionRelease** message includes the **idleModeMobilityControlInfo**:
2> store the cell reselection priority information provided by the idleModeMobilityControlInfo;
2> if the t320 is included:
3> start timer T320, with the timer value set according to the value of t320;
1> else:
2> apply the cell reselection priority information broadcast in the system information;
1> if the RRCConnectionRelease message includes the measIdleConfig:
2> clear VarMeasIdleConfig and VarMeasIdleReport;
2> store the received measIdleDuration in VarMeasIdleReport;
2> start T331 with the value of measIdleDuration;
2> if the measIdleConfig contains measIdleCarrierListEUTRA:
3> store the received measIdleCarrierListEUTRA in VarMeasIdleConfig;
2> else:
3> store the measIdleCarrierListEUTRA received in SIB5 in VarMeasIdleConfig;
2> start performing idle mode measurements as specified in 5.6.20;
1> for NB-IoT, if the RRCConnectionRelease message includes the redirectedCarrierInfo:
2> if the redirectedCarrierOffsetDedicated is included in the redirectedCarrierInfo:
3> store the dedicated offset for the frequency in redirectedCarrierInfo;
3> start timer T322, with the timer value set according to the value of T322 in redirectedCarrierInfo;
1> if the releaseCause received in the RRCConnectionRelease message indicates loadBalancingTAURequired:
2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'load balancing TAU required';
1> else if the releaseCause received in the RRCConnectionRelease message indicates cs-FallbackHighPriority:
2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'CS Fallback High Priority';
1> else:
2> if the extendedWaitTime is present; and
2> if the UE supports delay tolerant access or the UE is a NB-IoT UE:
3> forward the extendedWaitTime to upper layers;
2> if the extendedWaitTime-CPdata is present and the NB-IoT UE only supports the Control Plane CIoT EPS optimisation:
3> forward the extendedWaitTime-CPdata to upper layers;
2> if the releaseCause received in the RRCConnectionRelease message indicates rrc-Suspend:
3> if rrc-InactiveConfig is included:
4> perform the actions upon entering RRC_INACTIVE as specified in 5.3.8.7;
3> else:
4> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC suspension';
2> else:

3> perform the actions upon leaving RRC_CONNECTED or RRC_INACTIVE as specified in 5.3.12, with release cause 'other';

5.3.8.4 T320 expiry

The UE shall:

1> if T320 expires:

2> if stored, discard the cell reselection priority information provided by the idleModeMobilityControlInfo or inherited from another RAT;

2> apply the cell reselection priority information broadcast in the system information;

5.3.8.5 T322 expiry

The UE shall:

1> if T322 expires:

2> discard the redirectedCarrierOffsetDedicated provided in RRCConnectionRelease message;

5.3.8.6 UE actions upon receiving the expiry of DataInactivityTimer

Upon receiving the expiry of DataInactivityTimer from lower layers while in RRC_CONNECTED, the UE shall:

1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure';

5.3.8.7 UE actions upon entering RRC_INACTIVE

Upon entering RRC_INACTIVE, the UE shall:

1> reset MAC;

1> stop all timers that are running except T320 and T325;

1> re-establish RLC entities for all SRBs and DRBs;

1> apply the received rrc-InactiveConfig;

1> if the RRCConnectionRelease message was received in response to an RRCConnectionResumeRequest:

2> replace any previously stored security context with newly received security context in the rrc-InactiveConfig;

2> replace the previously stored C-RNTI with the temporary C-RNTI which the UE has used to receive the RRCConnectionRelease message;

2> replace the previously stored cellIdentity with the cellIdentity of the PCell at the time the UE has received the RRCConnectionRelease message;

2> replace the previously stored physical cell identity with the physical cell identity of the PCell at the time the UE has received the RRCConnectionRelease message;

1> else:

2> store the UE AS Context including the current RRC configuration, the current security context, the PDCP state including ROHC state, SDAP configuration, C-RNTI used in the source PCell, the cellIdentity and the physical cell identity of the source PCell;

1> start timer T380, with the timer value set to the periodic-RNAU-timer;

1> suspend all SRB(s) and DRB(s), except SRB0;

1> indicate the suspension of the RRC connection to upper layers;
Upon selecting to an inter-RAT cell or switching to another CN type, the UE shall:

1> perform the actions upon leaving RRC_INACTIVE as specified in 5.3.12, with release cause 'other';

5.3.9 RRC connection release requested by upper layers

5.3.9.1 General

The purpose of this procedure is to release the RRC connection. Access to the current PCell may be barred as a result of this procedure.

NOTE: Upper layers invoke the procedure, e.g. upon determining that the network has failed an authentication check, see TS 24.301 [35].

5.3.9.2 Initiation

The UE initiates the procedure when upper layers request the release of the RRC connection. The UE shall not initiate the procedure for power saving purposes.

The UE shall:

1> if the upper layers indicate barring of the PCell:
   2> treat the PCell used prior to entering RRC_IDLE as barred according to TS 36.304 [4];
   1> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other';

5.3.10 Radio resource configuration

5.3.10.0 General

The UE shall:

1> if the received radioResourceConfigDedicated includes the srb-ToAddModList:
   2> perform the SRB addition or reconfiguration as specified in 5.3.10.1;
1> if the received radioResourceConfigDedicated includes the drb-ToReleaseList:
   2> perform DRB release as specified in 5.3.10.2;
1> if the received radioResourceConfigDedicated includes the drb-ToAddModList:
   2> perform DRB addition or reconfiguration as specified in 5.3.10.3;
1> if the received radioResourceConfigDedicated includes the mac-MainConfig:
   2> perform MAC main reconfiguration as specified in 5.3.10.4;
1> if the received radioResourceConfigDedicated includes sps-Config:
   2> perform SPS reconfiguration according to 5.3.10.5;
1> if the received radioResourceConfigDedicated includes the physicalConfigDedicated:
   2> reconfigure the physical channel configuration as specified in 5.3.10.6.
1> if the received radioResourceConfigDedicated includes the rlf-TimersAndConstants:
   2> reconfigure the values of timers and constants as specified in 5.3.10.7;
1> if the received radioResourceConfigDedicated includes the measSubframePatternPCell:
   2> reconfigure the time domain measurement resource restriction for the serving cell as specified in 5.3.10.8;
1> if the received radioResourceConfigDedicated includes the naics-Info:
   2> perform NAICS neighbour cell information reconfiguration for the PCell as specified in 5.3.10.13;

1> if the received RadioResourceConfigDedicatedPSCell includes the naics-Info:
   2> perform NAICS neighbour cell information reconfiguration for the PSCell as specified in 5.3.10.13;

1> if the received RadioResourceConfigDedicatedSCell-r10 includes the naics-Info:
   2> perform NAICS neighbour cell information reconfiguration for the SCell as specified in 5.3.10.13;

1> if the received radioResourceConfigDedicated includes the srb-ToReleaseList:
   2> perform SRB release as specified in 5.3.10.17;

1> if the received radioResourceConfigDedicated includes the schedulingRequestConfig:
   2> perform scheduling request reconfiguration for the SCell as specified in 5.3.10.18.

5.3.10.1 SRB addition/ modification

The UE shall:

1> if the UE is a NB-IoT UE and SRB1 is not established; or

1> for each srb-Identity value included in the srb-ToAddModList that is not part of the current UE configuration (SRB establishment):

   2> if the UE is not a NB-IoT UE that only supports the Control Plane CIoT EPS optimisation:

      3> apply the specified configuration defined in 9.1.2 for the corresponding SRB;

      3> establish an (MCG) RLC entity in accordance with the received rlc-Config;

      3> establish a (MCG) DCCH logical channel in accordance with the received logicalChannelConfig and with the logical channel identity set in accordance with 9.1.2;

      3> if the same srb-Identity is included in NR srb-ToAddModList:

         4> after processing nr-RadioBearerConfig1 and nr-RadioBearerConfig2 if present in the RRCConnectionReconfiguration message which triggered the execution of the SRB addition/modification procedure, associate MCG RLC bearer with the NR PDCP entity associated with the same value of srb-Identity in the current UE configuration as specified in TS 38.331 [82];

         3> else:

            4> establish a PDCP entity and configure it with the current (MCG) security configuration, if applicable;

   2> if the UE is a NB-IoT UE:

      3> apply the specified configuration defined in 9.1.2 for SRB1bis;

      3> establish an (MCG) RLC entity in accordance with the received rlc-Config;

      3> establish a (MCG) DCCH logical channel in accordance with the received logicalChannelConfig and with the logical channel identity set in accordance with 9.1.2.1a;

1> if the UE is a NB-IoT UE and SRB1 is established; or

1> for each srb-Identity value included in the srb-ToAddModList that is part of the current UE configuration (SRB reconfiguration):

   2> if pdcp-verChange is included (i.e, NR PDCP to E-UTRA PDCP change):

      3> establish an (E-UTRA) PDCP entity and configure it with the current (MCG) security configuration;
NOTE: The UE applies the LTE ciphering and integrity protection algorithms that are equivalent to the previously configured NR security algorithms.

3> associate the RLC bearer of this SRB with the established PDCP entity;
3> release the NR PDCP entity of this SRB;
2> reconfigure the RLC entity in accordance with the received rlc-Config;
2> reconfigure the DCCH logical channel in accordance with the received logicalChannelConfig;

5.3.10.2 DRB release

The UE shall:

1> for each drb-Identity value included in the drb-ToReleaseList that is part of the current UE configuration (DRB release); or
1> for each drb-identity value that is to be released as the result of full configuration option according to 5.3.5.8:
2> if release of this DRB is result of full configuration option according to 5.3.5.8:
3> release the E-UTRA or NR PDCP entity;
2> else if this DRB is configured with pdcp-config:
3> release the E-UTRA PDCP entity;
2> else (release the RLC bearer configuration of MCG):
3> release the RLC entity or entities;
2> release the DTCH logical channel;
2> if the DRB was configured with pdcp-config and new DRB is not added with same eps-BearerIdentity in drb-ToAddModList nor radioBearerConfig1 nor in radioBearerConfig2:
3> if the procedure was triggered due to handover:
4> indicate the release of the DRB and the eps-BearerIdentity of the released DRB to upper layers after successful handover;
3> else:
4> indicate the release of the DRB and the eps-BearerIdentity of the released DRB to upper layers immediately.

NOTE 1: The UE does not consider the message as erroneous if the drb-ToReleaseList includes any drb-Identity value that is not part of the current UE configuration.

NOTE 2: The association of eps-BearerIdentity to an NR PDCP configuration as defined in TS 38.331 [82] can be included in the same message that releases an DRB associated to the same eps-BearerIdentity.

5.3.10.3 DRB addition/ modification

The UE shall:

1> for each drb-Identity value included in the drb-ToAddModList that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):
2> if the concerned entry of drb-ToAddModList includes the drb-TypeLWA set to TRUE (i.e. add LWA DRB):
3> perform the LWA specific DRB addition or reconfiguration as specified in 5.3.10.3a2;
2> if the concerned entry of drb-ToAddModList includes the drb-TypeLWIP (i.e. add LWIP DRB):
3> perform LWIP specific DRB addition or reconfiguration as specified in 5.3.10.3a3;

2> else if $drb$-ToAddModListSCG is not received or does not include the $drb$-Identity value (i.e. add MCG DRB or MCG RLC bearer for EN-DC):

3> if $pdcp$-Config is received, establish a PDCP entity and configure it with the current MCG security configuration and in accordance with the received $pdcp$-Config;

3> if $rlc$-Config is received, establish an MCG RLC entity or entities in accordance with the received $rlc$-Config;

3> if $logicalChannelIdentity$ and $logicalChannelConfig$ are received, establish an MCG DTCH logical channel in accordance with the received $logicalChannelIdentity$ and the received $logicalChannelConfig$;

3> if $pdcp$-Config is not received, after processing $nr$-$RadioBearerConfig1$ and $nr$-$RadioBearerConfig2$ if present in the $RRC$ConnectionReconfiguration message which triggered the execution of the DRB addition/modification procedure, associate MCG RLC bearer with the NR PDCP entity associated with the same value of $drb$-Identity in the current UE configuration as specified in TS 38.331 [82];

2> if a DRB was configured with the same $eps$-$BearerIdentity$ (fullConfig or change to E-UTRA PDCP):

3> associate the established DRB with corresponding included $eps$-$BearerIdentity$;

2> else if the entry of $drb$-ToAddModList includes $pdcp-config$ (establishment of bearer with E-UTRA PDCP):

3> indicate the establishment of the DRB(s) and the $eps$-$BearerIdentity$ of the established DRB(s) to upper layers;

1> for each $drb$-Identity value included in the $drb$-ToAddModList that is part of the current UE configuration (DRB reconfiguration):

2> if the DRB indicated by $drb$-Identity is an LWA DRB (i.e. LWA to LTE only or reconfigure LWA DRB):

3> perform the LWA specific DRB reconfiguration as specified in 5.3.10.3a2;

2> else if the concerned entry of $drb$-ToAddModList includes the $drb$-TypeLWA set to $TRUE$ (i.e. LTE only to LWA DRB):

3> perform the LWA specific DRB reconfiguration as specified in 5.3.10.3a2;

2> if the concerned entry of $drb$-ToAddModList includes the $drb$-TypeLWIP (i.e. add or reconfigure LWIP DRB):

3> perform LWIP specific DRB addition or reconfiguration as specified in 5.3.10.3a3;

2> if $drb$-ToAddModListSCG is not received or does not include the $drb$-Identity value:

3> if the DRB indicated by $drb$-Identity is an MCG DRB or configured with MCG RLC bearer in EN-DC (reconfigure MCG RLC bearer for EN-DC or reconfigure MCG DRB):

4> if the $pdcp$-Config is included:

5> reconfigure the PDCP entity in accordance with the received $pdcp$-Config;

4> if the $rlc$-Config is included:

5> if $reestab$ishRLC is received, re-establish the RLC entity of this DRB;

5> reconfigure the RLC entity or entities in accordance with the received $rlc$-Config;

4> if the $logicalChannelConfig$ is included:

5> reconfigure the DTCH logical channel in accordance with the received $logicalChannelConfig$;

NOTE: Removal and addition of the same $drb$-Identity in a single $radioResourceConfig$Dedicated is not supported. In case $drb$-Identity is removed and added due to handover or re-establishment with the full configuration option, the eNB can use the same value of $drb$-Identity.
5.3.10.3a1 DC specific DRB addition or reconfiguration

For the `drb-Identity` value for which this procedure is initiated, the UE shall:

1> if `drb-ToAddModListSCG` is received and includes the `drb-Identity` value; and `drb-Identity` value is not part of the current UE configuration (i.e. DC specific DRB establishment):

2> if `drb-ToAddModList` is received and includes the `drb-Identity` value (i.e. add split DRB):

3> establish a PDCP entity and configure it with the current MCG security configuration and in accordance with the `pdcp-Config` included in `drb-ToAddModList`;

3> establish an MCG RLC entity and an MCG DTCH logical channel in accordance with the `rlc-Config`, `logicalChannelIdentity` and `logicalChannelConfig` included in `drb-ToAddModList`;

3> establish an SCG RLC entity and an SCG DTCH logical channel in accordance with the `rlc-ConfigSCG`, `logicalChannelIdentitySCG` and `logicalChannelConfigSCG` included in `drb-ToAddModListSCG`;

2> else (i.e. add SCG DRB):

3> establish a PDCP entity and configure it with the current SCG security configuration and in accordance with the `pdcp-Config` included in `drb-ToAddModListSCG`;

3> establish an SCG RLC entity or entities and an SCG DTCH logical channel in accordance with the `rlc-ConfigSCG`, `logicalChannelIdentitySCG` and `logicalChannelConfigSCG` included in `drb-ToAddModListSCG`;

2> indicate the establishment of the DRB(s) and the `eps-BearerIdentity` of the established DRB(s) to upper layers;

1> else (i.e. DC specific DRB modification; `drb-ToAddModList` and/or `drb-ToAddModListSCG` received):

2> if the DRB indicated by `drb-Identity` is a split DRB:

3> if `drb-ToAddModList` is received and includes the `drb-Identity` value, while for this entry `drb-TypeChange` is included and set to `toMCG` (i.e. split to MCG):

4> release the SCG RLC entity and the SCG DTCH logical channel;

4> reconfigure the PDCP entity in accordance with the `pdcp-Config`, if included in `drb-ToAddModList`;

4> reconfigure the MCG RLC entity and/or the MCG DTCH logical channel in accordance with the `rlc-Config` and `logicalChannelConfig`, if included in `drb-ToAddModList`;

3> else (i.e. reconfigure split):

4> reconfigure the PDCP entity in accordance with the `pdcp-Config`, if included in `drb-ToAddModList`;

4> reconfigure the MCG RLC entity and/or the MCG DTCH logical channel in accordance with the `rlc-Config` and `logicalChannelConfig`, if included in `drb-ToAddModList`;

4> reconfigure the SCG RLC entity and/or the SCG DTCH logical channel in accordance with the `rlc-ConfigSCG` and `logicalChannelConfigSCG`, if included in `drb-ToAddModListSCG`;

2> if the DRB indicated by `drb-Identity` is an SCG DRB:

3> if `drb-ToAddModList` is received and includes the `drb-Identity` value, while for this entry `drb-TypeChange` is included and set to `toMCG` (i.e. SCG to MCG):

4> reconfigure the PDCP entity with the current MCG security configuration and in accordance with the `pdcp-Config`, if included in `drb-ToAddModList`;

4> reconfigure the SCG RLC entity or entities and the SCG DTCH logical channel to be an MCG RLC entity or entities and an MCG DTCH logical channel;
4> reconfigure the MCG RLC entity or entities and/ or the MCG DTCH logical channel in accordance with the rlc-Config, logicalChannelIdentity and logicalChannelConfig, if included in drb-ToAddModList;

3> else (i.e. drb-ToAddModListSCG is received and includes the drb-Identity value i.e. reconfigure SCG):

4> reconfigure the PDCP entity in accordance with the pdcp-Config, if included in drb-ToAddModListSCG;

4> reconfigure the SCG RLC entity or entities and/ or the SCG DTCH logical channel in accordance with the rlc-ConfigSCG and logicalChannelConfigSCG, if included in drb-ToAddModListSCG;

2> if the DRB indicated by drb-Identity is an MCG DRB:

3> if drb-ToAddModListSCG is received and includes the drb-Identity value, while for this entry drb-Type is included and set to split (i.e. MCG to split):

4> reconfigure the PDCP entity in accordance with the pdcp-Config, if included in drb-ToAddModList;

4> reconfigure the MCG RLC entity and/ or the MCG DTCH logical channel in accordance with the rlc-Config and logicalChannelConfig, if included in drb-ToAddModList;

4> establish an SCG RLC entity and an SCG DTCH logical channel in accordance with the rlc-ConfigSCG, logicalChannelIdentitySCG and logicalChannelConfigSCG, included in drb-ToAddModListSCG;

3> else (i.e. drb-Type is included and set to scg i.e. MCG to SCG):

4> reconfigure the PDCP entity with the current SCG security configuration and in accordance with the pdcp-Config, if included in drb-ToAddModListSCG;

4> reconfigure the MCG RLC entity or entities and the MCG DTCH logical channel to be an SCG RLC entity or entities and an SCG DTCH logical channel;

4> reconfigure the SCG RLC entity or entities and/ or the SCG DTCH logical channel in accordance with the rlc-ConfigSCG, logicalChannelIdentitySCG and logicalChannelConfigSCG, if included in drb-ToAddModListSCG;

5.3.10.3a2 LWA specific DRB addition or reconfiguration

For the drb-Identity value for which this procedure is initiated, the UE shall:

1> if the drb-Identity value is not part of the current UE configuration (i.e. add LWA DRB):

2> establish a PDCP entity and configure it with the current security configuration and in accordance with the pdcp-Config included in drb-ToAddModList;

2> establish an RLC entity and an DTCH logical channel in accordance with the rlc-Config, logicalChannelIdentity and logicalChannelConfig included in drb-ToAddModList;

2> enable data handling for this DRB at the LWAAP entity;

2> if lwa-WLAN-AC is configured:

3> apply the received lwa-WLAN-AC when performing transmissions of packets for this DRB over WLAN;

2> indicate the establishment of the DRB and the eps-BearerIdentity of the established DRB to upper layers;

1> else if the DRB indicated by drb-Identity is not an LWA DRB (i.e. LTE only to LWA DRB):

2> reconfigure the PDCP entity in accordance with the pdcp-Config, if included in drb-ToAddModList;

2> reconfigure the RLC entity and/ or the DTCH logical channel in accordance with the rlc-Config and logicalChannelConfig, if included in drb-ToAddModList;

2> enable data handling for this DRB at the LWAAP entity;
if lwa-WLAN-AC is configured:

apply the received lwa-WLAN-AC when performing transmissions of packets for this DRB over WLAN;

else if the concerned entry of drb-ToAddModList includes the drb-TypeLWA set to FALSE (i.e. LWA to LTE only DRB):

reconfigure the PDCP entity in accordance with the pdcp-Config, if included in drb-ToAddModList;

reconfigure the RLC entity and/or the DTCH logical channel in accordance with the rlc-Config and logicalChannelConfig, if included in drb-ToAddModList;

perform PDCP data recovery as specified in TS 36.323 [8] if bearer is configured with RLC AM;

disable data handling for this DRB at the LWAAP entity;

else (i.e. reconfigure LWA DRB):

reconfigure the PDCP entity in accordance with the pdcp-Config, if included in drb-ToAddModList;

reconfigure the RLC entity and/or the DTCH logical channel in accordance with the rlc-Config and logicalChannelConfig, if included in drb-ToAddModList;

if lwa-WLAN-AC is configured:

apply the received lwa-WLAN-AC when performing transmissions of packets for this DRB over WLAN;

5.3.10.3a3 LWIP specific DRB addition or reconfiguration

For the drb-Identity value for which this procedure is initiated, the UE shall:

if the drb-TypeLWIP is set to lwip:

indicate to higher layers to use LWIP resources in both UL and DL for the DRB associated with the drb-Identity;

if lwip-DL-Aggregation is set to TRUE:

indicate to higher layers to apply decoding of LWIPEP header with GRE sequence number for both LTE and WLAN DL reception for the DRB associated with the drb-Identity;

if lwip-DL-Aggregation is set to FALSE:

indicate to higher layers to stop decoding of LWIPEP header with GRE sequence number for both LTE and WLAN DL reception for the DRB associated with the drb-Identity;

if lwip-UL-Aggregation is set to TRUE:

indicate to higher layers to insert LWIPEP header with GRE sequence number for both LTE and WLAN UL transmissions for the DRB associated with the drb-Identity;

if lwip-UL-Aggregation is set to FALSE:

indicate to higher layers to stop inserting LWIPEP header with GRE sequence number for both LTE and WLAN UL transmissions for the DRB associated with the drb-Identity;

if the drb-TypeLWIP is set to lwip-DL-only:

indicate to higher layers to use LWIP resources in the DL only for the DRB associated with the drb-Identity;

if lwip-DL-Aggregation is set to TRUE:

indicate to higher layers to apply decoding of LWIPEP header with GRE sequence number for both LTE and WLAN DL reception for the DRB associated with the drb-Identity;

if the drb-TypeLWIP is set to lwip-UL-only:

indicate to higher layers to use LWIP resources in the UL only for the DRB associated with the drb-Identity;
2> if \textit{lwip-UL-Aggregation} is set to TRUE:

3> indicate to higher layers to insert LWIPEP header with GRE sequence number for both LTE and WLAN UL transmissions for the DRB associated with the \textit{drb-Identity};

1> if the \textit{drb-TypeLWIP} is set to \textit{eutran}:

2> indicate to higher layers to stop using LWIP resources for the DRB associated with the \textit{drb-Identity};

5.3.10.3a SCell release

The UE shall:

1> if the release is triggered by reception of the \textit{sCellToReleaseList} or the \textit{sCellToReleaseListSCG}:

2> for each \textit{sCellIndex} value included either in the \textit{sCellToReleaseList} or in the \textit{sCellToReleaseListSCG}:

3> if the current UE configuration includes an SCell with value \textit{sCellIndex}:

4> release the SCell;

1> if the release is triggered by RRC connection re-establishment:

2> release all SCells that are part of the current UE configuration;

5.3.10.3b SCell addition/ modification

The UE shall:

1> for each \textit{sCellIndex} value included either in the \textit{sCellToAddModList} or in the \textit{sCellToAddModListSCG} that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the \textit{cellIdentification}, in accordance with the \textit{radioResourceConfigCommonSCell} and \textit{radioResourceConfigDedicatedSCell}, both included either in the \textit{sCellToAddModList} or in the \textit{sCellToAddModListSCG};

2> if \textit{sCellState} is configured for the SCell and indicates \textit{activated}:

3> configure lower layers to consider the SCell to be in activated state;

2> else if \textit{sCellState} is configured for the SCell and indicates \textit{dormant}:

3> configure lower layers to consider the SCell to be in dormant state;

2> else:

3> configure lower layers to consider the SCell to be in deactivated state;

2> for each \textit{measId} included in the \textit{measIdList} within \textit{VarMeasConfig}:

3> if SCells are not applicable for the associated measurement; and

3> if the concerned SCell is included in \textit{cellsTriggeredList} defined within the \textit{VarMeasReportList} for this \textit{measId}:

4> remove the concerned SCell from \textit{cellsTriggeredList} defined within the \textit{VarMeasReportList} for this \textit{measId};

1> for each \textit{sCellIndex} value included either in the \textit{sCellToAddModList} or in the \textit{sCellToAddModListSCG} that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the \textit{radioResourceConfigDedicatedSCell}, included either in the \textit{sCellToAddModList} or in the \textit{sCellToAddModListSCG};

5.3.10.3c PSCell addition or modification

The UE shall:
1> if the PSCell is not part of the current UE configuration (i.e. PSCell addition):
   2> add the PSCell, corresponding to the cellIdentification, in accordance with the received radioResourceConfigCommonPSCell and radioResourceConfigDedicatedPSCell;
   2> configure lower layers to consider the PSCell to be in activated state;
1> if the PSCell is part of the current UE configuration (i.e. PSCell modification):
   2> modify the PSCell configuration in accordance with the received radioResourceConfigDedicatedPSCell;

5.3.10.4 MAC main reconfiguration

Except for NB-IoT, the UE shall:

1> if the procedure is triggered to perform SCG MAC main reconfiguration:
   2> if SCG MAC is not part of the current UE configuration (i.e. SCG establishment):
      3> create an SCG MAC entity;
   2> reconfigure the SCG MAC main configuration as specified in the following i.e. assuming it concerns the SCG MAC whenever MAC main configuration is referenced and that it is based on the received mac-MainConfigSCG instead of mac-MainConfig:
1> reconfigure the MAC main configuration in accordance with the received mac-MainConfig other than stag-ToReleaseList and stag-ToAddModList;

1> if the received mac-MainConfig includes the stag-ToReleaseList:
   2> for each STAG-Id value included in the stag-ToReleaseList that is part of the current UE configuration:
      3> release the STAG indicated by STAG-Id;
1> if the received mac-MainConfig includes the stag-ToAddModList:
   2> for each stag-Id value included in stag-ToAddModList that is not part of the current UE configuration (STAG addition):
      3> add the STAG, corresponding to the stag-Id, in accordance with the received timeAlignmentTimerSTAG;
   2> for each stag-Id value included in stag-ToAddModList that is part of the current UE configuration (STAG modification):
      3> reconfigure the STAG, corresponding to the stag-Id, in accordance with the received timeAlignmentTimerSTAG;

For NB-IoT, the UE shall:
1> reconfigure the MAC main configuration in accordance with the received mac-MainConfig;

5.3.10.5 Semi-persistent scheduling reconfiguration

The UE shall:
1> reconfigure the semi-persistent scheduling in accordance with the received sps-Config;

5.3.10.6 Physical channel reconfiguration

Except for NB-IoT, the UE shall:

1> if the antennaInfo-r10 is included in the received physicalConfigDedicated and the previous version of this field that was received by the UE was antennaInfo (without suffix i.e. the version defined in REL-8):
   2> apply the default antenna configuration as specified in 9.2.4;
1> if the cqi-ReportConfig-r10 is included in the received physicalConfigDedicated and the previous version of this field that was received by the UE was cqi-ReportConfig (without suffix i.e. the version defined in REL-8):

2> apply the default CQI reporting configuration as specified in 9.2.4;

NOTE: Application of the default configuration involves release of all extensions introduced in REL-9 and later.

1> reconfigure the physical channel configuration in accordance with the received physicalConfigDedicated;

1> if the antennaInfo is included and set to explicitValue:

2> if the configured transmissionMode is tm1, tm2, tm5, tm6 or tm7; or

2> if the configured transmissionMode is tm8 and pmi-RI-Report is not present; or

2> if the configured transmissionMode is tm9 and pmi-RI-Report is not present; or

2> if the configured transmissionMode is tm9 and pmi-RI-Report is present and antennaPortsCount within csi-RS is set to an1:

3> release ri-ConfigIndex in cqi-ReportPeriodic, if previously configured;

1> else if the antennaInfo is included and set to defaultValue:

2> release ri-ConfigIndex in cqi-ReportPeriodic, if previously configured;

1> if thepusch-EnhancementsConfig is included in the received physicalConfigDedicated, for the associated serving cell:

2> if PUSCH enhancement mode is previously released or not configured and pusch-EnhancementsConfig is set to setup, or

2> if PUSCH enhancement mode is previously configured and pusch-EnhancementConfig is set to release:

3> instruct the associated MAC entity to perform partial reset;

1> if the procedure was not triggered due to handover and ce-Mode is included in the received physicalConfigDedicated, for the associated serving cell:

2> if ce-Mode is not currently configured and ce-Mode is set to setup, or

2> if ce-Mode is currently configured and ce-Mode is set to release:

3> instruct the associated MAC entity to perform partial reset;

For NB-IoT, the UE shall:

1> if the carrierConfigDedicated is not included in the received physicalConfigDedicated:

2> if the UE is configured with a carrier configuration previously received in carrierConfigDedicated:

3> use the carrier configuration received in carrierConfigDedicated;

2> else:

3> use the carrier configuration received in system information for the uplink and downlink carrier used during the random access procedure;

1> else:

2> use the carrier configuration received in carrierConfigDedicated;

2> start to use the new carrier immediately after the last transport block carrying the RRC message has been acknowledged by the MAC layer, and any subsequent RRC response message sent for the current RRC procedure is therefore sent on the new carrier;

1> reconfigure the physical channel configuration in accordance with the received physicalConfigDedicated.
5.3.10.7 Radio Link Failure Timers and Constants reconfiguration

The UE shall:

1> if the received rlf-TimersAndConstants is set to release:
   2> use values for timers T301, T310, T311 and constants N310, N311, as included in ue-TimersAndConstants received in SystemInformationBlockType2 (or SystemInformationBlockType2-NB in NB-IoT);
1> else:
   2> reconfigure the value of timers and constants in accordance with received rlf-TimersAndConstants;
1> if the received rlf-TimersAndConstantsSCG is set to release:
   2> stop timer T313, if running, and
   2> release the value of timer t313 as well as constants n313 and n314;
1> else:
   2> reconfigure the value of timers and constants in accordance with received rlf-TimersAndConstantsSCG;

5.3.10.8 Time domain measurement resource restriction for serving cell

The UE shall:

1> if the received measSubframePatternPCell is set to release:
   2> release the time domain measurement resource restriction for the PCell, if previously configured
1> else:
   2> apply the time domain measurement resource restriction for the PCell in accordance with the received measSubframePatternPCell;

5.3.10.9 Other configuration

The UE shall:

1> if the received otherConfig includes the reportProximityConfig:
   2> if proximityIndicationEUTRA is set to enabled:
      3> consider itself to be configured to provide proximity indications for E-UTRA frequencies in accordance with 5.3.14;
   2> else:
      3> consider itself not to be configured to provide proximity indications for E-UTRA frequencies;
   2> if proximityIndicationUTRA is set to enabled:
      3> consider itself to be configured to provide proximity indications for UTRA frequencies in accordance with 5.3.14;
   2> else:
      3> consider itself not to be configured to provide proximity indications for UTRA frequencies;
1> if the received otherConfig includes the obtainLocation:
   2> attempt to have detailed location information available for any subsequent measurement report;

NOTE: The UE is requested to attempt to have valid detailed location information available whenever sending a measurement report for which it is configured to include available detailed location information. The UE may not succeed e.g. because the user manually disabled the GPS hardware, due to no/poor satellite coverage. Further details, e.g. regarding when to activate GNSS, are up to UE implementation.
1> if the received otherConfig includes the BT-NameList:
   2> attempt to have Bluetooth measurement results available for subsequent measurement report;
1> if the received otherConfig includes the WLAN-NameList:
   2> attempt to have WLAN measurement results available for subsequent measurement report;

NOTE: The UE is requested to attempt to have valid Bluetooth measurements and WLAN measurements whenever sending a measurement report for which it is configured to include these measurements. The UE may not succeed e.g. because the user manually disabled the WLAN or Bluetooth hardware. Further details, e.g. regarding when to activate WLAN or Bluetooth, are up to UE implementation.

1> if the received otherConfig includes the idc-Config:
   2> if idc-Indication is included (i.e. set to setup):
      3> consider itself to be configured to provide IDC indications in accordance with 5.6.9;
      3> if idc-Indication-UL-CA is included (i.e. set to setup):
         4> consider itself to be configured to indicate UL CA related information in IDC indications in accordance with 5.6.9;
      3> if idc-HardwareSharingIndication is included (i.e. set to setup):
         4> consider itself to be configured to indicate IDC hardware sharing problem indications in IDC indications in accordance with 5.6.9;
      3> if idc-Indication-MRDC is included (i.e. set to setup):
         4> consider itself to be configured to provide IDC indications for MR-DC in accordance with 5.6.9;
   2> else:
      3> consider itself not to be configured to provide IDC indications;
   2> if autonomousDenialParameters is included:
      3> consider itself to be allowed to deny any transmission in a particular UL subframe if during the number of subframes indicated by autonomousDenialValidity, preceeding and including this particular subframe, it autonomously denied fewer UL subframes than indicated by autonomousDenialSubframes;
   2> else:
      3> consider itself not to be allowed to deny any UL transmission;
1> if the received otherConfig includes the powerPrefIndicationConfig:
   2> if powerPrefIndicationConfig is set to setup:
      3> consider itself to be configured to provide power preference indications in accordance with 5.6.10;
   2> else:
      3> consider itself not to be configured to provide power preference indications;
1> if the received otherConfig includes the sps-AssistanceInfoReport:
   2> if sps-AssistanceInfoReport is set to TRUE:
      3> consider itself to be configured to provide SPS assistance information in accordance with 5.6.10;
   2> else
      3> consider itself not to be configured to provide SPS assistance information;
1> if the received otherConfig includes the bw-PreferenceIndicationTimer:
consider itself to be configured to provide maximum PDSCH/PUSCH bandwidth preference indication in accordance with 5.6.10;

else:
consider itself not to be configured to provide maximum PDSCH/PUSCH bandwidth indication preference;

if the received otherConfig includes the delayBudgetReportingConfig:

if delayBudgetReportingConfig is set to setup:
consider itself to be configured to send delay budget reports in accordance with 5.6.18;
else:
consider itself not to be configured to send delay budget reports and stop timer T342, if running;

if the received otherConfig includes the overheatingAssistanceConfig:

if overheatingAssistanceConfig is set to setup:
consider itself to be configured to provide overheating assistance information in accordance with 5.6.10;
else:
consider itself not to be configured to provide overheating assistance information and stop timer T345, if running;

for BL UEs or UEs in CE, if the received otherConfig includes the rlm-ReportConfig:

if rlm-ReportConfig is set to setup:
consider itself to be configured to detect "early-out-of-sync" and "early-in-sync" RLM events as specified in 5.3.11;
if rlmReportRep-MPDCCH is set to setup:
consider itself to be configured to report rlmReportRep-MPDCCH in accordance with 5.6.10;
else:
consider itself not to be configured to detect "early-out-of-sync" and "early-in-sync" RLM events and stop timer T343, timer T344, timer T314 and timer T315 if running;

if the received otherConfig includes the measConfigAppLayer:

if measConfigAppLayer is set to setup:
forward measConfigAppLayerContainer to upper layers considering the serviceType;
consider itself to be configured to send application layer measurement report in accordance with 5.6.19;
else:
inform upper layers to clear the stored application layer measurement configuration;
discard received application layer measurement report information from upper layers;
consider itself not to be configured to send application layer measurement report.

if the received otherConfig includes the ailc-BitConfig:

if ailc-BitConfig is set to TRUE:
consider itself to be configured to provide assistance information bit for local cache as specified in TS 36.323 [8], clause 6.2.3;
else:
3> consider itself not to be configured to provide assistance information bit for local cache;

5.3.10.10 SCG reconfiguration

The UE shall:

1> if makeBeforeBreakSCG is configured:
   2> stop timer T313, if running;
   2> start timer T307 with the timer value set to t307, as included in the mobilityControlInfoSCG;
   2> start synchronising to the DL of the target PSCell, if needed;
   2> perform the remainder of this procedure including and following resetting MAC after the UE has stopped the uplink transmission/downlink reception with the source SCG cell(s);

NOTE 0a: It is up to UE implementation when to stop the uplink transmission/ downlink reception with the source SCG cell(s) to initiate re-tuning for the connection to the target cell [16], if makeBeforeBreakSCG is configured.

1> if the received scg-Configuration is set to release or includes the mobilityControlInfoSCG (i.e. SCG release/change):
   2> if mobilityControlInfo is not received (i.e. SCG release/change without HO):
      3> reset SCG MAC, if configured;
      3> for each drb-Identity value that is part of the current UE configuration:
         4> if the DRB indicated by drb-Identity is an SCG DRB:
            5> re-establish the PDCP entity and the SCG RLC entity or entities;
         4> if the DRB indicated by drb-Identity is a split DRB:
            5> perform PDCP data recovery and re-establish the SCG RLC entity;
         4> if the DRB indicated by drb-Identity is an MCG DRB; and
         4> drb-ToAddModListSCG is received and includes the drb-Identity value, while for this entry drb-Type is included and set to scg (i.e. MCG to SCG):
            5> re-establish the PDCP entity and the MCG RLC entity or entities;
      3> configure lower layers to consider the SCG SCell(s), except for the PSCell, to be in deactivated state;

1> if the received scg-Configuration is set to release:
   2> release the entire SCG configuration, except for the DRB configuration (i.e. as configured by drb-ToAddModListSCG);
   2> if the current UE configuration includes one or more split or SCG DRBs and the received RRCConnectionReconfiguration message includes radioResourceConfigDedicated including drb-ToAddModList:
      3> reconfigure the SCG or split DRB by drb-ToAddModList as specified in 5.3.10.12;
   2> stop timer T313, if running;
   2> stop timer T307, if running;

1> else:
   2> if the received scg-ConfigPartMCG includes the scg-Counter:
3> update the S-K_{NB} key based on the K_{NB} key and using the received scg-Counter value, as specified in TS 33.401 [32];

3> derive the K_{UPenc} key associated with the cipheringAlgorithmSCG included in mobilityControlInfoSCG within the received scg-ConfigPartSCG, as specified in TS 33.401 [32];

3> configure lower layers to apply the ciphering algorithm and the K_{UPenc} key;

2> if the received scg-ConfigPartSCG includes the radioResourceConfigDedicatedSCG:

3> reconfigure the dedicated radio resource configuration for the SCG as specified in 5.3.10.11;

2> if the current UE configuration includes one or more split or SCG DRBs and the received RRConnectionReconfiguration message includes radioResourceConfigDedicated including drb-ToAddModList:

3> reconfigure the SCG or split DRB by drb-ToAddModList as specified in 5.3.10.12;

2> if the received scg-ConfigPartSCG includes the sCellToReleaseListSCG:

3> perform SCell release for the SCG as specified in 5.3.10.3a;

2> if the received scg-ConfigPartSCG includes the pSCellToAddMod:

3> perform PSCell addition or modification as specified in 5.3.10.3c;

NOTE 0: This procedure is also used to release the PSCell e.g. PSCell change, SI change for the PSCell.

2> if the received scg-ConfigPartSCG includes the sCellToAddModListSCG:

3> perform SCell addition or modification as specified in 5.3.10.3b;

2> configure lower layers in accordance with mobilityControlInfoSCG, if received;

2> if rach-SkipSCG is configured:

3> configure lower layers to apply the rach-SkipSCG for the target SCG, as specified in TS 36.213 [23] and TS 36.321 [6];

2> if the received scg-ConfigPartSCG includes the mobilityControlInfoSCG (i.e. SCG change):

3> resume all SCG DRBs and resume SCG transmission for split DRBs, if suspended;

3> stop timer T313, if running;

3> start timer T307 with the timer value set to t307, as included in the mobilityControlInfoSCG, if makeBeforeBreakSCG is not configured;

3> start synchronising to the DL of the target PSCell;

3> initiate the random access procedure on the PSCell, as specified in TS 36.321 [6], if rach-SkipSCG is not configured;

NOTE 1: The UE is not required to determine the SFN of the target PSCell by acquiring system information from that cell before performing RACH access in the target PSCell.

3> the procedure ends, except that the following actions are performed when MAC successfully completes the random access procedure on the PSCell or when MAC indicates the successful reception of a PDCCH transmission addressed to C-RNTI and if rach-skipSCG is configured:

4> stop timer T307;

4> release rach-SkipSCG;

4> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target PSCell, if any;
apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target PSCell (e.g. periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target PSCell;

NOTE 2: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

5.3.10.11 SCG dedicated resource configuration

The UE shall:

1> if the received radioResourceConfigDedicatedSCG includes the drb-ToAddModListSCG:
   2> for each drb-Identity value included in the drb-ToAddModListSCG perform the DC specific DRB addition or reconfiguration as specified in 5.3.10.3a1

1> if the received radioResourceConfigDedicatedSCG includes the mac-MainConfigSCG:
   2> perform the SCG MAC main reconfiguration as specified in 5.3.10.4;

1> if the received radioResourceConfigDedicatedSCG includes the rlf-TimersAndConstantsSCG:
   2> reconfigure the values of timers and constants as specified in 5.3.10.7;

5.3.10.12 Reconfiguration SCG or split DRB by drb-ToAddModList

The UE shall:

1> for each split or SCG DRBs that is part of the current configuration:
   2> if the corresponding drb-Identity value is included in the received drb-ToAddModList; and
   2> if the corresponding drb-Identity value is not included in the received drb-ToAddModListSCG (i.e. reconfigure split, split to MCG or SCG to MCG):
      3> perform the DC specific DRB addition or reconfiguration as specified in 5.3.10.3a1;

5.3.10.13 Neighbour cell information reconfiguration

The UE shall:

1> if the received naics-Info is set to release:
   2> instruct lower layer to release all the NAICS neighbour cell information for the concerned cell, if previously configured;

1> if the received naics-Info includes the neighCellsToReleaseList-r12:
   2> for each physCellId-r12 value included in the neighCellsToReleaseList-r12 that is part of the current NAICS neighbour cell information of the concerned cell:
      3> instruct lower layer to release the NAICS neighbour cell information for the concerned cell;

1> if the received naics-Info includes the NeighCellsToAddModList-r12:
   2> for each physCellId-r12 value included in the neighCellsToAddModList-r12 that is not part of the current NAICS neighbour cell information of the concerned cell:
      3> instruct lower layer to add the NAICS neighbour cell information for the concerned cell;
   2> for each physCellId-r12 value included in the neighCellsToAddModList-r12 that is part of the current NAICS neighbour cell information of the concerned cell:
      3> instruct lower layer to modify the NAICS neighbour cell information in accordance with the received NeighCellsInfo for the concerned cell;
5.3.10.14 Void

5.3.10.15 Sidelink dedicated configuration

The UE shall:

1> if the **RRCConnectionReconfiguration** message includes the **sl-CommConfig**:

2> if **commTxResources** is included and set to **setup**:

3> from the next SC period use the resources indicated by **commTxResources** for sidelink communication transmission, as specified in 5.10.4;

2> else if **commTxResources** is included and set to **release**:

3> from the next SC period, release the resources allocated for sidelink communication transmission previously configured by **commTxResources**;

1> if the **RRCConnectionReconfiguration** message includes the **sl-DiscConfig**:

2> if **discTxResources** is included and set to **setup**:

3> from the next discovery period, as defined by **discPeriod**, use the resources indicated by **discTxResources** for sidelink discovery announcement, as specified in 5.10.6;

2> else if **discTxResources** is included and set to **release**:

3> from the next discovery period, as defined by **discPeriod**, release the resources allocated for sidelink discovery announcement previously configured by **discTxResources**;

2> if **discTxResourcesPS** is included and set to **setup**:

3> from the next discovery period, as defined by **discPeriod**, use the resources indicated by **discTxResourcesPS** for sidelink discovery announcement, as specified in 5.10.6;

2> else if **discTxResourcesPS** is included and set to **release**:

3> from the next discovery period, as defined by **discPeriod**, release the resources allocated for sidelink discovery announcement previously configured by **discTxResourcesPS**;

2> if **discTxInterFreqInfo** is included and set to **setup**:

3> from the next discovery period, as defined by **discPeriod**, use the resources indicated by **discTxInterFreqInfo** for sidelink discovery announcement, as specified in 5.10.6;

2> else if **discTxInterFreqInfo** is included and set to **release**:

3> from the next discovery period, as defined by **discPeriod**, release the resources allocated for sidelink discovery announcement previously configured by **discTxInterFreqInfo**;

2> if **discRxGapConfig** is included and set to **setup**:

3> from the next gap period, as defined by **gapPeriod**, use the gaps indicated by **discRxGapConfig** for sidelink discovery monitoring, as specified in 5.10.5;

2> else if **discRxGapConfig** is included and set to **release**:

3> from the next gap period, as defined by **gapPeriod**, release the gaps configured for sidelink discovery monitoring previously configured by **discRxGapConfig**;

2> if **discTxGapConfig** is included and set to **setup**:

3> from the next gap period, as defined by **gapPeriod**, use the gaps indicated by **discTxGapConfig** for sidelink discovery announcement, as specified in 5.10.6;

2> else if **discTxGapConfig** is included and set to **release**:
3> from the next gap period, as defined by gapPeriod, release the gaps configured for sidelink discovery announcement previously configured by discTxGapConfig;

2> if discSysInfoToReportConfig is included and set to setup:
   3> start timer T370 with the timer value set to 60s;
2> else if discSysInfoToReportConfig is included and set to release:
   3> stop timer T370 and release discSysInfoToReportConfig;

5.3.10.15a V2X sidelink Communication dedicated configuration

The UE shall:

1> if the RRCConnectionReconfiguration message includes the sl-V2X-ConfigDedicated:
   2> if commTxResources is included and set to setup:
      3> use the resources indicated by commTxResources for V2X sidelink communication transmission, as specified in 5.10.13;
      3> perform CBR measurement on the transmission resource pool indicated in commTxResources for V2X sidelink communication transmission, as specified in 5.5.3;
   2> else if commTxResources is included and set to release:
      3> release the resources allocated for V2X sidelink communication transmission previously configured by commTxResources;
   2> if v2x-InterFreqInfoList is included:
      3> use the synchronization configuration and resource configuration parameters for V2X sidelink communication on frequencies included in v2x-InterFreqInfoList, as specified in 5.10.13;
      3> perform CBR measurement on the transmission resource pool indicated in v2x-InterFreqInfoList for V2X sidelink communication transmission, as specified in 5.5.3;
1> if the RRCConnectionReconfiguration message includes the mobilityControlInfoV2X:
   2> if v2x-CommRxPool is included:
      3> use the resources indicated by v2x-CommRxPool for V2X sidelink communication reception, as specified in 5.10.12;
   2> if v2x-CommTxPoolExceptional is included:
      3> use the resources indicated by v2x-CommTxPoolExceptional for V2X sidelink communication transmission, as specified in 5.10.13;
      3> perform CBR measurement on the transmission resource pool indicated by v2x-CommTxPoolExceptional for V2X sidelink communication transmission, as specified in 5.5.3;

5.3.10.16 T370 expiry

The UE shall:

1> if T370 expires:
   2> release discSysInfoToReportConfig;

5.3.10.17 SRB release

The UE shall for the SRB with SRB identity corresponding to srb-ToReleaseList:

1> release the PDCP entity.
5.3.10.18  Scheduling Request Configuration for NB-IoT

The UE shall:

1> apply sr-WithHARQ-ACK-Config, if included;
1> apply sr-WithoutHARQ-ACK-Config, if included;
1> apply sr-SPS-BSR-Config, if included;

5.3.11  Radio link failure related actions

5.3.11.1  Detection of physical layer problems in RRC_CONNECTED

The UE shall:

1> upon receiving N310 consecutive "out-of-sync" indications for the PCell from lower layers while neither T300, T301, T304 nor T311 is running:
   2> start timer T310;
1> upon receiving N313 consecutive "out-of-sync" indications for the PSCell from lower layers while T307 is not running:
   2> start T313;

NOTE: Physical layer monitoring and related autonomous actions do not apply to SCells except for the PSCell.

5.3.11.1a  Early detection of physical layer problems in RRC_CONNECTED

The UE shall:

1> upon receiving N310 consecutive "early-out-of-sync" indications for the PCell from lower layers:
   2> start timer T314 with the timer value set to the value of T310;

5.3.11.1b  Detection of physical layer improvements in RRC_CONNECTED

The UE shall:

1> upon receiving N311 consecutive "early-in-sync" indications for the PCell from lower layers:
   2> start timer T315 with the timer value set to the value of T310;

5.3.11.2  Recovery of physical layer problems

Upon receiving N311 consecutive "in-sync" indications for the PCell from lower layers while T310 is running, the UE shall:

1> stop timer T310;
1> stop timer T312, if running;

NOTE 1: In this case, the UE maintains the RRC connection without explicit signalling, i.e. the UE maintains the entire radio resource configuration.

NOTE 2: Periods in time where neither "in-sync" nor "out-of-sync" is reported by layer 1 do not affect the evaluation of the number of consecutive "in-sync" or "out-of-sync" indications.

Upon receiving N314 consecutive "in-sync" indications for the PSCell from lower layers while T313 is running, the UE shall:

1> stop timer T313;
5.3.11.2a Recovery of early detection of physical layer problems

Upon receiving N311 consecutive “in-sync” indications for the PCell from lower layers while T314 is running, the UE shall:

1> stop timer T314;

5.3.11.2b Cancellation of physical layer improvements in RRC_CONNECTED

Upon receiving N311 consecutive “in-sync” indications for the PCell from lower layers while T315 is running, the UE shall:

1> stop timer T315;

5.3.11.3 Detection of radio link failure

The UE shall:

1> upon T310 expiry; or
1> upon T312 expiry; or
1> upon random access problem indication from MCG MAC while neither T300, T301, T304 nor T311 is running; or
1> upon indication from MCG RLC, which is allowed to be send on PCell, that the maximum number of retransmissions has been reached for an SRB or DRB:

2> consider radio link failure to be detected for the MCG i.e. RLF;
2> except for NB-IoT, store the following radio link failure information in the VarRLF-Report by setting its fields as follows:

3> clear the information included in VarRLF-Report, if any;
3> set the plmn-IdentityList to include the list of EPLMNs stored by the UE (i.e. includes the RPLMN);
3> set the_measResultLastServCell to include the RSRP and RSRQ, if available, of the PCell based on measurements collected up to the moment the UE detected radio link failure;
3> set the_measResultNeighCells to include the best measured cells, other than the PCell, ordered such that the best cell is listed first, and based on measurements collected up to the moment the UE detected radio link failure, and set its fields as follows;

4> if the UE was configured to perform measurements for one or more EUTRA frequencies, include the measResultListEUTRA;
4> if the UE was configured to perform measurement reporting for one or more neighbouring UTRA frequencies, include the measResultListUTRA;
4> if the UE was configured to perform measurement reporting for one or more neighbouring GERAN frequencies, include the measResultListGERAN;
4> if the UE was configured to perform measurement reporting for one or more neighbouring CDMA2000 frequencies, include the measResultsCDMA2000;
4> for each neighbour cell included, include the optional fields that are available;

NOTE 1: The measured quantities are filtered by the L3 filter as configured in the mobility measurement configuration. The measurements are based on the time domain measurement resource restriction, if configured. Blacklisted cells are not required to be reported.

3> if available, set the logMeasResultListWLAN to include the WLAN measurement results, in order of decreasing RSSI for WLAN APs;
if available, set the `logMeasResultListBT` to include the Bluetooth measurement results, in order of decreasing RSSI for Bluetooth beacons;

if detailed location information is available, set the content of the `locationInfo` as follows:

- include the `locationCoordinates`;
- include the `horizontalVelocity`, if available;

set the `failedPCellId` to the global cell identity, if available, and otherwise to the physical cell identity and carrier frequency of the PCell where radio link failure is detected;

set the `tac-FailedPCell` to the tracking area code, if available, of the PCell where radio link failure is detected;

if an `RRCConnectionReconfiguration` message including the `mobilityControlInfo` was received before the connection failure:

- if the last `RRCConnectionReconfiguration` message including the `mobilityControlInfo` concerned an intra E-UTRA handover:
  - include the `previousPCellId` and set it to the global cell identity of the PCell where the last `RRCConnectionReconfiguration` message including `mobilityControlInfo` was received;
  - set the `timeConnFailure` to the elapsed time since reception of the last `RRCConnectionReconfiguration` message including `mobilityControlInfo`;

- if the last `RRCConnectionReconfiguration` message including the `mobilityControlInfo` concerned a handover to E-UTRA from UTRA and if the UE supports Radio Link Failure Report for Inter-RAT MRO:
  - include the `previousUTRA-CellId` and set it to the physical cell identity, the carrier frequency and the global cell identity, if available, of the UTRA Cell in which the last `RRCConnectionReconfiguration` message including `mobilityControlInfo` was received;
  - set the `timeConnFailure` to the elapsed time since reception of the last `RRCConnectionReconfiguration` message including `mobilityControlInfo`;

- if the UE supports QCI1 indication in Radio Link Failure Report and has a DRB for which QCI is 1:
  - include the `drb-EstablishedWithQCI-1`;

- set the `connectionFailureType` to `rlf`;

- set the `c-RNTI` to the C-RNTI used in the PCell;

- set the `rlf-Cause` to the trigger for detecting radio link failure;

if AS security has not been activated:

- if the UE is a NB-IoT UE:
  - if the UE supports RRC connection re-establishment for the Control Plane CIoT EPS optimisation:
    - initiate the RRC connection re-establishment procedure as specified in 5.3.7;
  - else:
    - perform the actions upon leaving `RRC_CONNECTED` as specified in 5.3.12, with release cause 'RRC connection failure';

- else:
  - perform the actions upon leaving `RRC_CONNECTED` as specified in 5.3.12, with release cause 'other';

else:
3> initiate the connection re-establishment procedure as specified in 5.3.7;

In case of DC, the UE shall:

1> upon T313 expiry; or
1> upon random access problem indication from SCG MAC; or
1> upon indication from SCG RLC, which is allowed to be sent on PSCell, that the maximum number of retransmissions has been reached:

2> consider radio link failure to be detected for the SCG i.e. SCG-RLF;
2> initiate the SCG failure information procedure as specified in 5.6.13 to report SCG radio link failure;

In case of CA PDCP duplication, the UE shall:

1> upon indication from an RLC entity, which is restricted to be sent on SCell only, that the maximum number of retransmissions has been reached:

2> consider radio link failure to be detected for the RLC entity;
2> initiate the failure information procedure as specified in 5.6.21 to report PDCP duplication failure;

The UE may discard the radio link failure information, i.e. release the UE variable VarRLF-Report, 48 hours after the radio link failure is detected, upon power off or upon detach.

5.3.11.3a Detection of early-out-of-sync event

The UE shall:

1> upon T314 expiry;

2> consider “early-out-of-sync” event to be detected and initiate transmission of the UEAssistanceInformation message in accordance with 5.6.10;

5.3.11.3b Detection of early-in-sync event

The UE shall:

1> upon T315 expiry;

2> consider “early-in-sync” event to be detected and initiate transmission of the UEAssistanceInformation message in accordance with 5.6.10;

5.3.12 UE actions upon leaving RRC_CONNECTED or RRC_INACTIVE

Upon entering RRC_IDLE, the UE shall:

1> reset MAC;
1> stop all timers that are running except T320, T322, T325, T330;
1> if leaving RRC_CONNECTED was triggered by suspension of the RRC:

2> re-establish RLC entities for all SRBs and DRBs, including RBs configured with NR PDCP;
2> store the UE AS Context including the current RRC configuration, the current security context, the PDCP state including ROHC state, C-RNTI used in the source PCell, the cellIdentity and the physical cell identity of the source PCell;
2> store the following information provided by E-UTRAN:

3> the resumIdentity;
3> the nextHopChainingCount, if present;
Upon receiving a PUCCH release request from lower layers, for an indicated serving cell the UE shall:

1. apply the default physical channel configuration for cqi-ReportConfig for the indicated serving cell as specified in 9.2.4 and release cqi-ReportConfigSCell, for each SCell that sends HARQ feedback on the indicated serving cell, if any;

1. apply the default physical channel configuration for schedulingRequestConfig as specified in 9.2.4, for the concerned CG;

Upon receiving a sPUCCH release request from lower layers, the UE shall:

1. for each serving cell in the UE configuration:

2. apply the value release to the field schedulingRequest-SPUCCH;
Upon receiving an SRS release request from lower layers, for an indicated serving cell the UE shall:

1> apply the default physical channel configuration for $soundingRS-UL-ConfigDedicated$, as specified in 9.2.4;

NOTE: Upon PUCCH/ SRS release request, the UE does not modify the $soundingRS-UL-ConfigDedicatedAperiodic$ i.e. it does not apply the default for this field (release).

5.3.13a UE actions upon SR release request for NB-IoT

Upon receiving a SR release request from lower layers, the UE shall:

1> apply the value FALSE for $sr$-WithHARQ-ACK-Config and release $sr$-WithHARQ-ACK-Config, if configured;

1> apply the value release for $sr$-WithoutHARQ-ACK-Config and release $sr$-WithoutHARQ-ACK-Config, if configured;

1> apply the value release for $sr$-SPS-BSR-Config and release $sr$-SPS-BSR-Config, if configured;

5.3.14 Proximity indication

5.3.14.1 General

![Diagram of RRC connection reconfiguration and ProximityIndication message exchange](attachment:proximity_diagram.png)

**Figure 5.3.14.1-1: Proximity indication**

The purpose of this procedure is to indicate that the UE is entering or leaving the proximity of one or more CSG member cells. The detection of proximity is based on an autonomous search function as defined in TS 36.304 [4].

5.3.14.2 Initiation

A UE in RRC_CONNECTED shall:

1> if the UE enters the proximity of one or more CSG member cell(s) on an E-UTRA frequency while proximity indication is enabled for such E-UTRA cells; or

1> if the UE enters the proximity of one or more CSG member cell(s) on a UTRA frequency while proximity indication is enabled for such UTRA cells; or

1> if the UE leaves the proximity of all CSG member cell(s) on an E-UTRA frequency while proximity indication is enabled for such E-UTRA cells; or

1> if the UE leaves the proximity of all CSG member cell(s) on a UTRA frequency while proximity indication is enabled for such UTRA cells:

2> if the UE has previously not transmitted a $ProximityIndication$ for the RAT and frequency during the current RRC connection, or if more than 5 s has elapsed since the UE has last transmitted a $ProximityIndication$ (either entering or leaving) for the RAT and frequency:

3> initiate transmission of the $ProximityIndication$ message in accordance with 5.3.14.3;

NOTE: In the conditions above, “if the UE enters the proximity of one or more CSG member cell(s)” includes the case of already being in the proximity of such cell(s) at the time proximity indication for the corresponding RAT is enabled.
5.3.14.3 Actions related to transmission of ProximityIndication message

The UE shall set the contents of ProximityIndication message as follows:

1> if the UE applies the procedure to report entering the proximity of CSG member cell(s):
   2> set type to entering;

1> else if the UE applies the procedure to report leaving the proximity of CSG member cell(s):
   2> set type to leaving;

1> if the proximity indication was triggered for one or more CSG member cell(s) on an E-UTRA frequency:
   2> set the carrierFreq to eutra with the value set to the E-ARFCN value of the E-UTRA cell(s) for which proximity indication was triggered;

1> else if the proximity indication was triggered for one or more CSG member cell(s) on a UTRA frequency:
   2> set the carrierFreq to utra with the value set to the ARFCN value of the UTRA cell(s) for which proximity indication was triggered;

The UE shall submit the ProximityIndication message to lower layers for transmission.

5.3.15 Void

5.3.16 Unified Access Control

5.3.16.1 General

The purpose of this procedure is to perform access barring check for an access attempt associated with a given Access Category and one or more Access Identities upon request from upper layers according to TS 24.501 [95] or the RRC layer.

5.3.16.2 Initiation

Upon initiation of the procedure, the UE shall:

1> if T309 is running for the Access Category:
   2> consider the access attempt as barred;

1> if timer T302 is running and the Access Category is neither ’2’ nor ’0’:
   2> consider the access attempt as barred;

1> else:
   2> if the Access Category is ’0’:
      3> consider the access attempt as allowed;
   2> else if SystemInformationBlockType25 is not broadcasted:
      3> consider the access attempt as allowed;
   2> else:
      3> if SystemInformationBlockType25 includes uac-BarringPerPLMN-List and the uac-BarringPerPLMN-List contains an UAC-BarringPerPLMN entry with the plmn-IdentityIndex corresponding to the PLMN selected by upper layers (see TS 24.501 [95]):
         4> select the UAC-BarringPerPLMN entry with the plmn-IdentityIndex corresponding to the PLMN selected by upper layers;
in the remainder of this procedure, use the selected **UAC-BarringPerPLMN** entry (i.e. presence or absence of access barring parameters in this entry) irrespective of the **uac-BarringForCommon** included in **SystemInformationBlockType25**;

else if **SystemInformationBlockType25** includes **uac-BarringForCommon**:

in the remainder of this procedure use the **uac-BarringForCommon** (i.e. presence or absence of these parameters) included in **SystemInformationBlockType25**;

else:

consider the access attempt as allowed;

else if **uac-BarringForCommon** is applicable or the **uac-AC-BarringListType** indicated that **uac-ExplicitAC-BarringList** is used:

if the corresponding **UAC-BarringPerCatList** contains a **UAC-BarringPerCat** entry corresponding to the Access Category:

select the **UAC-BarringPerCat** entry;

if the **uac-BarringInfoSetList** contain a **UAC-BarringInfoSet** entry corresponding to the **uac-barringInfoSetIndex** in the **UAC-BarringPerCat**:

select the **UAC-BarringInfoSet** entry;

perform access barring check for the Access Category as specified in 5.3.16.5, using the **UAC-BarringInfoSet** as "UAC barring parameter";

else:

consider the access attempt as allowed;

else:

consider the access attempt as allowed;

else if the **uac-AC-BarringListType** indicated that **uac-ImplicitAC-BarringList** is used:

if the **uac-BarringInfoSetList** contain a **UAC-BarringInfoSet** entry corresponding to the **uac-barringInfoSetIndex** in the **UAC-BarringPerCat**:

select the **UAC-BarringInfoSet** entry;

perform access barring check for the Access Category as specified in 5.3.16.5, using the **UAC-BarringInfoSet** as "UAC barring parameter";

else:

consider the access attempt as allowed;

else:

consider the access attempt as allowed;

else:

consider the access attempt as allowed;

if the access barring check was requested by RRC for an RRC establishment or for an RRC resumption requested by upper layers; or

if the access barring check was requested by upper layers:

if the access attempt is considered as barred:

inform upper layers that the access attempt for the Access Category is barred, upon which the procedure ends;

else:
inform upper layers that the access attempt for the Access Category is allowed, upon which the procedure ends;
else:
the procedure ends;

5.3.16.3 Conditions for stopping of barring timers T309

The UE shall:
if cell reselection occurs; or
if cell selection occurs; or
if a state change to RRC_CONNECTED occurs; or
if a change of PCell occurs while in RRC_CONNECTED; or
upon reception of a MobilityFromEUTRACCommand message:
if T309 is running:
stop timer T309 for all access categories;
perform the actions as specified in 5.3.16.4.

5.3.16.4 Barring alleviation

The UE shall:
if timer T302 expires or is stopped, and if timer T309 corresponding to an Access Category is not running; or
if timer T309 corresponding to an Access Category expires or is stopped, and if timer T302 is not running:
consider the barring for this Access Category to be alleviated;
When barring for an access category is considered being alleviated:
if the Access Category was provided upon access barring check requested by upper layers:
inform upper layers about barring alleviation for the Access Category;

5.3.16.5 Access barring check

The UE shall:
if one or more Access Identities are indicated by upper layers according to TS 24.501 [95] or obtained by the RRC layer, and
if for at least one of these Access Identities the corresponding bit in the uac-BarringForAccessIdentity contained in "UAC barring parameter" is set to zero:
consider the access attempt as allowed;
else:
draw a random number \( \text{rand} \) uniformly distributed in the range: \( 0 \leq \text{rand} < 1 \);
if \( \text{rand} \) is lower than the value indicated by uac-BarringFactor included in "UAC barring parameter":
consider the access attempt as allowed;
else:
consider the access attempt as barred;
if the access attempt is considered as barred:
2> draw a random number \( \text{rand} \) that is uniformly distributed in the range \( 0 \leq \text{rand} < 1 \);

2> start timer T309 for the Access Category with the timer value calculated as follows, using the \( uac\text{-BarringTime} \) included in "AC barring parameter";

\[ \text{Tbarring} = (0.7 + 0.6 \times \text{rand}) \times uac\text{-BarringTime} \]

5.3.17 RAN notification area update

5.3.17.1 General

The purpose of this procedure is:

- to notify the network that a UE in RRC_INACTIVE has re-selected to a cell not belonging to the configured RAN notification area; or

- to periodically notify the network by a UE in RRC_INACTIVE;

5.3.17.2 Initiation

In RRC_INACTIVE state, the UE shall:

1> if T380 expires, or:

1> if upon cell reselection the UE enters an RNA not belonging to the configured \( \text{ran-NotificationAreaInfo} \):

2> if upper layers request resumption of an RRC connection;

3> initiate RRC connection resume procedure in 5.3.3 with cause value set in accordance with the information received from upper layers;

2> else:

3> initiate RRC connection resume procedure in 5.3.3 with cause value set to 'rna-Update';

Editor's note: FFS How to handle simultaneous NAS triggered events and AS triggered events (except TAU and RNAU, which has been explicitly agreed).

1> if barring is alleviated for Access Category [the standardised RAN specific access category], as specified in 5.3.16.4:

Editor's Note: Which value to use for the standardised RAN specific access category needs to be confirmed by SA1.

2> if upper layers do not request RRC the resumption of an RRC connection, and

2> if the variable \( \text{pendingRnaUpdate} \) is set to 'TRUE':

3> set the variable \( \text{pendingRnaUpdate} \) to 'FALSE';

3> initiate RRC connection resume procedure in 5.3.3 with cause value set to 'rna-Update';

5.4 Inter-RAT mobility

5.4.1 Introduction

The general principles of connected mode mobility are described in 5.3.1.3. The general principles of the security handling upon connected mode mobility are described in 5.3.1.2.

For the (network controlled) inter RAT mobility from E-UTRA for a UE in RRC_CONNECTED, a single procedure is defined that supports both handover, cell change order with optional network assistance (NACC) and enhanced CS fallback to CDMA2000 1xRTT. In case of mobility to CDMA2000, the eNB decides when to move to the other RAT while the target RAT determines to which cell the UE shall move.
5.4.2 Handover to E-UTRA

5.4.2.1 General

The purpose of this procedure is to, under the control of the network, transfer a connection between the UE and another Radio Access Network (e.g. GERAN, UTRAN or NR) to E-UTRAN, or transfer a connection between the UE and the E-UTRAN with one type of CN to the E-UTRAN with a different type of CN.

The handover to E-UTRA procedure applies when SRBs, possibly in combination with DRBs, are established in another RAT or in E-UTRA connected to another type of CN. Handover from UTRAN to E-UTRAN applies only after integrity has been activated in UTRAN.

5.4.2.2 Initiation

The RAN using another RAT or the E-UTRA connected to a different type of CN initiates the handover to E-UTRA procedure, in accordance with the specifications applicable for the other RAT or for the E-UTRA connected to a different type of CN, by sending the **RRCConnectionReconfiguration** message via the radio access technology from which the inter-RAT handover is performed.

E-UTRAN applies the procedure as follows:

- to activate ciphering, possibly using NULL algorithm, if not yet activated in the other RAT or in the E-UTRA connected to a different type of CN;
- to establish SRB1, SRB2 and one or more DRBs, i.e. at least the DRB associated with the default EPS bearer is established if the target CN is EPC and at least one DRB if the target CN is 5GC.

5.4.2.3 Reception of the **RRCConnectionReconfiguration** by the UE

If the UE is able to comply with the configuration included in the **RRCConnectionReconfiguration** message, the UE shall:

1> if the **RRCConnectionReconfiguration** message includes the **fullConfig**:

2> start timer T304 with the timer value set to t304, as included in the **mobilityControlInfo**;
2> release/ clear all current dedicated radio configurations except the MCG C-RNTI, the MCG/MN security configurations;

Editor's note: It is FFS on how to handle the MCG/MN security configuration since the UE will have MCG security configuration and for 5GC, UE will have a security configuration associated with master key.

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like **MeasConfig** and **OtherConfig**.

2> release/ clear all current common radio configurations;
2> for each **srb-Identity** value included in the **srb-ToAddModList** (SRB reconfiguration):

3> apply the specified configuration defined in 9.1.2 for the corresponding SRB;
apply the corresponding default RLC configuration for the SRB specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;

apply the corresponding default logical channel configuration for the SRB as specified in 9.2.1.1 for SRB1 or in 9.2.1.2 for SRB2;

if the `handoverType` in `securityConfigHO` is set to `ngc-ToEPC`:

release the NR PDCP entity of this SRB and establish it with an E-UTRA PDCP entity and with the received security configuration;

associate the RLC bearer of this SRB with the established PDCP entity;

if the `handoverType` in `securityConfigHO` is set to `epc-ToNGC`:

release the E-UTRA PDCP entity of this SRB and establish it with an NR PDCP entity and with the received security configuration;

associate the RLC bearer of this SRB with the established PDCP entity;

NOTE 2: This is to get SRB1 and SRB2 to a known state from which the reconfiguration message can do further configuration.

apply the default physical channel configuration as specified in 9.2.4;

apply the default semi-persistent scheduling configuration as specified in 9.2.3;

apply the default MAC main configuration as specified in 9.2.2;

start timer T304 with the timer value set to \( t_{304} \), as included in the `mobilityControlInfo`, if not previously started;

consider the target PCell to be one on the frequency indicated by the `carrierFreq` with a physical cell identity indicated by the `targetPhysCellId`;

start synchronising to the DL of the target PCell;

set the C-RNTI to the value of the `newUE-Identity`;

for the target PCell, apply the downlink bandwidth indicated by the `dl-Bandwidth`;

for the target PCell, apply the uplink bandwidth indicated by (the absence or presence of) the `ul-Bandwidth`;

configure lower layers in accordance with the received `radioResourceConfigCommon`;

configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received `mobilityControlInfo`;

perform the radio resource configuration procedure as specified in 5.3.10;

if the `handoverType` in `securityConfigHO` is set to `ngc-ToEPC`:

indicate to higher layer that the CN has changed from 5GC to EPC;

derive the key \( K_{\text{NB}} \) based on the mapped \( K_{\text{ASME}} \) key as specified for interworking between EPS and 5GS in TS 33.501 [86];

store the `nextHopChainingCount-r15` value;

else if the `handoverType` in `securityConfigHO` is set to `intraNGC`:

if the `keyChangeIndicator-r15` received in the `securityConfigHO` is set to `TRUE`:

forward `nas-Container` to the upper layers, if included;

update the \( K_{\text{NB}} \) key based on the \( K_{\text{AMF}} \) key, as specified in TS 33.501 [86];

else:
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3> update the KeNB key based on the current KeNB or the NH, using the nextHopChainingCount-r15 value indicated in the SecurityConfigHO, as specified in TS 33.501 [86];

2> update the Key KeNB based on the current key K_{NB} or the NH, using the nextHopChainingCount-r15 value indicated in the securityConfigHO, as specified in TS 33.501 [86];

2> store the nextHopChainingCount-r15 value;

1> else if the handoverType in securityConfigHO is set to epc-ToNGC:

2> forward the nas-Container to the upper layers

2> derive the KeNB key, as specified in TS 33.501 [86];

1> else:

2> forward the nas-SecurityParamToEUTRA to the upper layers;

2> derive the KeNB key, as specified in TS 33.401 [32];

1> else if the handoverType in securityConfigHO is set to intra-5GC or if the handoverType-v1530 is not present:

2> configure lower layers to apply the indicated integrity protection algorithm and the KRRCint key immediately, i.e. the indicated integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

2> configure lower layers to apply the indicated ciphering algorithm, the KRRCenc key and the KUPenc key immediately, i.e. the indicated ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> if the received RRCConnectionReconfiguration includes the nr-RadioBearerConfig1:

2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6];

1> if the received RRCConnectionReconfiguration includes the nr-RadioBearerConfig2:

2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6].

1> if the handoverType in securityConfigHO is not set to intra5GC or if the handoverType-v1530 is not present:

2> configure lower layers to apply the indicated integrity protection algorithm and the KRRCint key immediately, i.e. the indicated integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

2> configure lower layers to apply the indicated ciphering algorithm, the KRRCenc key and the KUPenc key immediately, i.e. the indicated ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> if the received RRCConnectionReconfiguration includes the sCellToAddModList:

2> perform SCell addition as specified in 5.3.10.3b;

1> if the RRCConnectionReconfiguration message includes the measConfig:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

1> if the RRCConnectionReconfiguration message includes the otherConfig:

2> perform the other configuration procedure as specified in 5.3.10.9;

1> if the RRCConnectionReconfiguration message includes wlan-OffloadInfo:

2> perform the dedicated WLAN offload configuration procedure as specified in 5.6.12.2;

1> if the RRCConnectionReconfiguration message includes rclwi-Configuration:

2> perform the WLAN traffic steering command procedure as specified in 5.6.16.2;

1> if the RRCConnectionReconfiguration message includes lwa-Configuration:
2> perform the LWA configuration procedure as specified in 5.6.14.2;
1> if the **RRCConnectionReconfiguration** message includes **lwip-Configuration**:
2> perform the LWIP reconfiguration procedure as specified in 5.6.17.2;
1> set the content of **RRCConnectionReconfigurationComplete** message as follows:
2> if the UE has radio link failure or handover failure information available in **VarRLF-Report** and if the RPLMN is included in **plmn-IdentityList** stored in **VarRLF-Report**:
3> include **rlf-InfoAvailable**;
2> if the UE has MBSFN logged measurements available for E-UTRA and if the RPLMN is included in **plmn-IdentityList** stored in **VarLogMeasReport** and if T330 is not running:
3> include **logMeasAvailableMBSFN**;
2> else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in **plmn-IdentityList** stored in **VarLogMeasReport**:
3> include **logMeasAvailable**;
2> if the UE has Bluetooth logged measurements available and if the RPLMN is included in **plmn-IdentityList** stored in **VarLogMeasReport**:
3> include **logMeasAvailableBT**;
2> if the UE has WLAN logged measurements available and if the RPLMN is included in **plmn-IdentityList** stored in **VarLogMeasReport**:
3> include **logMeasAvailableWLAN**;
2> if the UE has connection establishment failure information available in **VarConnEstFailReport** and if the RPLMN is equal to **plmn-Identity** stored in **VarConnEstFailReport**:
3> include **connEstFailInfoAvailable**;
1> submit the **RRCConnectionReconfigurationComplete** message to lower layers for transmission using the new configuration;
1> if the **RRCConnectionReconfiguration** message does not include **rlf-TimersAndConstants** set to **setup**:
2> use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;
1> if MAC successfully completes the random access procedure:
2> stop timer T304;
2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target PCell, if any;
2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target PCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target PCell;

**NOTE 1:** Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

2> enter E-UTRA RRC_CONNECTED, upon which the procedure ends;

**NOTE 2:** The UE is not required to determine the SFN of the target PCell by acquiring system information from that cell before performing RACH access in the target PCell.

### 5.4.2.4 Reconfiguration failure

The UE shall:
if the UE is unable to comply with (part of) the configuration included in the \textit{RRCConnectionReconfiguration} message:

2> if the source RAT is E-UTRA:

3> perform the actions defined in intra-RAT handover failure procedure as specified in 5.3.5.5;

2> else:

3> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

\textbf{NOTE 1:} The UE may apply above failure handling also in case the \textit{RRCConnectionReconfiguration} message causes a protocol error for which the generic error handling as defined in 5.7 specifies that the UE shall ignore the message.

\textbf{NOTE 2:} If the UE is unable to comply with part of the configuration, it does not apply any part of the configuration, i.e. there is no partial success/failure.

\subsection*{5.4.2.5 T304 expiry (handover to E-UTRA failure)}

The UE shall:

1> upon T304 expiry (handover to E-UTRA failure):

2> if the source RAT is E-UTRA:

3> perform the actions defined in intra-RAT handover failure procedure as specified in 5.3.5.6;

2> else:

3> reset MAC;

3> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

\subsection{5.4.3 Mobility from E-UTRA}

\subsection*{5.4.3.1 General}

\begin{figure}[h]
\centering
\includegraphics[width=0.8\textwidth]{figure5.4.3.1-1.png}
\caption{Mobility from E-UTRA, successful}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=0.8\textwidth]{figure5.4.3.1-2.png}
\caption{Mobility from E-UTRA, failure}
\end{figure}
The purpose of this procedure is to move a UE in RRC_CONNECTED to a cell using another Radio Access Technology (RAT), e.g. GERAN, UTRA, CDMA2000 systems or NR. The mobility from E-UTRA procedure covers the following type of mobility:

- handover, i.e. the MobilityFromEUTRACommand message includes radio resources that have been allocated for the UE in the target cell;

- cell change order, i.e. the MobilityFromEUTRACommand message may include information facilitating access of and/or connection establishment in the target cell, e.g. system information. Cell change order is applicable only to GERAN; and

- enhanced CS fallback to CDMA2000 1xRTT, i.e. the MobilityFromEUTRACommand message includes radio resources that have been allocated for the UE in the target cell. The enhanced CS fallback to CDMA2000 1xRTT may be combined with concurrent handover or redirection to CDMA2000 HRPD.

NOTE: For the case of dual receiver/transmitter enhanced CS fallback to CDMA2000 1xRTT, the DLInformationTransfer message is used instead of the MobilityFromEUTRACommand message (see TS 36.300 [9]).

5.4.3.2 Initiation

E-UTRAN initiates the mobility from E-UTRA procedure to a UE in RRC_CONNECTED, possibly in response to a MeasurementReport message or in response to reception of CS fallback indication for the UE from MME, by sending a MobilityFromEUTRACommand message. E-UTRAN applies the procedure as follows:

- the procedure is initiated only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;

5.4.3.3 Reception of the MobilityFromEUTRACommand by the UE

The UE shall be able to receive a MobilityFromEUTRACommand message and perform a cell change order to GERAN, even if no prior UE measurements have been performed on the target cell.

The UE shall:

1> stop timer T310, if running;
1> stop timer T312, if running;
1> if the MobilityFromEUTRACommand message includes the purpose set to handover:

2> if the targetRAT-Type is set toutra or geran:

3> consider inter-RAT mobility as initiated towards the RAT indicated by the targetRAT-Type included in the MobilityFromEUTRACommand message;
3> forward the nas-SecurityParamFromEUTRA to the upper layers;
3> access the target cell indicated in the inter-RAT message in accordance with the specifications of the target RAT;
3> if the targetRAT-Type is set to geran:

4> use the contents of systemInformation, if provided for PS Handover, as the system information to begin access on the target GERAN cell;

NOTE 1: If there are DRBs for which no radio bearers are established in the target RAT as indicated in the targetRAT-MessageContainer in the message, the E-UTRA RRC part of the UE does not indicate the release of the concerned DRBs to the upper layers. Upper layers may derive which bearers are not established from information received from the AS of the target RAT.

NOTE 2: In case of SR-VCC, the DRB to be replaced is specified in [61].

2> else if the targetRAT-Type is set to eutra:

3> consider inter-system mobility as initiated towards E-UTRA;
3> access the target cell indicated in the inter-RAT message in accordance with section 5.4.2.3;

2> else if the targetRAT-Type is set to nr:
3> consider inter-RAT mobility as initiated towards NR;
3> forward the nas-SecurityParamFromEUTRA to the upper layers, if included;
3> access the target cell indicated in the inter-RAT message in accordance with the specifications in TS 38.331 [82];

2> else if the targetRAT-Type is set to cdma2000-1XRTT or cdma2000-HRPD:
3> forward the targetRAT-Type and the targetRAT-MessageContainer to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specifications of the CDMA2000 target-RAT;

1> else if the MobilityFromEUTRACCommand message includes the purpose set to cellChangeOrder:
2> start timer T304 with the timer value set to t304, as included in the MobilityFromEUTRACCommand message;
2> if the targetRAT-Type is set to geran:
3> if networkControlOrder is included in the MobilityFromEUTRACCommand message:
4> apply the value as specified in TS 44.060 [36];
3> else:
4> acquire networkControlOrder and apply the value as specified in TS 44.060 [36];
3> use the contents of systemInformation, if provided, as the system information to begin access on the target GERAN cell;
2> establish the connection to the target cell indicated in the CellChangeOrder;

NOTE 3: The criteria for success or failure of the cell change order to GERAN are specified in TS 44.060[36].

1> if the MobilityFromEUTRACCommand message includes the purpose set to e-CSFB:
2> if messageContCDMA2000-1XRTT is present:
3> forward the messageContCDMA2000-1XRTT to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specification of the target RAT;
2> if mobilityCDMA2000-HRPD is present and is set to handover:
3> forward the messageContCDMA2000-HRPD to the CDMA2000 upper layers for the UE to access the cell(s) indicated in the inter-RAT message in accordance with the specification of the target RAT;
2> if mobilityCDMA2000-HRPD is present and is set to redirection:
3> forward the redirectCarrierCDMA2000-HRPD to the CDMA2000 upper layers;

NOTE 4: When the CDMA2000 upper layers in the UE receive both the messageContCDMA2000-1XRTT and messageContCDMA2000-HRPD the UE performs concurrent access to both CDMA2000 1xRTT and CDMA2000 HRPD RAT.

NOTE 5: The UE should perform the handover, the cell change order or enhanced 1xRTT CS fallback as soon as possible following the reception of the RRC message MobilityFromEUTRACCommand, which could be before confirming successful reception (HARQ and ARQ) of this message.

5.4.3.4 Successful completion of the mobility from E-UTRA

Upon successfully completing the handover, the cell change order or enhanced 1xRTT CS fallback, the UE shall:

1> if the targetRAT-Type in the received MobilityFromEUTRACCommand is set to eutra or nr:
the procedure ends;

else:

perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause ‘other’;

NOTE: If the UE performs enhanced 1xRTT CS fallback along with concurrent mobility to CDMA2000 HRPD and the connection to either CDMA2000 1xRTT or CDMA2000 HRPD succeeds, then the mobility from E-UTRA is considered successful.

5.4.3.5 Mobility from E-UTRA failure

The UE shall:

if T304 configured in the MobilityFromEUTRACommand message expires (mobility from E-UTRA failure); or

if the UE does not succeed in establishing the connection to the target radio access technology; or

if the UE is unable to comply with (part of) the configuration included in the MobilityFromEUTRACommand message; or

if there is a protocol error in the inter RAT information included in the MobilityFromEUTRACommand message, causing the UE to fail the procedure according to the specifications applicable for the target RAT (i.e. according to sub-clause 5.3.5.6 if the targetRAT-Type in the received MobilityFromEUTRACommand is set to eutra):

stop T304, if running;

if the cs-FallbackIndicator in the MobilityFromEUTRACommand message was set to TRUE or e-CSFB was present:

indicate to upper layers that the CS fallback procedure has failed;

revert back to the configuration used in the source PCell, excluding the configuration configured by the physicalConfigDedicated, mac-MainConfig and sps-Config;

initiate the connection re-establishment procedure as specified in 5.3.7;

NOTE: For enhanced CS fallback to CDMA2000 1xRTT, the above UE behavior applies only when the UE is attempting the enhanced 1xRTT CS fallback and connection to the target radio access technology fails or if the UE is attempting enhanced 1xRTT CS fallback along with concurrent mobility to CDMA2000 HRPD and connection to both the target radio access technologies fails.

5.4.4 Handover from E-UTRA preparation request (CDMA2000)

5.4.4.1 General

The purpose of this procedure is to trigger the UE to prepare for handover or enhanced 1xRTT CS fallback to CDMA2000 by requesting a connection with this network. The UE may use this procedure to concurrently prepare for handover to CDMA2000 HRPD along with preparation for enhanced CS fallback to CDMA2000 1xRTT. This procedure applies to CDMA2000 capable UEs only.

This procedure is also used to trigger the UE which supports dual Rx/Tx enhanced 1xCSFB to redirect its second radio to CDMA2000 1xRTT.

The handover from E-UTRA preparation request procedure applies when signalling radio bearers are established.
5.4.4.2 Initiation

E-UTRAN initiates the handover from E-UTRA preparation request procedure to a UE in RRC_CONNECTED, possibly in response to a MeasurementReport message or CS fallback indication for the UE, by sending a HandoverFromEUTRAPreparationRequest message. E-UTRA initiates the procedure only when AS security has been activated.

5.4.4.3 Reception of the HandoverFromEUTRAPreparationRequest by the UE

Upon reception of the HandoverFromEUTRAPreparationRequest message, the UE shall:

1. if dualRxTxRedirectIndicator is present in the received message:
   2. forward dualRxTxRedirectIndicator to the CDMA2000 upper layers;
   2. forward redirectCarrierCDMA2000-1XRTT to the CDMA2000 upper layers, if included;
1. else:
   2. indicate the request to prepare handover or enhanced 1xRTT CS fallback and forward the cdma2000-Type to the CDMA2000 upper layers;
   2. if cdma2000-Type is set to type1XRTT:
      3. forward the rand and the mobilityParameters to the CDMA2000 upper layers;
   2. if concurrPrepCDMA2000-HRPD is present in the received message:
      3. forward concurrPrepCDMA2000-HRPD to the CDMA2000 upper layers;
   2. else:
      3. forward concurrPrepCDMA2000-HRPD, with its value set to FALSE, to the CDMA2000 upper layers;

5.4.5 UL handover preparation transfer (CDMA2000)

5.4.5.1 General

![Figure 5.4.5.1-1: UL handover preparation transfer](image)

The purpose of this procedure is to tunnel the handover related CDMA2000 dedicated information or enhanced 1xRTT CS fallback related CDMA2000 dedicated information from UE to E-UTRAN when requested by the higher layers. The procedure is triggered by the higher layers on receipt of HandoverFromEUTRAPreparationRequest message. If preparing for enhanced CS fallback to CDMA2000 1xRTT and handover to CDMA2000 HRPD, the UE sends two consecutive ULHandoverPreparationTransfer messages to E-UTRAN, one per addressed CDMA2000 RAT Type. This procedure applies to CDMA2000 capable UEs only.

5.4.5.2 Initiation

A UE in RRC_CONNECTED initiates the UL handover preparation transfer procedure whenever there is a need to transfer handover or enhanced 1xRTT CS fallback related non-3GPP dedicated information. The UE initiates the UL handover preparation transfer procedure by sending the ULHandoverPreparationTransfer message.
5.4.5.3 Actions related to transmission of the ULHandoverPreparationTransfer message

The UE shall set the contents of the ULHandoverPreparationTransfer message as follows:

1> include the cdma2000-Type and the dedicatedInfo;

1> if the cdma2000-Type is set to typeIXRTT:

2> include the meid and set it to the value received from the CDMA2000 upper layers;

1> submit the ULHandoverPreparationTransfer message to lower layers for transmission, upon which the procedure ends;

5.4.5.4 Failure to deliver the ULHandoverPreparationTransfer message

The UE shall:

1> if the UE is unable to guarantee successful delivery of ULHandoverPreparationTransfer messages:

2> inform upper layers about the possible failure to deliver the information contained in the concerned ULHandoverPreparationTransfer message;

5.4.6 Inter-RAT cell change order to E-UTRAN

5.4.6.1 General

The purpose of the inter-RAT cell change order to E-UTRAN procedure is to transfer, under the control of the source radio access technology, a connection between the UE and another radio access technology (e.g. GSM/ GPRS) to E-UTRAN.

5.4.6.2 Initiation

The procedure is initiated when a radio access technology other than E-UTRAN, e.g. GSM/GPRS, using procedures specific for that RAT, orders the UE to change to an E-UTRAN cell. In response, upper layers request the establishment of an RRC connection as specified in subclause 5.3.3.

NOTE: Within the message used to order the UE to change to an E-UTRAN cell, the source RAT should specify the identity of the target E-UTRAN cell as specified in the specifications for that RAT.

The UE shall:

1> upon receiving an RRCConnectionSetup message:

2> consider the inter-RAT cell change order procedure to have completed successfully;

5.4.6.3 UE fails to complete an inter-RAT cell change order

If the inter-RAT cell change order fails the UE shall return to the other radio access technology and proceed as specified in the appropriate specifications for that RAT.

The UE shall:

1> upon failure to establish the RRC connection as specified in subclause 5.3.3:

2> consider the inter-RAT cell change order procedure to have failed;

NOTE: The cell change was network ordered. Therefore, failure to change to the target PCell should not cause the UE to move to UE-controlled cell selection.
5.5 Measurements

5.5.1 Introduction

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the RRCConnectionReconfiguration or RRCConnectionResume message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency(ies) of the serving cell(s).
- Inter-frequency measurements: measurements at frequencies that differ from any of the downlink carrier frequency(ies) of the serving cell(s).
- Inter-RAT measurements of NR frequencies.
- Inter-RAT measurements of UTRA frequencies.
- Inter-RAT measurements of GERAN frequencies.
- Inter-RAT measurements of CDMA2000 HRPD or CDMA2000 1xRTT or WLAN frequencies.
- CBR measurements.
- Sensing measurements.

The measurement configuration includes the following parameters:

1. Measurement objects: The objects on which the UE shall perform the measurements.
   - For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
   - For inter-RAT NR measurements a measurement object is a single NR carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
   - For inter-RAT UTRA measurements a measurement object is a set of cells on a single UTRA carrier frequency.
   - For inter-RAT GERAN measurements a measurement object is a set of GERAN carrier frequencies.
   - For inter-RAT CDMA2000 measurements a measurement object is a set of cells on a single (HRPD or 1xRTT) carrier frequency.
   - For inter-RAT WLAN measurements a measurement object is a set of WLAN identifiers and optionally a set of WLAN frequencies.
   - For CBR measurements and sensing measurements a measurement object is a set of transmission resource pools for V2X sidelink communication.

   NOTE 1: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, PCell UE Rx-Tx time difference, or a pair of cells, e.g. SSTD measurements between the PCell and the PSCell.

2. Reporting configurations: A list of reporting configurations where each reporting configuration consists of the following:
   - Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
   - Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).
3. **Measurement identities**: A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations**: One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity, except for NR where the network may configure up to 2 sets of quantity configurations each comprising per measurement quantity separate filters for cell and RS index measurement results. The quantity configuration set that applies for a given measurement is indicated within the NR measurement object.

5. **Measurement gaps**: Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

E-UTRAN only configures a single measurement object for a given frequency (except for WLAN and except for CBR measurements), i.e. it is not possible to configure two or more measurement objects for the same frequency with different associated parameters, e.g. different offsets and/ or blacklists. E-UTRAN may configure multiple instances of the same event e.g. by configuring two reporting configurations with different thresholds.

The UE maintains a single measurement object list, a single reporting configuration list, and a single measurement identities list. The measurement object list includes measurement objects, that are specified per RAT type, possibly including intra-frequency object(s) (i.e. the object(s) corresponding to the serving frequency(ies)), inter-frequency object(s) and inter-RAT objects. Similarly, the reporting configuration list includes E-UTRA and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

The measurement procedures distinguish the following types of cells:

1. The serving cell(s) - these are the PCell and one or more SCells, if configured for a UE supporting CA or DC. Likewise, NR serving cell(s) are the NR PSCell and SCells, if the UE is configured with EN-DC.
2. Listed cells - these are cells listed within the measurement object(s) or, for inter-RAT WLAN, the WLANs matching the WLAN identifiers configured in the measurement object or the WLAN the UE is connected to.
3. Detected cells - these are cells that are not listed within the measurement object(s) but are detected by the UE on the carrier frequency(ies) indicated by the measurement object(s) or, for inter-RAT WLAN, the WLANs not included in the `measObjectWLAN` but meeting the triggering requirements.

For E-UTRA, the UE measures and reports on the serving cell(s), listed cells, detected cells, transmission resource pools for V2X sidelink communication, and, for RSSI and channel occupancy measurements, the UE measures and reports on any reception on the indicated frequency. For inter-RAT NR, the UE measures and reports on detected cells and, if configured with EN-DC, on NR serving cell(s). For inter-RAT UTRA, the UE measures and reports on listed cells and optionally on cells that are within a range for which reporting is allowed by E-UTRAN. For inter-RAT GERAN, the UE measures and reports on detected cells. For inter-RAT CDMA2000, the UE measures and reports on listed cells. For inter-RAT WLAN, the UE measures and reports on listed cells.

**NOTE 2**: For inter-RAT UTRA and CDMA2000, the UE measures and reports also on detected cells for the purpose of SON.

**NOTE 3**: This specification is based on the assumption that typically CSG cells of home deployment type are not indicated within the neighbour list. Furthermore, the assumption is that for non-home deployments, the physical cell identity is unique within the area of a large macro cell (i.e. as for UTRAN).

Whenever the procedural specification, other than contained in sub-clause 5.5.2, refers to a field it concerns a field included in the `VarMeasConfig` unless explicitly stated otherwise i.e. only the measurement configuration procedure covers the direct UE action related to the received `measConfig`. 
5.5.2 Measurement configuration

5.5.2.1 General

E-UTRAN applies the procedure as follows:

- to ensure that, whenever the UE has a measConfig, it includes a measObject for each LTE serving frequency;
- to configure at most one measurement identity using a reporting configuration with the purpose set to reportCGI;
- for E-UTRA serving frequencies, set the EARFCN within the corresponding measObject according to the band as used for reception/transmission;
- to configure at most one measurement identity using a reporting configuration with ul-DelayConfig;
- to configure at most one measurement identity using a reporting configuration with reportSFTD-Meas;
- to configure at most one MeasObjectNR with the same carrierFreq and subcarrierSpacingSSB;

The UE shall:

1> if the received measConfig includes the measObjectToRemoveList:
   2> perform the measurement object removal procedure as specified in 5.5.2.4;
1> if the received measConfig includes the measObjectToAddModList:
   2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;
1> if the received measConfig includes the reportConfigToRemoveList:
   2> perform the reporting configuration removal procedure as specified in 5.5.2.6;
1> if the received measConfig includes the reportConfigToAddModList:
   2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;
1> if the received measConfig includes the quantityConfig:
   2> perform the quantity configuration procedure as specified in 5.5.2.8;
1> if the received measConfig includes the measIdToRemoveList:
   2> perform the measurement identity removal procedure as specified in 5.5.2.2;
1> if the received measConfig includes the measIdToAddModList:
   2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;
1> if the received measConfig includes the measGapConfig or measGapConfigPerCC-List:
   2> perform the measurement gap configuration procedure as specified in 5.5.2.9;
1> if the received measConfig includes the measGapConfigDensePRS:
   2> perform the measurement gap configuration procedure for RSTD measurements with dense PRS configuration as specified in 5.5.2.9a;
1> if the received measConfig includes the measGapSharingConfig:
   2> perform the measurement gap sharing configuration procedure as specified in 5.5.2.12;
1> if the received measConfig includes the s-Measure:
   2> set the parameter s-Measure within VarMeasConfig to the lowest value of the RSRP ranges indicated by the received value of s-Measure;
1> if the received measConfig includes the preRegistrationInfoHRPD:
   2> forward the preRegistrationInfoHRPD to CDMA2000 upper layers;
1> if the received measConfig includes the speedStatePars:
   2> set the parameter speedStatePars within VarMeasConfig to the received value of speedStatePars;
1> if the received measConfig includes the allowInterruptions:
   2> set the parameter allowInterruptions within VarMeasConfig to the received value of allowInterruptions;

5.5.2.2 Measurement identity removal

The UE shall:

1> for each measId included in the received measIdToRemoveList that is part of the current UE configuration in VarMeasConfig:
   2> remove the entry with the matching measId from the measIdList within the VarMeasConfig;
   2> remove the measurement reporting entry for this measId from the VarMeasReportList, if included;
   2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;

NOTE: The UE does not consider the message as erroneous if the measIdToRemoveList includes any measId value that is not part of the current UE configuration.

5.5.2.2a Measurement identity autonomous removal

The UE shall:

1> for each measId included in the measIdList within VarMeasConfig:
   2> if the associated reportConfig concerns an event involving a serving cell while the concerned serving cell is not configured; or
   2> if the associated reportConfig concerns an event involving a WLAN mobility set while the concerned WLAN mobility set is not configured; or
   2> if the associated reportConfig concerns an event involving a transmission resource pool for V2X sidelink communication while the concerned resource pool is not configured; or
   2> if the associated reportConfig concerns an event involving reportSFTD-Meas set to pSCell while the nr-Config is not configured:
      3> remove the measId from the measIdList within the VarMeasConfig;
      3> remove the measurement reporting entry for this measId from the VarMeasReportList, if included;
      3> stop the periodical reporting timer if running, and reset the associated information (e.g. timeToTrigger) for this measId;

NOTE 1: The above UE autonomous removal of measIds applies only for measurement events A1, A2, A6, and also applies for events A3 and A5 if configured for PSCell and W2 and W3 and V1 and V2 and event involving reportSFTD-Meas set to pSCell, if configured.

NOTE 2: When performed during re-establishment, the UE is only configured with a primary frequency (i.e. the SCell(s) and WLAN mobility set are released, if configured).

5.5.2.3 Measurement identity addition/ modification

E-UTRAN applies the procedure as follows:

- configure a measId only if the corresponding measurement object, the corresponding reporting configuration and the corresponding quantity configuration, are configured;
The UE shall:

1> for each `measId` included in the received `measIdToAddModList`:
   2> if an entry with the matching `measId` exists in the `measIdList` within the `VarMeasConfig`:
      3> replace the entry with the value received for this `measId`;
   2> else:
      3> add a new entry for this `measId` within the `VarMeasConfig`;
   2> remove the measurement reporting entry for this `measId` from the `VarMeasReportList`, if included;
   2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. `timeToTrigger`) for this `measId`;
   2> if the `triggerType` is set to `periodical` and the `purpose` is set to `reportCGI` in the `reportConfig` associated with this `measId`:
      3> if the `measObject` associated with this `measId` concerns E-UTRA:
         4> if the `si-RequestForHO` is included in the `reportConfig` associated with this `measId`:
            5> if the UE is a category 0 UE according to TS 36.306 [5]:
               6> start timer T321 with the timer value set to 190 ms for this `measId`;
               5> else:
                  6> start timer T321 with the timer value set to 150 ms for this `measId`;
            4> else:
               5> start timer T321 with the timer value set to 1 second for this `measId`;
      3> else if the `measObject` associated with this `measId` concerns UTRA:
         4> if the `si-RequestForHO` is included in the `reportConfig` associated with this `measId`:
            5> for UTRA FDD, start timer T321 with the timer value set to 2 seconds for this `measId`;
            5> for UTRA TDD, start timer T321 with the timer value set to [1 second] for this `measId`;
         4> else:
            5> start timer T321 with the timer value set to 8 seconds for this `measId`;
      3> else:
         4> start timer T321 with the timer value set to 8 seconds for this `measId`;

Editor's Note: The value of T321 for NR is FFS.

5.5.2.4 Measurement object removal

The UE shall:

1> for each `measObjectId` included in the received `measObjectIdToRemoveList` that is part of the current UE configuration in `VarMeasConfig`:
   2> remove the entry with the matching `measObjectId` from the `measObjectList` within the `VarMeasConfig`;
   2> remove all `measId` associated with this `measObjectId` from the `measIdList` within the `VarMeasConfig`, if any;
   2> if a `measId` is removed from the `measIdList`:
      3> remove the measurement reporting entry for this `measId` from the `VarMeasReportList`, if included;
stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. timeToTrigger) for this measId;

NOTE: The UE does not consider the message as erroneous if the measObjectId value that is not part of the current UE configuration.

5.5.2.5 Measurement object addition/ modification

The UE shall:

1> for each measObjectId included in the received measObjectToAddModList:

2> if an entry with the matching measObjectId exists in the measObjectList within the VarMeasConfig, for this entry:

3> reconfigure the entry with the value received for this measObject, except for the fields cellsToAddModList, blackCellsToAddModList, whiteCellsToAddModList, altTTT-CellsToAddModList, cellsToRemoveList, blackCellsToRemoveList, whiteCellsToRemoveList, altTTT-CellsToRemoveList, measSubframePatternConfigNeigh, measDS-Config, wlan-ToAddModList, wlan-ToRemoveList, tx-ResourcePoolToAddList and tx-ResourcePoolToRemoveList;

3> if the received measObject includes the cellsToRemoveList:

4> for each cellIndex included in the cellsToRemoveList:

5> remove the entry with the matching cellIndex from the cellsToAddModList;

3> if the received measObject includes the cellsToAddModList:

4> for each cellIndex value included in the cellsToAddModList:

5> if an entry with the matching cellIndex exists in the cellsToAddModList:

6> replace the entry with the value received for this cellIndex;

5> else:

6> add a new entry for the received cellIndex to the cellsToAddModList;

3> if the received measObject includes the blackCellsToRemoveList:

4> for each cellIndex included in the blackCellsToRemoveList:

5> remove the entry with the matching cellIndex from the blackCellsToAddModList;

NOTE 1: For each cellIndex included in the blackCellsToRemoveList that concerns overlapping ranges of cells, a cell is removed from the black list of cells only if all cell indexes containing it are removed.

3> if the received measObject includes the blackCellsToAddModList:

4> for each cellIndex included in the blackCellsToAddModList:

5> if an entry with the matching cellIndex is included in the blackCellsToAddModList:

6> replace the entry with the value received for this cellIndex;

5> else:

6> add a new entry for the received cellIndex to the blackCellsToAddModList;

3> if the received measObject includes the whiteCellsToRemoveList:

4> for each cellIndex included in the whiteCellsToRemoveList:

5> remove the entry with the matching cellIndex from the whiteCellsToAddModList;

NOTE 2: For each cellIndex included in the whiteCellsToRemoveList that concerns overlapping ranges of cells, a cell is removed from the white list of cells only if all cell indexes containing it are removed.
if the received `measObject` includes the `whiteCellsToAddModList`:
  for each `cellIndex` included in the `whiteCellsToAddModList`:
    if an entry with the matching `cellIndex` is included in the `whiteCellsToAddModList`:
      replace the entry with the value received for this `cellIndex`;
    else:
      add a new entry for the received `cellIndex` to the `whiteCellsToAddModList`;

if the received `measObject` includes the `altTTT-CellsToRemoveList`:
  for each `cellIndex` included in the `altTTT-CellsToRemoveList`:
    remove the entry with the matching `cellIndex` from the `altTTT-CellsToAddModList`;

NOTE 3: For each `cellIndex` included in the `altTTT-CellsToRemoveList` that concerns overlapping ranges of cells, a cell is removed from the list of cells only if all cell indexes containing it are removed.

if the received `measObject` includes the `altTTT-CellsToAddModList`:
  for each `cellIndex` value included in the `altTTT-CellsToAddModList`:
    if an entry with the matching `cellIndex` exists in the `altTTT-CellsToAddModList`:
      replace the entry with the value received for this `cellIndex`;
    else:
      add a new entry for the received `cellIndex` to the `altTTT-CellsToAddModList`;

if the received `measObject` includes `measSubframePatternConfigNeigh`:
  set `measSubframePatternConfigNeigh` within the `VarMeasConfig` to the value of the received field

if the received `measObject` includes `measDS-Config`:
  if `measDS-Config` is set to `setup`:
    if the received `measDS-Config` includes the `measCSI-RS-ToRemoveList`:
      for each `measCSI-RS-Id` included in the `measCSI-RS-ToRemoveList`:
        remove the entry with the matching `measCSI-RS-Id` from the `measCSI-RS-ToAddModList`;
    if the received `measDS-Config` includes the `measCSI-RS-ToAddModList`, for each `measCSI-RS-Id` value included in the `measCSI-RS-ToAddModList`:
      if an entry with the matching `measCSI-RS-Id` exists in the `measCSI-RS-ToAddModList`:
        replace the entry with the value received for this `measCSI-RS-Id`;
      else:
        add a new entry for the received `measCSI-RS-Id` to the `measCSI-RS-ToAddModList`;
    set other fields of the `measDS-Config` within the `VarMeasConfig` to the value of the received fields;
    perform the discovery signals measurement timing configuration procedure as specified in 5.5.2.10;
  else:
    release the discovery signals measurement configuration;

if the received `measObject` modifies fields other than `cellsForWhichToReportSFTD`:  

for each `measId` associated with this `measObjectId` in the `measIdList` within the `VarMeasConfig`, if any:

5> remove the measurement reporting entry for this `measId` from the `VarMeasReportList`, if included;

5> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. `timeToTrigger`) for this `measId`;

3> if the received `measObject` includes the `wlan-ToRemoveList`:

4> for each `WLAN-Identifiers` included in the `wlan-ToRemoveList`:

5> remove the entry with the matching `WLAN-Identifiers` from the `wlan-ToAddModList`;

NOTE 3a: Matching of `WLAN-Identifiers` requires that all WLAN identifier fields should be same.

3> if the received `measObject` includes the `wlan-ToAddModList`:

4> for each `WLAN-Identifiers` included in the `wlan-ToAddModList`:

5> add a new entry for the received `WLAN-Identifiers` to the `wlan-ToAddModList`;

3> if the received `measObject` includes the `tx-ResourcePoolToRemoveList`:

4> for each transmission resource pool indicated in `tx-ResourcePoolToRemoveList`:

5> remove the entry with the matching identity of the transmission resource pool from the `tx-ResourcePoolToAddList`;

3> if the received `measObject` includes the `tx-ResourcePoolToAddList`:

4> for each transmission resource pool indicated in `tx-ResourcePoolToAddList`:

5> add a new entry for the received identity of the transmission resource pool to the `tx-ResourcePoolToAddList`;

2> else:

3> add a new entry for the received `measObject` to the `measObjectList` within `VarMeasConfig`;

NOTE 4: UE does not need to retain `cellForWhichToReportCGI` in the `measObject` after reporting `cgi-Info`.

### 5.5.2.6 Reporting configuration removal

The UE shall:

1> for each `reportConfigId` included in the received `reportConfigToRemoveList` that is part of the current UE configuration in `VarMeasConfig`:

2> remove the entry with the matching `reportConfigId` from the `reportConfigList` within the `VarMeasConfig`;

2> remove all `measId` associated with the `reportConfigId` from the `measIdList` within the `VarMeasConfig`, if any;

2> if a `measId` is removed from the `measIdList`:

3> remove the measurement reporting entry for this `measId` from the `VarMeasReportList`, if included;

3> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. `timeToTrigger`) for this `measId`;

NOTE: The UE does not consider the message as erroneous if the `reportConfigToRemoveList` includes any `reportConfigId` value that is not part of the current UE configuration.

### 5.5.2.7 Reporting configuration addition/ modification

The UE shall:

1> for each `reportConfigId` included in the received `reportConfigToAddModList`:
2> if an entry with the matching `reportConfigId` exists in the `reportConfigList` within the `VarMeasConfig`, for this entry:

3> reconfigure the entry with the value received for this `reportConfig`;

3> for each `measId` associated with this `reportConfigId` included in the `measIdList` within the `VarMeasConfig`, if any:

4> remove the measurement reporting entry for this `measId` from in `VarMeasReportList`, if included;

4> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. `timeToTrigger`) for this `measId`;

2> else:

3> add a new entry for the received `reportConfig` to the `reportConfigList` within the `VarMeasConfig`;

5.5.2.8 **Quantity configuration**

The UE shall:

1> for each RAT for which the received `quantityConfig` includes parameter(s):

2> set the corresponding parameter(s) in `quantityConfig` within `VarMeasConfig` to the value of the received `quantityConfig` parameter(s);

1> for each `measId` included in the `measIdList` within `VarMeasConfig`:

2> remove the measurement reporting entry for this `measId` from the `VarMeasReportList`, if included;

2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. `timeToTrigger`) for this `measId`;

5.5.2.9 **Measurement gap configuration**

The UE shall:

1> if `measGapConfig` is set to `setup`:

2> if a measurement gap configuration `measGapConfig` or `measGapConfigPerCC-List` is already setup, release the measurement gap configuration;

2> if the `gapOffset` in `measGapConfig` indicates a non-uniform gap pattern:

3> setup the measurement gap configuration indicated by the `measGapConfig` in accordance with the received `gapOffset`, i.e., the first subframe of the first gap of each non-uniform gap pattern occurs at an SFN and subframe meeting the following condition (SFN and subframe of MCG cells):

   \[ \text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10); \]

   \[ \text{subframe} = \text{gapOffset mod } 10; \]

   with \( T = \text{LMGRP}/10 \) as defined in TS 36.133 [16];

2> else:

3> setup the measurement gap configuration indicated by the `measGapConfig` in accordance with the received `gapOffset`, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition (SFN and subframe of MCG cells):

   \[ \text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10); \]

   \[ \text{subframe} = \text{gapOffset mod } 10; \]

   with \( T = \text{MGRP}/10 \) as defined in TS 36.133 [16];

2> if EN-DC is configured:
3> if the UE is configured with \texttt{fr1-Gap} set to \texttt{TRUE}:
  4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;
3> else:
  4> apply the gap configuration for all LTE and NR serving cells;
2> if \texttt{mgta} is set to \texttt{TRUE}, apply a timing advance value of 0.5ms to the gap occurrences calculated above according to TS 38.133 [16];

NOTE 1: The UE applies a single gap, which timing is relative to the MCG cells, even when configured with DC. In case of EN-DC, the UE may either be configured with a single (common) gap or with two separate gaps i.e. a first one for FR1 (configured by E-UTRA RRC) and a second one for FR2 (configured by NR RRC).

1> else if \texttt{measGapConfig} is set to \texttt{release}:
  2> release the measurement gap configuration \texttt{measGapConfig};
1> if \texttt{measGapConfigPerCC-List} is set to \texttt{setup}:
  2> if a measurement gap configuration \texttt{measGapConfig} is already setup, release \texttt{measGapConfig};
  2> if \texttt{measGapConfigToRemoveList} is included:
    3> for each \texttt{ServCellIndex} included in the \texttt{measGapConfigToRemoveList}:
      4> release \texttt{measGapConfigCC} for the serving cell indicated by \texttt{servCellId};
  2> if \texttt{measGapConfigToAddModList} is included:
    3> for each \texttt{ServCellIndex} included in the \texttt{measGapConfigToAddModList}:
      4> store \texttt{measGapConfigCC} for the serving cell indicated by \texttt{servCellId};
  2> for each serving cell with stored \texttt{measGapConfigCC} indicating a non-uniform gap pattern, setup the measurement gap configuration indicated by the \texttt{measGapConfigCC} in accordance with the received \texttt{gapOffset}, i.e., the first subframe of the first gap of each non-uniform gap pattern occurs at an SFN and subframe meeting the following condition (SFN and subframe of MCG cells):
    SFN mod $T = \text{FLOOR}(\text{gapOffset}/10)$;
    subframe = $\text{gapOffset}$ mod 10;
    with $T = \text{LMGRP}/10$ as defined in TS 36.133 [16];
  2> for each serving cell with stored \texttt{measGapConfigCC} not indicating a non-uniform gap pattern, setup the measurement gap configuration indicated by the \texttt{measGapConfigCC} in accordance with the received \texttt{gapOffset}, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition (SFN and subframe of MCG cells):
    SFN mod $T = \text{FLOOR}(\text{gapOffset}/10)$;
    subframe = $\text{gapOffset}$ mod 10;
    with $T = \text{MGRP}/10$ as defined in TS 36.133 [16];

NOTE 2: The UE applies gap timing relative to the MCG cells, even when configured with DC.
1> else (\texttt{measGapConfigPerCC-List} is set to \texttt{release}):
  2> release the measurement gap configuration \texttt{measGapConfigPerCC-List};

NOTE 3: When a SCell is released, the UE is not required to apply a per CC measurement gap configuration associated to the SCell.
5.5.2.9a Measurement gap configuration for RSTD measurements with dense PRS configuration

The UE shall:

1> if `measGapConfigDensePRS` is set to `setup`:

2> setup the measurement gap configuration indicated by the `measGapConfigDensePRS` in accordance with the received `gapOffsetDensePRS`, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

   SFN mod \( T = \text{FLOOR}(\text{gapOffsetDensePRS}/10); \)
   
   subframe = `gapOffsetDensePRS` mod 10;

   with \( T = \text{MGRP}/10 \) as defined in TS 36.133 [16];

5.5.2.10 Discovery signals measurement timing configuration

The UE shall setup the discovery signals measurement timing configuration (DMTC) in accordance with the received `dmtc-PeriodOffset`, i.e., the first subframe of each DMTC occasion occurs at an SFN and subframe of the PCell meeting the following condition:

   SFN mod \( T = \text{FLOOR}(\text{dmtc-Offset}/10); \)
   
   subframe = `dmtc-Offset` mod 10;

   with \( T = \text{dmtc-Periodicity}/10; \)

On the concerned frequency, the UE shall not consider discovery signals transmission in subframes outside the DMTC occasion for measurements including RRM measurements.

5.5.2.11 RSSI measurement timing configuration

The UE shall setup the RSSI measurement timing configuration (RMTC) in accordance with the received `rmtc-Period`, `rmtc-SubframeOffset` if configured otherwise determined by the UE randomly, i.e. the first symbol of each RMTC occasion occurs at first symbol of an SFN and subframe of the PCell meeting the following condition:

   SFN mod \( T = \text{FLOOR}(\text{rmtc-SubframeOffset}/10); \)
   
   subframe = `rmtc-SubframeOffset` mod 10;

   with \( T = \text{rmtc-Period}/10; \)

On the concerned frequency, the UE shall not consider RSSI measurements outside the configured RMTC occasion which lasts for `measDuration` for RSSI and channel occupancy measurements.

5.5.2.12 Measurement gap sharing configuration

The UE shall:

1> if `measGapSharingConfig` is set to `setup`:

2> if a measurement gap sharing configuration is already setup, release the measurement gap sharing configuration;

2> setup the measurement gap sharing configuration indicated by the `measGapSharingConfig` in accordance with the received `measGapSharingScheme` as defined in TS 36.133 [16];

NOTE: In case of EN-DC, the UE may either be configured with a single (common) gap sharing or with two separate gap sharing configurations, i.e. a first one for FR1 (configured by E-UTRA RRC) and a second one for FR2 (configured by NR RRC). For the case of per FR gap configuration, the gap sharing configured here (i.e. E-UTRA RRC) is applicable only for FR1 gap.

1> else:
2> release the measurement gap sharing configuration;

5.5.2.13 NR measurement timing configuration

The UE shall setup the first SS/PBCH block measurement timing configuration (SMTC) in accordance with the received periodicityAndOffset parameter in the MTC-SSB-NR configuration i.e., the first subframe of each SMTC occasion occurs at an SFN and subframe of the PCell meeting the following condition:

\[
\text{SFN mod } T = \text{FLOOR}(\text{Offset}/10);
\]

if the Periodicity is larger than sf5:

\[
\text{subframe} = \text{Offset} \mod 10;
\]

else;

\[
\text{subframe} = \text{Offset} \text{ or } (\text{Offset} + 5);
\]

with \( T = \text{CEIL}(\text{Periodicity}/10) \).

On the concerned frequency, the UE shall not consider SS/PBCH block transmission in subframes outside the SMTC occasion for measurements including RRM measurements.

5.5.3 Performing measurements

5.5.3.1 General

For all measurements, except for UE Rx–Tx time difference measurements, RSSI, UL PDCP Packet Delay per QCI measurement, channel occupancy measurements, CBR measurement, sensing measurement and except for WLAN measurements of Band, Carrier Info, Available Admission Capacity, Backhaul Bandwidth, Channel Utilization, and Station Count, the UE applies the layer 3 filtering as specified in 5.5.3.2, before using the measured results for evaluation of reporting criteria or for measurement reporting. When performing measurements on NR carriers, the UE derives the cell quality as specified in 5.5.3.3 and the beam quality as specified in 5.5.3.4.

The UE shall:

1> whenever the UE has a measConfig, perform RSRP and RSRQ measurements for each serving cell as follows:

2> for the PCell, apply the time domain measurement resource restriction in accordance with measSubframePatternPCell, if configured;

2> if the UE supports CRS based discovery signals measurement:

3> for each SCell in deactivated state, apply the discovery signals measurement timing configuration in accordance with measDS-Config, if configured within the measObject corresponding to the frequency of the SCell;

1> if the UE has a measConfig with rs-sinr-Config configured, perform RS-SINR (as indicated in the associated reportConfig) measurements as follows:

2> perform the corresponding measurements on the frequency indicated in the associated measObject using available idle periods or using autonomous gaps as necessary;

1> for each measId included in the measIdList within VarMeasConfig:

2> if the purpose for the associated reportConfig is set to reportCGI:

3> if si-RequestForHO is configured for the associated reportConfig:

4> perform the corresponding measurements on the frequency and RAT indicated in the associated measObject using autonomous gaps as necessary;

3> else:

4> perform the corresponding measurements on the frequency and RAT indicated in the associated measObject using available idle periods or using autonomous gaps as necessary;
NOTE 1: If autonomous gaps are used to perform measurements, the UE is allowed to temporarily abort communication with all serving cell(s), i.e. create autonomous gaps to perform the corresponding measurements within the limits specified in TS 36.133 [16]. Otherwise, the UE only supports the measurements with the purpose set to reportCGI only if E-UTRAN has provided sufficient idle periods.

3> try to acquire the global cell identity of the cell indicated by the cellForWhichToReportCGI in the associated measObject by acquiring the relevant system information from the concerned cell;

3> if an entry in the cellAccessRelatedInfoList includes the selected PLMN, acquire the relevant system information from the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is an E-UTRAN cell:
   4> try to acquire the CSG identity, if the CSG identity is broadcast in the concerned cell;
   4> try to acquire the trackingAreaCode in the concerned cell;
   4> try to acquire the list of additional PLMN Identities, as included in the plmn-IdentityList, if multiple PLMN identities are broadcast in the concerned cell;
   4> if cellAccessRelatedInfoList is included, use trackingAreaCode and plmn-IdentityList from the entry of cellAccessRelatedInfoList containing the selected PLMN;

4> if the includeMultiBandInfo is configured:
   5> try to acquire the freqBandIndicator in the SystemInformationBlockType1of the concerned cell;
   5> try to acquire the list of additional frequency band indicators, as included in the multiBandInfoList, if multiple frequency band indicators are included in the SystemInformationBlockType1of the concerned cell;
   5> try to acquire the freqBandIndicatorPriority, if the freqBandIndicatorPriority is included in the SystemInformationBlockType1of the concerned cell;

4> if cellAccessRelatedInfoList-5GC is broadcast in the concerned cell and the UE is E-UTRA/5GC capable:
   5> try to acquire the cellAccessRelatedInfoList-5GC;

NOTE 2: The 'primary' PLMN is part of the global cell identity.

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a UTRAN cell:
   4> try to acquire the LAC, the RAC and the list of additional PLMN Identities, if multiple PLMN identities are broadcast in the concerned cell;
   4> try to acquire the CSG identity, if the CSG identity is broadcast in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a GERAN cell:
   4> try to acquire the RAC in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a CDMA2000 cell and the cdma2000-Type included in the measObject is typeHRPD:
   4> try to acquire the Sector ID in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated measObject is a CDMA2000 cell and the cdma2000-Type included in the measObject is type1XRTT:
   4> try to acquire the BASE ID, SID and NID in the concerned cell;

3> if the cell indicated by the cellForWhichToReportCGI included in the associated MeasObject is an NR cell:
4> try to acquire the `plmn-IdentityInfoList` including `plmn-IdentityList`, `trackingAreaCode` (if available), `ran-AreaCode` (if available) and `cellIdentity` for each entry of the `plmn-IdentityInfoList`;

4> try to acquire the `frequencyBandList`, if multiple frequency bands are broadcasted in the concerned cell;

2> if the `ul-DelayConfig` is configured for the associated `reportConfig`:

3> ignore the `measObject`;

3> configure the PDCP layer to perform UL PDCP Packet Delay per QCI measurement;

2> else:

3> if a measurement gap configuration is setup; or

3> if the UE does not require measurement gaps to perform the concerned measurements:

4> if `s-Measure` is not configured; or

4> if `s-Measure` is configured and the PCell RSRP, after layer 3 filtering, is lower than this value; or

4> if the associated `measObject` concerns NR; or

4> if `measDS-Config` is configured in the associated `measObject`:

5> if the UE supports CSI-RS based discovery signals measurement; and

5> if the `eventId` in the associated `reportConfig` is set to `eventC1` or `eventC2`, or if `reportStrongestCSI-RSs` is included in the associated `reportConfig`:

6> perform the corresponding measurements of CSI-RS resources on the frequency indicated in the concerned `measObject`, applying the discovery signals measurement timing configuration in accordance with `measDS-Config` in the concerned `measObject`;

6> if `reportCRS-Meas` is included in the associated `reportConfig`, perform the corresponding measurements of neighbouring cells on the frequencies indicated in the concerned `measObject` as follows:

7> for neighbouring cells on the primary frequency, apply the time domain measurement resource restriction in accordance with `measSubframePatternConfigNeigh`, if configured in the concerned `measObject`;

7> apply the discovery signals measurement timing configuration in accordance with `measDS-Config` in the concerned `measObject`;

5> else:

6> perform the corresponding measurements of neighbouring cells on the frequencies and RATs indicated in the concerned `measObject` as follows:

7> for neighbouring cells on the primary frequency, apply the time domain measurement resource restriction in accordance with `measSubframePatternConfigNeigh`, if configured in the concerned `measObject`;

7> if the UE supports CRS based discovery signals measurement, apply the discovery signals measurement timing configuration in accordance with `measDS-Config`, if configured in the concerned `measObject`;

4> if the `ue-RxTxTimeDiffPeriodical` is configured in the associated `reportConfig`:

5> perform the UE Rx–Tx time difference measurements on the PCell;

4> if the `reportSSTD-Meas` is set to `true` or `pSCell` in the associated `reportConfig`:

5> perform SSTD measurements between the PCell and the PSCell;
The UE capable of CBR measurement when configured to transmit non-P2X related V2X sidelink communication shall:

1> if in coverage on the frequency used for V2X sidelink communication transmission as defined in TS 36.304 [4, 11.4]; or

1> if the concerned frequency is included in v2x-InterFreqInfoList in RRCCConnectionReconfiguration or in v2x-InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26:

2> if the UE is in RRC_IDLE:

3> if the concerned frequency is the camped frequency:

4> perform CBR measurement on the pools in v2x-CommTxPoolNormalCommon and v2x-CommTxPoolExceptional if included in SystemInformationBlockType21;

3> else if v2x-CommTxPoolNormal or v2x-CommTxPoolExceptional is included in v2x-InterFreqInfoList for the concerned frequency within SystemInformationBlockType21 or SystemInformationBlockType26:

4> perform CBR measurement on pools in v2x-CommTxPoolNormal and v2x-CommTxPoolExceptional in v2x-InterFreqInfoList for the concerned frequency in SystemInformationBlockType21 or SystemInformationBlockType26;

3> else if the concerned frequency broadcasts SystemInformationBlockType21:

4> perform CBR measurement on pools in v2x-CommTxPoolNormalCommon and v2x-CommTxPoolExceptional if included in SystemInformationBlockType21 broadcast on the concerned frequency;

2> if the UE is in RRC_CONNECTED:

3> if tx-ResourcePoolToAddList is included in VarMeasConfig:

4> perform CBR measurements on each resource pool indicated in tx-ResourcePoolToAddList;

3> if the concerned frequency is the PCell’s frequency:

4> perform CBR measurement on the pools in v2x-CommTxPoolNormalDedicated or v2x-SchedulingPool if included in RRCCConnectionReconfiguration, v2x-CommTxPoolExceptional if included in SystemInformationBlockType21 for the concerned frequency and v2x-CommTxPoolExceptional if included in mobilityControlInfoV2X;

3> else if v2x-CommTxPoolNormal, v2x-SchedulingPool or v2x-CommTxPoolExceptional is included in v2x-InterFreqInfoList for the concerned frequency within RRCCConnectionReconfiguration:

4> perform CBR measurement on pools in v2x-CommTxPoolNormal, v2x-SchedulingPool, and v2x-CommTxPoolExceptional if included in v2x-InterFreqInfoList for the concerned frequency in RRCCConnectionReconfiguration;

3> else if the concerned frequency broadcasts SystemInformationBlockType21:
4> perform CBR measurement on pools in v2x-CommTxPoolNormalCommon and v2x-CommTxPoolExceptional if included in SystemInformationBlockType21 for the concerned frequency;

1> else:

2> perform CBR measurement on pools in v2x-CommTxPoolList in SL-V2X-Preconfiguration for the concerned frequency;

The UE capable of sensing measurement, with \textit{commTxResources} set to \textit{scheduled}, shall:

1> for each \textit{measId} included in the \textit{measIdList} within \textit{VarMeasConfig}:

2> if \textit{measSensing-Config} is configured in the associated \textit{measObject}

3> perform the sensing measurement in accordance with TS 36.213 [23] on the pools of v2x-SchedulingPool and also indicated in tx-ResourcePoolToAddList in the associated \textit{measObject}, using \textit{sensingSubchannelNumber}, \textit{sensingPeriodicity}, \textit{sensingResourceCounter} and \textit{sensingPriority}.

\textbf{NOTE 3:} The \textit{s-Measure} defines when the UE is required to perform measurements. The UE is however allowed to perform measurements also when the PCell RSRP exceeds \textit{s-Measure}, e.g., to measure cells broadcasting a CSG identity following use of the autonomous search function as defined in TS 36.304 [4].

\textbf{NOTE 4:} The UE may not perform the WLAN measurements if it is configured with e.g. due to connection to another WLAN based on user preferences as specified in TS 23.402 [75] or due to turning off WLAN.

\subsection*{5.5.3.2 Layer 3 filtering}

The UE shall:

1> for each measurement quantity that the UE performs measurements according to 5.5.3.1:

\textbf{NOTE 1:} This does not include quantities configured solely for UE Rx-Tx time difference, SSTD measurements and RSSI, channel occupancy measurements, WLAN measurements of Band, Carrier Info, Available Admission Capacity, Backhaul Bandwidth, Channel Utilization, and Station Count, CBR measurement, sensing measurement and UL PDCP Packet Delay per QCI measurement i.e. for those types of measurements the UE ignores the \textit{triggerQuantity} and \textit{reportQuantity}.

2> filter the measured result, before using for evaluation of reporting criteria or for measurement reporting, by the following formula:

\[ F_n = (1 - a) \cdot F_{n-1} + a \cdot M_n \]

\begin{itemize}
  \item \textit{M}_n is the latest received measurement result from the physical layer;
  \item \textit{F}_n is the updated filtered measurement result, that is used for evaluation of reporting criteria or for measurement reporting;
  \item \textit{F}_{n-1} is the old filtered measurement result, where \textit{F}_0 is set to \textit{M}_1 when the first measurement result from the physical layer is received; and
  \item \textit{a} = \frac{1}{2^{k(1)}} where \textit{k} is the \textit{filterCoefficient} for the corresponding measurement quantity received by the \textit{quantityConfig};
\end{itemize}

2> adapt the filter such that the time characteristics of the filter are preserved at different input rates, observing that the \textit{filterCoefficient} \textit{k} assumes a sample rate equal to 200 ms;

\textbf{NOTE 2:} If \textit{k} is set to 0, no layer 3 filtering is applicable.

\textbf{NOTE 3:} The filtering is performed in the same domain as used for evaluation of reporting criteria or for measurement reporting, i.e., logarithmic filtering for logarithmic measurements.

\textbf{NOTE 4:} The filter input rate is implementation dependent, to fulfil the performance requirements set in [16]. For further details about the physical layer measurements, see TS 36.133 [16].
5.5.3.3 Derivation of NR cell quality

The UE shall:

1> if the associated measObject includes maxRS-IndexCellQual; and
1> if there are multiple detected NR-SS beams associated to the cell; and
1> if threshRS-Index is configured and if for more than one of the NR-SS beams the measured result exceeds this threshold:
   2> consider the cell quality to be the linear average of the power values of the, up to maxRS-IndexCellQual, best of the detected NR-SS beams exceeding threshRS-Index;
1> else:
   2> consider the cell quality to be the measurement result of the detected NR-SS beam, associated to the cell, with the highest measurement result;

5.5.3.4 Derivation of NR beam quality

The UE shall:

1> consider the beam quality to be the value resulting after layer 3 filtering, as specified in 5.5.3.2, of the measurement results of the concerned beam, where each result is averaged as described in TS 38.215 [89];

5.5.4 Measurement report triggering

5.5.4.1 General

If security has been activated successfully, the UE shall:

1> for each measId included in the measIdList within VarMeasConfig:
   2> if the corresponding reportConfig includes a purpose set to reportStrongestCellsForSON:
      3> consider any neighbouring cell detected on the associated frequency to be applicable;
   2> else if the corresponding reportConfig includes a purpose set to reportCGI:
      3> consider any neighbouring cell detected on the associated frequency/ set of frequencies (GERAN) which has a physical cell identity matching the value of the cellForWhichToReportCGI included in the corresponding measObject within the VarMeasConfig to be applicable;
   2> else if the corresponding reportConfig includes a purpose set to reportLocation:
      3> consider only the PCell to be applicable;
   2> else:
      3> if the corresponding measObject concerns E-UTRA:
         4> if the ue-RxTxTimeDiffPeriodical is configured in the corresponding reportConfig:
            5> consider only the PCell to be applicable;
         4> else if the reportSSTD-Meas is set to true in the corresponding reportConfig:
            5> consider the PSCell to be applicable;
         4> else if the eventA1 or eventA2 is configured in the corresponding reportConfig:
            5> consider only the serving cell to be applicable;
         4> else if eventC1 or eventC2 is configured in the corresponding reportConfig; or if reportStrongestCSI-RSs is included in the corresponding reportConfig:
5> consider a CSI-RS resource on the associated frequency to be applicable when the concerned CSI-RS resource is included in the measCSI-RS-ToAddModList defined within the VarMeasConfig for this measId;
4> else if measRSSI-ReportConfig is configured in the corresponding reportConfig:
5> consider the resource indicated by the rmte-Config on the associated frequency to be applicable;
4> else if tx-ResourcePoolToAddList is configured in the measObject:
5> consider the transmission resource pools indicated by the tx-ResourcePoolToAddList defined within the VarMeasConfig for this measId to be applicable;
4> else:
5> if useWhiteCellList is set to TRUE:
6> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is included in the whiteCellsToAddModList defined within the VarMeasConfig for this measId;
5> else:
6> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the blackCellsToAddModList defined within the VarMeasConfig for this measId;
5> for events involving a serving cell on one frequency and neighbours on another frequency, consider the serving cell on the other frequency as a neighbouring cell;
4> if the corresponding reportConfig includes alternativeTimeToTrigger and if the UE supports alternativeTimeToTrigger:
5> use the value of alternativeTimeToTrigger as the time to trigger instead of the value of timeToTrigger in the corresponding reportConfig for cells included in the altTTT-CellsToAddModList of the corresponding measObject;
3> else if the corresponding measObject concerns UTRA or CDMA2000:
4> consider a neighbouring cell on the associated frequency to be applicable when the concerned cell is included in the cellsToAddModList defined within the VarMeasConfig for this measId (i.e. the cell is included in the white-list);
5> NOTE 0: The UE may also consider a neighbouring cell on the associated UTRA frequency to be applicable when the concerned cell is included in the csg-allowedReportingCells within the VarMeasConfig for this measId, if configured in the corresponding measObjectUTRA (i.e. the cell is included in the range of physical cell identities for which reporting is allowed).
3> else if the corresponding measObject concerns GERAN:
4> consider a neighbouring cell on the associated set of frequencies to be applicable when the concerned cell matches the ncc-Permitted defined within the VarMeasConfig for this measId;
3> else if the corresponding measObject concerns WLAN:
4> consider a WLAN on the associated set of frequencies, as indicated by carrierFreq or on all WLAN frequencies when carrierFreq is not present, to be applicable if the WLAN matches all WLAN identifiers of at least one entry within wlan-Id-List for this measId;
3> else if the corresponding measObject concerns NR:
4> if the reportSFTD-Meas is set to pSCell in the corresponding reportConfigInterRAT:
5> consider the PSCell to be applicable;
4> else if the reportSFTD-Meas is set to neighborCells in the corresponding reportConfigInterRAT:
5> if cellsForWhichToReportSFTD is configured in the corresponding measObjectNR:

6> consider any neighbouring NR cell on the associated frequency that is included in cellsForWhichToReportSFTD to be applicable;

5> else:

6> consider up to 3 strongest neighbouring NR cells detected on the associated frequency to be applicable when the concerned cells are not included in the blackCellsToAddModList defined within the VarMeasConfig for this measId;

4> else:

5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the blackCellsToAddModList defined within the VarMeasConfig for this measId;

2> if the triggerType is set to event, and if the corresponding reportConfig does not include numberOfTriggeringCells, and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig, while the VarMeasReportList does not include a measurement reporting entry for this measId (a first cell triggers the event):

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> if the UE supports T312 and if useT312 is included for this event and if T310 is running:

4> if T312 is not running:

5> start timer T312 with the value configured in the corresponding measObject;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the triggerType is set to event, and if the corresponding reportConfig does not include numberOfTriggeringCells, and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable cells not included in the cellsTriggeredList for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig (a subsequent cell triggers the event):

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> if the UE supports T312 and if useT312 is included for this event and if T310 is running:

4> if T312 is not running:

5> start timer T312 with the value configured in the corresponding measObject;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the triggerType is set to event and if the corresponding reportConfig includes numberOfTriggeringCells, and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig:

3> If the VarMeasReportList does not include a measurement reporting entry for this measId (a first cell triggers the event):
4> include a measurement reporting entry within the \texttt{VarMeasReportList} for this \texttt{measId};

3> If the number of cells(s) in the \texttt{cellsTriggeredList} is larger than or equal to \texttt{numberOfTriggeringCell};

4> include the concerned cell(s) in the \texttt{cellsTriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId};

3> else:

4> include the concerned cell(s) in the \texttt{cellsTriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId};

4> If the number of cells(s) in the \texttt{cellsTriggeredList} is larger than or equal to \texttt{numberOfTriggeringCells};

5> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the \texttt{triggerType} is set to \texttt{event} and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the \texttt{cellsTriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId} for all measurements after layer 3 filtering taken during \texttt{timeToTrigger} defined within the \texttt{VarMeasConfig} for this event:

3> remove the concerned cell(s) in the \texttt{cellsTriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId};

3> if the UE supports T312 and if \texttt{useT312} is included for this event and if T310 is running:

4> if T312 is not running:

5> start timer T312 with the value configured in the corresponding \texttt{measObject};

3> if \texttt{reportOnLeave} is set to \texttt{TRUE} for the corresponding reporting configuration or if \texttt{a0-ReportOnLeave} is set to \texttt{TRUE} or if \texttt{a4-a5-ReportOnLeave} is set to \texttt{TRUE} for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the \texttt{cellsTriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId} is empty:

4> remove the measurement reporting entry within the \texttt{VarMeasReportList} for this \texttt{measId};

4> stop the periodical reporting timer for this \texttt{measId}, if running;

2> if the \texttt{triggerType} is set to \texttt{event} and if the entry condition applicable for this event, i.e. the event corresponding with the \texttt{eventId} of the corresponding \texttt{reportConfig} within \texttt{VarMeasConfig}, is fulfilled for one or more applicable CSI-RS resources for all measurements after layer 3 filtering taken during \texttt{timeToTrigger} defined for this event within the \texttt{VarMeasConfig}, while the \texttt{VarMeasReportList} does not include an measurement reporting entry for this \texttt{measId} (i.e. a first CSI-RS resource triggers the event):

3> include a measurement reporting entry within the \texttt{VarMeasReportList} for this \texttt{measId};

3> set the \texttt{numberOfReportsSent} defined within the \texttt{VarMeasReportList} for this \texttt{measId} to 0;

3> include the concerned CSI-RS resource(s) in the \texttt{csi-RS-TriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId};

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the \texttt{triggerType} is set to \texttt{event} and if the entry condition applicable for this event, i.e. the event corresponding with the \texttt{eventId} of the corresponding \texttt{reportConfig} within \texttt{VarMeasConfig}, is fulfilled for one or more applicable CSI-RS resources not included in the \texttt{csi-RS-TriggeredList} for all measurements after layer 3 filtering taken during \texttt{timeToTrigger} defined for this event within the \texttt{VarMeasConfig} (i.e. a subsequent CSI-RS resource triggers the event):

3> set the \texttt{numberOfReportsSent} defined within the \texttt{VarMeasReportList} for this \texttt{measId} to 0;

3> include the concerned CSI-RS resource(s) in the \texttt{csi-RS-TriggeredList} defined within the \texttt{VarMeasReportList} for this \texttt{measId};
if the triggerType is set to event and if the leaving condition applicable for this event is fulfilled for one or more of the CSI-RS resources included in the csi-RS-TriggeredList defined within the VarMeasReportList for this measId for all measurements after layer 3 filtering taken during timeToTrigger defined within the VarMeasConfig for this event:

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the triggerType is set to event and if the leaving condition applicable for this event is fulfilled for one or more of the CSI-RS resources included in the csi-RS-TriggeredList defined within the VarMeasReportList for this measId for all measurements after layer 3 filtering taken during timeToTrigger defined within the VarMeasConfig for this event:

3> remove the concerned CSI-RS resource(s) in the csi-RS-TriggeredList defined within the VarMeasReportList for this measId;

3> if c1-ReportOnLeave is set to TRUE for the corresponding reporting configuration or if c2-ReportOnLeave is set to TRUE for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the csi-RS-TriggeredList defined within the VarMeasReportList for this measId is empty:

4> remove the measurement reporting entry within the VarMeasReportList for this measId;

3> if the csi-RS-TriggeredList defined within the VarMeasReportList for this measId is empty:

4> remove the measurement reporting entry within the VarMeasReportList for this measId;

4> stop the periodical reporting timer for this measId, if running;

2> if the triggerType is set to event and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable transmission resource pools for all measurements taken during timeToTrigger defined for this event within the VarMeasConfig, while the VarMeasReportList does not include an measurement reporting entry for this measId (a first transmission resource pool triggers the event):

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned transmission resource pool(s) in the poolsTriggeredList defined within the VarMeasReportList for this measId;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the triggerType is set to event and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable transmission resource pools not included in the poolsTriggeredList for all measurements taken during timeToTrigger defined for this event within the VarMeasConfig (a subsequent transmission resource pool triggers the event):

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned transmission resource pool(s) in the poolsTriggeredList defined within the VarMeasReportList for this measId;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the triggerType is set to event and if the leaving condition applicable for this event is fulfilled for one or more applicable transmission resource pools included in the poolsTriggeredList defined within the VarMeasReportList for this measId for all measurements taken during timeToTrigger defined within the VarMeasConfig for this event:

3> remove the concerned transmission resource pool(s) from the poolsTriggeredList defined within the VarMeasReportList for this measId;

3> if the poolsTriggeredList defined within the VarMeasReportList for this measId is empty:

4> remove the measurement reporting entry within the VarMeasReportList for this measId;

4> stop the periodical reporting timer for this measId, if running;

2> if the triggerType is set to event and if the eventId is set to eventH1 or eventH2 and if the entering condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled during timeToTrigger defined within the VarMeasConfig for this event:
3> include a measurement reporting entry within the VarMeasReportList for this measId;
3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;
3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if measRSSI-ReportConfig is included and if a (first) measurement result is available:
   3> include a measurement reporting entry within the VarMeasReportList for this measId;
   3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;
   3> initiate the measurement reporting procedure as specified in 5.5.5 immediately when RSSI sample values are reported by the physical layer after the first L1 measurement duration;

2> else if the purpose is included and set to reportStrongestCells, reportStrongestCellsForSON, reportLocation sidelink or sensing sidelink and if a (first) measurement result is available:
   3> include a measurement reporting entry within the VarMeasReportList for this measId;
   3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;
   3> if the purpose is set to reportStrongestCells and reportStrongestCSI-RSs is not included:
      4> if the triggerType is set to periodical and the corresponding reportConfig includes the ul-DelayConfig:
         5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after a first measurement result is provided by lower layers;
      4> else if the corresponding measurement object concerns WLAN:
         5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell and for the applicable WLAN(s);
      4> else if the reportAmount exceeds 1:
         5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell;
      4> else (i.e. the reportAmount is equal to 1):
         5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell and for the strongest cell among the applicable cells, or becomes available for the pair of PCell and the PSCell in case of SSTD measurements, or becomes available for each requested pair of PCell and NR cell or the maximal measurement reporting delay as specified in TS 38.133 [84, 8.17.2.3] in case of SFTD measurements;
   3> else if the purpose is set to reportLocation:
      4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after both the quantity to be reported for the PCell and the location information become available;
   3> else if the purpose is set to sidelink:
      4> initiate the measurement reporting procedure as specified in 5.5.5 immediately after both the quantity to be reported for the PCell and the CBR measurement result become available;
   3> else if the purpose is set to sensing:
      4> initiate the measurement reporting procedure as specified in 5.5.5 immediately after both the quantity to be reported for the PCell and the sensing measurement result become available;
   3> else:
      4> initiate the measurement reporting procedure, as specified in 5.5.5, when it has determined the strongest cells on the associated frequency;
2> upon expiry of the periodical reporting timer for this measId:
3> initiate the measurement reporting procedure, as specified in 5.5.5;
2> if the purpose is included and set to reportCGI and if the UE acquired the information needed to set all fields of cgi-Info for the requested cell:
3> include a measurement reporting entry within the VarMeasReportList for this measId;
3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;
3> stop timer T321;
3> initiate the measurement reporting procedure, as specified in 5.5.5;
2> upon expiry of the T321 for this measId:
3> include a measurement reporting entry within the VarMeasReportList for this measId;
3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;
3> initiate the measurement reporting procedure, as specified in 5.5.5;

NOTE 2: The UE does not stop the periodical reporting with triggerType set to event or to periodical while the corresponding measurement is not performed due to the PCell RSRP being equal to or better than s-Measure or due to the measurement gap not being setup.

NOTE 3: If the UE is configured with DRX, the UE may delay the measurement reporting for event triggered and periodical triggered measurements until the Active Time, which is defined in TS 36.321 [6].

5.5.4.2 Event A1 (Serving becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A1-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A1-2, as specified below, is fulfilled;
1> for this measurement, consider the primary or secondary cell that is configured on the frequency indicated in the associated measObjectEUTRA to be the serving cell;

Inequality A1-1 (Entering condition)

\[ Ms - Hys > Thresh \]

Inequality A1-2 (Leaving condition)

\[ Ms + Hys < Thresh \]

The variables in the formula are defined as follows:

\[ Ms \] is the measurement result of the serving cell, not taking into account any offsets.
\[ Hys \] is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigEUTRA for this event).
\[ Thresh \] is the threshold parameter for this event (i.e. a1-Threshold as defined within reportConfigEUTRA for this event).

\[ Ms \] is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.
\[ Hys \] is expressed in dB.
\[ Thresh \] is expressed in the same unit as \[ Ms \].

5.5.4.3 Event A2 (Serving becomes worse than threshold)

The UE shall:
1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;
1> for this measurement, consider the primary or secondary cell that is configured on the frequency indicated in the associated measObjectEUTRA to be the serving cell;

Inequality A2-1 (Entering condition)

\[ Ms + Hys < Thresh \]

Inequality A2-2 (Leaving condition)

\[ Ms - Hys > Thresh \]

The variables in the formula are defined as follows:

- \( Ms \) is the measurement result of the serving cell, not taking into account any offsets.
- \( Hys \) is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigEUTRA for this event).
- \( Thresh \) is the threshold parameter for this event (i.e. a2-Threshold as defined within reportConfigEUTRA for this event).

\( Ms \) is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

\( Hys \) is expressed in dB.

\( Thresh \) is expressed in the same unit as \( Ms \).

5.5.4.4 Event A3 (Neighbour becomes offset better than PCell/ PSCell)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;
1> if \( usePSCell \) of the corresponding reportConfig is set to \text{true}:
2> use the PSCell for \( Mp, Ofp \) and \( Ocp \);
1> else:
2> use the PCell for \( Mp, Ofp \) and \( Ocp \);

\text{NOTE} The cell(s) that triggers the event is on the frequency indicated in the associated measObject which may be different from the frequency used by the PCell/ PSCell.

Inequality A3-1 (Entering condition)

\[ Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off \]

Inequality A3-2 (Leaving condition)

\[ Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off \]

The variables in the formula are defined as follows:

- \( Mn \) is the measurement result of the neighbouring cell, not taking into account any offsets.
- \( Ofn \) is the frequency specific offset of the frequency of the neighbour cell (i.e. offsetFreq as defined within measObjectEUTRA corresponding to the frequency of the neighbour cell).
- \( Ocn \) is the cell specific offset of the neighbour cell (i.e. cellIndividualOffset as defined within measObjectEUTRA corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.
- \( Mp \) is the measurement result of the PCell/ PSCell, not taking into account any offsets.
**Offp** is the frequency specific offset of the frequency of the PCell/ PSCell (i.e. `offsetFreq` as defined within `measObjectEUTRA` corresponding to the frequency of the PCell/ PSCell).

**Ocp** is the cell specific offset of the PCell/ PSCell (i.e. `cellIndividualOffset` as defined within `measObjectEUTRA` corresponding to the frequency of the PCell/ PSCell), and is set to zero if not configured for the PCell/ PSCell.

**Hys** is the hysteresis parameter for this event (i.e. `hysteresis` as defined within `reportConfigEUTRA` for this event).

**Off** is the offset parameter for this event (i.e. `a3-Offset` as defined within `reportConfigEUTRA` for this event).

**Mn, Mp** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

**Ofn, Ocn, Off, Ocp, Hys, Off** are expressed in dB.

### 5.5.4.5 Event A4 (Neighbour becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A4-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled;

**Inequality A4-1 (Entering condition)**

\[
Mn + Ofn + Ocn - Hys > \text{Thresh}
\]

**Inequality A4-2 (Leaving condition)**

\[
Mn + Ofn + Ocn + Hys < \text{Thresh}
\]

The variables in the formula are defined as follows:

**Mn** is the measurement result of the neighbouring cell, not taking into account any offsets.

**Ofn** is the frequency specific offset of the frequency of the neighbour cell (i.e. `offsetFreq` as defined within `measObjectEUTRA` corresponding to the frequency of the neighbour cell).

**Ocn** is the cell specific offset of the neighbour cell (i.e. `cellIndividualOffset` as defined within `measObjectEUTRA` corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

**Hys** is the hysteresis parameter for this event (i.e. `hysteresis` as defined within `reportConfigEUTRA` for this event).

**Thresh** is the threshold parameter for this event (i.e. `a4-Threshold` as defined within `reportConfigEUTRA` for this event).

**Mn** is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

**Ofn, Ocn, Hys** are expressed in dB.

**Thresh** is expressed in the same unit as **Mn**.

### 5.5.4.6 Event A5 (PCell/ PSCell becomes worse than threshold1 and neighbour becomes better than threshold2)

The UE shall:

1> consider the entering condition for this event to be satisfied when both condition A5-1 and condition A5-2, as specified below, are fulfilled;
1> consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;
1> if `usePSCell` of the corresponding `reportConfig` is set to `true`:
   2> use the PCell for **Mp**;
1> else:
2> use the PCell for $M_p$;

NOTE: The cell(s) that triggers the event is on the frequency indicated in the associated measObject which may be different from the frequency used by the PCell/ PSCell.

Inequality A5-1 (Entering condition 1)

\[ M_p + Hys < Thresh1 \]

Inequality A5-2 (Entering condition 2)

\[ M_n + Ofn + Ocn - Hys > Thresh2 \]

Inequality A5-3 (Leaving condition 1)

\[ M_p - Hys > Thresh1 \]

Inequality A5-4 (Leaving condition 2)

\[ M_n + Ofn + Ocn + Hys < Thresh2 \]

The variables in the formula are defined as follows:

- $M_p$ is the measurement result of the PCell/ PSCell, not taking into account any offsets.
- $M_n$ is the measurement result of the neighbouring cell, not taking into account any offsets.
- $Ofn$ is the frequency specific offset of the frequency of the neighbour cell (i.e. $offsetFreq$ as defined within measObjectEUTRA corresponding to the frequency of the neighbour cell).
- $Ocn$ is the cell specific offset of the neighbour cell (i.e. $cellIndividualOffset$ as defined within measObjectEUTRA corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.
- $Hys$ is the hysteresis parameter for this event (i.e. $hysteresis$ as defined within reportConfigEUTRA for this event).
- $Thresh1$ is the threshold parameter for this event (i.e. a5-Threshold1 as defined within reportConfigEUTRA for this event).
- $Thresh2$ is the threshold parameter for this event (i.e. a5-Threshold2 as defined within reportConfigEUTRA for this event).

$M_n, M_p$ are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

$Ofn, Ocn, Hys$ are expressed in dB.

$Thresh1$ is expressed in the same unit as $M_p$.

$Thresh2$ is expressed in the same unit as $M_n$.

5.5.4.6a Event A6 (Neighbour becomes offset better than SCell)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A6-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A6-2, as specified below, is fulfilled;

1> for this measurement, consider the (secondary) cell that is configured on the frequency indicated in the associated measObjectEUTRA to be the serving cell;

NOTE: The neighbour(s) is on the same frequency as the SCell i.e. both are on the frequency indicated in the associated measObject.

Inequality A6-1 (Entering condition)

\[ M_n + Ocn - Hys > M_s + Ocs + Off \]
Inequality A6-2 (Leaving condition)

\[ M_n + Ocn + Hys < M_s + Ocs + Off \]

The variables in the formula are defined as follows:

- **Mn** is the measurement result of the neighbouring cell, not taking into account any offsets.
- **Ocn** is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.
- **Ms** is the measurement result of the serving cell, not taking into account any offsets.
- **Ocs** is the cell specific offset of the serving cell (i.e. *cellIndividualOffset* as defined within *measObjectEUTRA* corresponding to the serving frequency), and is set to zero if not configured for the serving cell.
- **Hys** is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).
- **Off** is the offset parameter for this event (i.e. *a6-Offset* as defined within *reportConfigEUTRA* for this event).

**Mn, Ms** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

**Ocn, Ocs, Hys, Off** are expressed in dB.

5.5.4.7 Event B1 (Inter RAT neighbour becomes better than threshold)

The UE shall:

1. for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;
2. consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;
3. consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

**Inequality B1-1 (Entering condition)**

\[ M_n - Ocn - Hys > Thresh \]

**Inequality B1-2 (Leaving condition)**

\[ M_n + Ocn - Hys < Thresh \]

The variables in the formula are defined as follows:

- **Mn** is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, *pilotStrength* is divided by -2.
- **Ofn** is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the neighbour inter-RAT cell).
- **Hys** is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).
- **Thresh** is the threshold parameter for this event (i.e. *b1-Threshold* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b1-Threshold* is divided by -2.

**Mn** is expressed in dBm or in dB, depending on the measurement quantity of the inter-RAT neighbour cell.

**Ofn, Hys** are expressed in dB.

**Thresh** is expressed in the same unit as **Mn**.

5.5.4.8 Event B2 (PCell becomes worse than threshold1 and inter RAT neighbour becomes better than threshold2)

The UE shall:

1. for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;
1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

\[ Mp + Hys < \text{Thresh1} \]

Inequality B2-2 (Entering condition 2)

\[ Mn + Ofn - Hys > \text{Thresh2} \]

Inequality B2-3 (Leaving condition 1)

\[ Mp - Hys > \text{Thresh} \]

Inequality B2-4 (Leaving condition 2)

\[ Mn + Ofn + Hys < \text{Thresh2} \]

The variables in the formula are defined as follows:

- \( Mp \) is the measurement result of the PCell, not taking into account any offsets.
- \( Mn \) is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA2000 measurement result, \( \text{pilotStrength} \) is divided by -2.
- \( Ofn \) is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. \( \text{offsetFreq} \) as defined within the \( \text{measObject} \) corresponding to the frequency of the inter-RAT neighbour cell).
- \( Hys \) is the hysteresis parameter for this event (i.e. \( \text{hysteresis} \) as defined within \( \text{reportConfigInterRAT} \) for this event).
- \( \text{Thresh1} \) is the threshold parameter for this event (i.e. \( \text{b2-Threshold1} \) as defined within \( \text{reportConfigInterRAT} \) for this event).
- \( \text{Thresh2} \) is the threshold parameter for this event (i.e. \( \text{b2-Threshold2} \) as defined within \( \text{reportConfigInterRAT} \) for this event). For CDMA2000, \( \text{b2-Threshold2} \) is divided by -2.
- \( Mp \) is expressed in dBm in case of RSRP, or in dB in case of RSRQ.
- \( Mn \) is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.
- \( Ofn, Hys \) are expressed in dB.
- \( \text{Thresh1} \) is expressed in the same unit as \( Mp \).
- \( \text{Thresh2} \) is expressed in the same unit as \( Mn \).

5.5.4.9 Event C1 (CSI-RS resource becomes better than threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition C1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition C1-2, as specified below, is fulfilled;

Inequality C1-1 (Entering condition)

\[ Mcr + Ocr - Hys > \text{Thresh} \]

Inequality C1-2 (Leaving condition)

\[ Mcr + Ocr + Hys < \text{Thresh} \]

The variables in the formula are defined as follows:
**Mcr** is the measurement result of the CSI-RS resource, not taking into account any offsets.

**Ocr** is the CSI-RS specific offset (i.e. *csi-RS-IndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the CSI-RS resource), and set to zero if not configured for the CSI-RS resource.

**Hys** is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

**Thresh** is the threshold parameter for this event (i.e. *c1-Threshold* as defined within *reportConfigEUTRA* for this event).

**Mcr, Thresh** are expressed in dBm.

**Ocr, Hys** are expressed in dB.

### 5.5.4.10 Event C2 (CSI-RS resource becomes offset better than reference CSI-RS resource)

The UE shall:

1. consider the entering condition for this event to be satisfied when condition C2-1, as specified below, is fulfilled;
2. consider the leaving condition for this event to be satisfied when condition C2-2, as specified below, is fulfilled;

**NOTE:** The CSI-RS resource(s) that triggers the event is on the same frequency as the reference CSI-RS resource, i.e. both are on the frequency indicated in the associated *measObject*.

**Inequality C2-1 (Entering condition)**

\[
Mcr + Ocr - Hys > Mref + Oref + Off
\]

**Inequality C2-2 (Leaving condition)**

\[
Mcr + Ocr + Hys < Mref + Oref + Off
\]

The variables in the formula are defined as follows:

- **Mcr** is the measurement result of the CSI-RS resource, not taking into account any offsets.
- **Ocr** is the CSI-RS specific offset of the CSI-RS resource (i.e. *csi-RS-IndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the CSI-RS resource), and set to zero if not configured for the CSI-RS resource.
- **Mref** is the measurement result of the reference CSI-RS resource (i.e. *c2-RefCSI-RS* as defined within *reportConfigEUTRA* for this event), not taking into account any offsets.
- **Oref** is the CSI-RS specific offset of the reference CSI-RS resource (i.e. *csi-RS-IndividualOffset* as defined within *measObjectEUTRA* corresponding to the frequency of the reference CSI-RS resource), and is set to zero if not configured for the reference CSI-RS resource.
- **Hys** is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).
- **Off** is the offset parameter for this event (i.e. *c2-Offset* as defined within *reportConfigEUTRA* for this event).

**Mcr, Mref** are expressed in dBm.

**Ocr, Oref, Hys, Off** are expressed in dB.

### 5.5.4.11 Event W1 (WLAN becomes better than a threshold)

The UE shall:

1. consider the entering condition for this event to be satisfied when *wlan-MobilitySet* within *VarWLAN-MobilityConfig* does not contain any entries and condition W1-1, as specified below, is fulfilled;
2. consider the leaving condition for this event to be satisfied when condition W1-2, as specified below, is fulfilled;

**Inequality W1-1 (Entering condition)**

\[
Mcr + Ocr - Hys > Mref + Oref + Off
\]
$$M_n - \text{Hys} > \text{Thresh}$$

Inequality W1-2 (Leaving condition)

$$M_n + \text{Hys} < \text{Thresh}$$

The variables in the formula are defined as follows:

- $M_n$ is the measurement result of WLAN(s) configured in the measurement object, not taking into account any offsets.
- $\text{Hys}$ is the hysteresis parameter for this event.
- $\text{Thresh}$ is the threshold parameter for this event (i.e. $w1$-$\text{Threshold}$ as defined within reportConfigInterRAT for this event).

$M_n$ is expressed in dBm.

$\text{Hys}$ is expressed in dB.

$\text{Thresh}$ is expressed in the same unit as $M_n$.

5.5.4.12 Event W2 (All WLAN inside WLAN mobility set becomes worse than threshold1 and a WLAN outside WLAN mobility set becomes better than threshold2)

The UE shall:

1. consider the entering condition for this event to be satisfied when both conditions W2-1 and W2-2 as specified below are fulfilled;
2. consider the leaving condition for this event to be satisfied when condition W2-3 or condition W2-4, i.e. at least one of the two, as specified below is fulfilled;

Inequality W2-1 (Entering condition 1)

$$M_s + \text{Hys} < \text{Thresh1}$$

Inequality W2-2 (Entering condition 2)

$$M_n - \text{Hys} > \text{Thresh2}$$

Inequality W2-3 (Leaving condition 1)

$$M_s - \text{Hys} > \text{Thresh1}$$

Inequality W2-4 (Leaving condition 2)

$$M_n + \text{Hys} < \text{Thresh2}$$

The variables in the formula are defined as follows:

- $M_s$ is the measurement result of WLAN(s) which matches all WLAN identifiers of at least one entry within wlan-MobilitySet in VarWLAN-MobilityConfig, not taking into account any offsets.
- $M_n$ is the measurement result of WLAN(s) configured in the measurement object which does not match all WLAN identifiers of any entry within wlan-MobilitySet in VarWLAN-MobilityConfig, not taking into account any offsets.
- $\text{Hys}$ is the hysteresis parameter for this event.
- $\text{Thresh1}$ is the threshold parameter for this event (i.e. $w2$-$\text{Threshold1}$ as defined within reportConfigInterRAT for this event).
- $\text{Thresh2}$ is the threshold parameter for this event (i.e. $w2$-$\text{Threshold2}$ as defined within reportConfigInterRAT for this event).
\( \text{Mn, Ms} \) are expressed in dBm.

\( \text{Hys} \) is expressed in dB.

\( \text{Thresh1} \) is expressed in the same unit as \( \text{Ms} \).

\( \text{Thresh2} \) is expressed in the same unit as \( \text{Mn} \).

5.5.4.13 Event W3 (All WLAN inside WLAN mobility set becomes worse than a threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition W3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition W3-2, as specified below, is fulfilled;

Inequality W3-1 (Entering condition)

\[ \text{Ms} + \text{Hys} < \text{Thresh} \]

Inequality W3-2 (Leaving condition)

\[ \text{Ms} - \text{Hys} > \text{Thresh} \]

The variables in the formula are defined as follows:

\( \text{Ms} \) is the measurement result of WLAN(s) which matches all WLAN identifiers of at least one entry within wlan-MobilitySet in VarWLAN-MobilityConfig, not taking into account any offsets.

\( \text{Hys} \) is the hysteresis parameter for this event.

\( \text{Thresh} \) is the threshold parameter for this event (i.e. \( \text{w3-Threshold} \) as defined within reportConfigInterRAT for this event).

\( \text{Ms} \) is expressed in dBm.

\( \text{Hys} \) is expressed in dB.

\( \text{Thresh} \) is expressed in the same unit as \( \text{Ms} \).

5.5.4.14 Event V1 (The channel busy ratio is above a threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition V1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition V1-2, as specified below, is fulfilled;

Inequality V1-1 (Entering condition)

\[ \text{Ms} - \text{Hys} > \text{Thresh} \]

Inequality V1-2 (Leaving condition)

\[ \text{Ms} + \text{Hys} < \text{Thresh} \]

The variables in the formula are defined as follows:

\( \text{Ms} \) is the measurement result of channel busy ratio of the transmission resource pool, not taking into account any offsets.

\( \text{Hys} \) is the hysteresis parameter for this event (i.e. \( \text{hysteresis} \) as defined within reportConfigEUTRA for this event).

\( \text{Thresh} \) is the threshold parameter for this event (i.e. \( \text{v1-Threshold} \) as defined within ReportConfigEUTRA).
Ms is expressed in decimal from 0 to 1 in steps of 0.01.

Hys is expressed in the same unit as Ms.

Threshold is expressed in the same unit as Ms.

5.5.4.15 Event V2 (The channel busy ratio is below a threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition V2-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition V2-2, as specified below, is fulfilled;

Inequality V2-1 (Entering condition)

\[ Ms + Hys < \text{Threshold} \]

Inequality V2-2 (Leaving condition)

\[ Ms - Hys > \text{Threshold} \]

The variables in the formula are defined as follows:

Ms is the measurement result of channel busy ratio of the transmission resource pool, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigEUTRA for this event).

Threshold is the threshold parameter for this event (i.e. v2-Threshold as defined within ReportConfigEUTRA).

Ms is expressed in decimal from 0 to 1 in steps of 0.01.

Hys is expressed in the same unit as Ms.

Threshold is expressed in the same unit as Ms.

5.5.4.16 Event H1 (The Aerial UE height is above a threshold)

The UE shall:

1> consider the entering condition for this event to be satisfied when condition H1-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition H1-2, as specified below, is fulfilled;

Inequality H1-1 (Entering condition)

\[ Ms - Hys > \text{Threshold} + \text{Offset} \]

Inequality H1-2 (Leaving condition)

\[ Ms + Hys < \text{Threshold} + \text{Offset} \]

The variables in the formula are defined as follows:

Ms is the Aerial UE height, not taking into account any offsets.

Hys is the hysteresis parameter (i.e. h1-Hysteresis as defined within ReportConfigEUTRA) for this event.

Threshold is the reference threshold parameter for this event given in MeasConfig (i.e. heightThreshRef as defined within MeasConfig).

Offset is the offset value to heightThreshRef to obtain the absolute threshold for this event. (i.e. h1-ThresholdOffset as defined within ReportConfigEUTRA)

Ms is expressed in meters.
**5.5.4.17 Event H2 (The Aerial UE height is below a threshold)**

The UE shall:

1. consider the entering condition for this event to be satisfied when condition H2-1, as specified below, is fulfilled;
2. consider the leaving condition for this event to be satisfied when condition H2-2, as specified below, is fulfilled;

Inequality H2-1 (Entering condition)

\[ Ms + Hys < Thresh + Offset \]

Inequality H2-2 (Leaving condition)

\[ Ms - Hys > Thresh + Offset \]

The variables in the formula are defined as follows:

- **Ms** is the Aerial UE height, not taking into account any offsets.
- **Hys** is the hysteresis parameter (i.e. \( h2\text{-Hysteresis} \) as defined within ReportConfigEUTRA) for this event.
- **Thresh** is the reference threshold parameter for this event given in MeasConfig (i.e. \( heightThreshRef \) as defined within MeasConfig).
- **Offset** is the offset value to \( heightThreshRef \) to obtain the absolute threshold for this event. (i.e. \( h2\text{-ThresholdOffset} \) as defined within ReportConfigEUTRA)

**Ms** is expressed in meters.

**Thresh** is expressed in the same unit as **Ms**.

**5.5.5 Measurement reporting**

**5.5.5.1 General**

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN. The UE shall initiate this procedure only after successful security activation.

For the **measId** for which the measurement reporting procedure was triggered, the UE shall set the **measResults** within the **MeasurementReport** message as follows:

1. set the **measId** to the measurement identity that triggered the measurement reporting;
2. set the **measResultPCell** to include the quantities of the PCell;
3. set the **measResultServFreqList** to include for each E-UTRA SCell that is configured, if any, within **measResultSCell** the quantities of the concerned SCell, if available according to performance requirements in [16], except if **purpose** for the **reportConfig** associated with the **measId** that triggered the measurement reporting is set to reportLocation;
4. if the **reportConfig** associated with the **measId** that triggered the measurement reporting includes reportAddNeighMeas:
2> for each E-UTRA serving frequency for which measObjectId is referenced in the_measIdList, other than the frequency corresponding with the_measId that triggered the measurement reporting:

3> set the_measResultServFreqList to include within_measResultBestNeighCell the_physCellId and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;

1> if the triggerType is set to event; and if the corresponding measObject concerns NR; and if eventId is set to eventB1 or eventB2; or
1> if the triggerType is set to event; and if eventId is set to eventA3 or eventA4 or eventA5:

2> if purpose for the reportConfig associated with the_measId that triggered the measurement reporting is set to a value other than reportLocation:

3> set the_measResultServFreqListNR to include for each NR serving frequency, if any, the following:

4> set_measResultSCell to include the available results of the NR serving cell, as specified in 5.5.5.2;

4> if the reportConfig associated with the_measId that triggered the measurement reporting includes reportAddNeighMeas:

5> set_measResultBestNeighCell to include the available results, as specified in 5.5.5.2, of the best non-serving cell, ordered based on the quantity determined as specified in 5.5.5.3;

5> for each (serving or neighbouring) cell for which the UE reports results according to the previous, additionally include available beam results according to the following:

6> if maxReportRS-Index is configured, set_measResultCellRS-Index to include available results, as specified in 5.5.5.2, of up to maxReportRS-Index beams, ordered based on the quantity determined as specified in 5.5.5.3;

1> if there is at least one applicable neighbouring cell to report:

2> set the_measResultNeighCells to include the best neighbouring cells up to maxReportCells in accordance with the following:

3> if the triggerType is set to event:

4> include the cells included in the_cellsTriggeredList as defined within the VarMeasReportList for this_measId;

3> else:

4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE 1: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the reportInterval. The related performance requirements are specified in TS 36.133 [16].

3> for each cell that is included in the_measResultNeighCells, include the_physCellId;

3> if the triggerType is set to event; or the purpose is set to reportStrongestCells or to reportStrongestCellsForSON:

4> for each included cell, include the layer 3 filtered measured results in accordance with the reportConfig for this_measId, ordered as follows:

5> if the measObject associated with this_measId concerns E-UTRA:

6> set the_measResult to include the quantity(ies) indicated in the reportQuantity within the concerned reportConfig in order of decreasing triggerQuantity, i.e. the best cell is included first;

5> if the measObject associated with this_measId concerns NR:
6> set the measResultCell to include the quantity(ies) indicated in the reportQuantityCellNR within the concerned reportConfig in order of decreasing quantity according to bN-ThreshYNR, i.e. the best cell is included first;

6> if maxReportRS-Index and reportQuantityRS-IndexNR are configured, set measResultCellRS-Index to include results of the best beam and the beams whose quantity is above threshRS-Index defined in the VarMeasConfig for the corresponding measObject, up to maxReportRS-Index beams in total, and in order of decreasing quantity, same as used for cell reporting, and as follows:

7> order beams based on the sorting quantity determined as specified in 5.5.5.3;

7> include ssbIndex;

7> if reportRS-IndexResultsNR is configured, for each quantity indicated, include the corresponding measurement result;

5> if the measObject associated with this measId concerns UTRA FDD and if ReportConfigInterRAT includes the reportQuantityUTRA-FDD:

6> set the measResult to include the quantities indicated by the reportQuantityUTRA-FDD in order of decreasing measQuantityUTRA-FDD within the quantityConfig, i.e. the best cell is included first;

5> if the measObject associated with this measId concerns UTRA FDD and if ReportConfigInterRAT does not include the reportQuantityUTRA-FDD; or

5> if the measObject associated with this measId concerns UTRA TDD, GERAN or CDMA2000:

6> set the measResult to the quantity as configured for the concerned RAT within the quantityConfig in order of either decreasing quantity for UTRA and GERAN or increasing quantity for CDMA2000 pilotStrength, i.e. the best cell is included first;

3> else if the purpose is set to reportCGI and the corresponding measObject concerns a RAT other than NR:

4> if the mandatory present fields of the cgi-Info for the cell indicated by the cellForWhichToReportCGI in the associated measObject have been obtained:

5> if the includeMultiBandInfo is configured:

6> include the freqBandIndicator;

6> if the cell broadcasts the multiBandInfoList, include the multiBandInfoList;

6> if the cell broadcasts the freqBandIndicatorPriority, include the freqBandIndicatorPriority;

5> if the cell broadcasts a CSG identity:

6> include the csg-Identity;

6> include the csg-MemberStatus and set it to member if the cell is a CSG member cell;

5> if the si-RequestForHO is configured within the reportConfig associated with this measId:

6> include the cgi-Info containing all the fields other than the plmn-IdentityList that have been successfully acquired;

6> include, within the cgi-Info, the field plmn-IdentityList in accordance with the following:

7> if the cell is a CSG member cell, determine the subset of the PLMN identities, starting from the second entry of PLMN identities in the broadcast information, that meet the following conditions:

a) equal to the RPLMN or an EPLMN; and

b) the CSG whitelist of the UE includes an entry comprising of the concerned PLMN identity and the CSG identity broadcast by the cell;
7> if the subset of PLMN identities determined according to the previous includes at least one PLMN identity, include the `plmn-IdentityList` and set it to include this subset of the PLMN identities;

7> if the cell is a CSG member cell, include the `primaryPLMN-Suitable` if the primary PLMN meets conditions a) and b) specified above;

7> if the cell does not broadcast `csg-Identity` and the UE is capable of reporting the `plmn-IdentityList` from cells not broadcasting `csg-Identity`:
8> include in the `plmn-IdentityList` the list of identities starting from the second entry of PLMN identities in the broadcast information;

5> else:
6> include the `cgi-Info` containing all the fields that have been successfully acquired and in accordance with the following:
7> include in the `plmn-IdentityList` the list of identities starting from the second entry of PLMN Identities in the broadcast information;

4> if the `cellAccessRelatedInfoList-5GC` has been acquired:
5> include `cgi-Info-5GC`;

NOTE 1a: The UE may include the `cgi-Info-5GC` even when the N1 mode is disabled.

3> else if the `purpose` is set to `reportCGI` and the corresponding `measObject` concerns NR RAT:
4> if the Cell information of `cgi-Info` for the cell indicated by the `cellForWhichToReportCGI` in the associated `measObject` has been obtained:
5> include `plmn-IdentityInfoList` including `plmn-IdentityList`, `trackingAreaCode` (if available), `ran-AreaCode` (if available) and `cellIdentity` for each entry of the `plmn-IdentityInfoList`;
5> include `frequencyBandList` if broadcasted;
4> else if MIB associated with the concerned `measObject` indicates that SIB1 is not broadcast:
5> include the `noSIB1` field;
1> for the cells included according to the previous (i.e. covering the PCell, the SCells, the best non-serving cells on serving frequencies as well as neighbouring EUTRA cells) include results according to the extended RSRQ if corresponding results are available according to the associated performance requirements defined in 36.133 [16];

1> if there is at least one applicable CSI-RS resource to report:

2> set the `measResultCSI-RS-List` to include the best CSI-RS resources up to `maxReportCells` in accordance with the following:

3> if the `triggerType` is set to `event`:
4> include the CSI-RS resources included in the `csi-RS-TriggeredList` as defined within the `VarMeasReportList` for this `measId`;

3> else:
4> include the applicable CSI-RS resources for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE 2: The reliability of the report (i.e. the certainty it contains the strongest CSI-RS resources on the concerned frequency) depends on the measurement configuration i.e. the `reportInterval`. The related performance requirements are specified in TS 36.133 [16].

3> for each CSI-RS resource that is included in the `measResultCSI-RS-List`:
4> include the `measCSI-RS-Id`;
include the layer 3 filtered measured results in accordance with the reportConfig for this measId, ordered as follow:

5> set the csi-RSRP-Result to include the quantity indicated in the reportQuantity within the concerned reportConfig in order of decreasing triggerQuantityCSI-RS, i.e. the best CSI-RS resource is included first;

4> if reportCRS-Meas is included within the associated reportConfig, and the cell indicated by physCellId of this CSI-RS resource is not a serving cell:

5> set the measResultNeighCells to include the cell indicated by physCellId of this CSI-RS resource, and include the physCellId;

5> set the rsrpResult to include the RSRP of the concerned cell, if available according to performance requirements in [16];

5> set the rsrqResult to include the RSRQ of the concerned cell, if available according to performance requirements in [16];

1> if the ue-RxTxTimeDiffPeriodical is configured within the corresponding reportConfig for this measId;

2> set the ue-RxTxTimeDiffResult to the measurement result provided by lower layers;

2> set the currentSFN;

1> if the measRSSI-ReportConfig is configured within the corresponding reportConfig for this measId:

2> set the rssi-Result to the average of sample value(s) provided by lower layers in the reportInterval;

2> set the channelOccupancy to the rounded percentage of sample values which are beyond to the channelOccupancyThreshold within all the sample values in the reportInterval;

1> if uplink PDCP delay results are available:

2> set the ul-PDCP-DelayResultList to include the uplink PDCP delay results available;

1> if the includeLocationInfo is configured in the corresponding reportConfig for this measId or if purpose for the reportConfig associated with the measId that triggered the measurement reporting is set to reportLocation; and detailed location information that has not been reported is available, set the content of the locationInfo as follows:

2> include the locationCoordinates;

2> if available, include the gnss-TOD-msec, except if purpose for the reportConfig associated with the measId that triggered the measurement reporting is set to reportLocation;

2> include the verticalVelocityInfo, if available;

1> if the includeWLAN-Meas is configured in the corresponding reportConfig for this measId, set the measResults as follows:

2> if available, include the logMeasResultListWLAN, in order of decreasing RSSI for WLAN APs;

1> if the includeBT-Meas is configured in the corresponding reportConfig for this measId, set the measResults as follows:

2> if available, include the logMeasResultListBT, in order of decreasing RSSI for Bluetooth beacons;

1> if the reportSSTD-Meas is set to true or pSCell within the corresponding reportConfig for this measId:

2> set the measResultSSTD to the measurement results provided by lower layers;

1> if the reportSFTD-Meas is set to neighborCells or pSCell within the corresponding reportConfigInterRAT for this measId, for each applicable cell for which results are available:

2> set sfn-OffsetResult and frameBoundaryOffsetResult to the measurement results provided by lower layers;
2> optionally include rsrpResult set to the RSRP of the concerned cell, if available according to performance requirements;

1> if there is at least one applicable transmission resource pool to report:

2> set the measResultListCBR to include the CBR measurement results in accordance with the following:

3> if the triggerType is set to event:

4> include the transmission resource pools included in the poolsTriggeredList as defined within the VarMeasReportList for this measId;

3> else:

4> include the applicable transmission resource pools for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

3> for each transmission resource pool to be reported:

4> set the poolIdentity to the poolReportId of this transmission resource pool;

4> if adjacencyPSCCH-PSSCH is set to TRUE for this transmission resource pool:

5> set the cbr-PSSCH to the CBR measurement result on PSSCH and PSCCH of this transmission resource pool provided by lower layers;

4> else:

5> set the cbr-PSSCH to the CBR measurement result on PSSCH of this transmission resource pool provided by lower layers if available;

5> set the cbr-PSCCH to the CBR measurement result on PSCCH of this transmission resource pool provided by lower layers if available;

2> set the measResultSensing to include the sensing measurement results in accordance with the following:

3> include the applicable transmission resource pools for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

3> for each transmission resource pool to be reported:

4> set the sensingResult to the sensing measurement results provided by the lower layers;

1> if the triggerType is set to event; and if eventId is set to eventH1 or eventH2:

2> set the heightUE to include the altitude of the UE;

1> increment the numberOfReportsSent as defined within the VarMeasReportList for this measId by 1;

1> stop the periodical reporting timer, if running;

1> if the numberOfReportsSent as defined within the VarMeasReportList for this measId is less than the reportAmount as defined within the corresponding reportConfig for this measId:

2> start the periodical reporting timer with the value of reportInterval as defined within the corresponding reportConfig for this measId;

1> else:

2> if the triggerType is set to periodical:

3> remove the entry within the VarMeasReportList for this measId;

3> remove this measId from the measIdList within VarMeasConfig;

1> if the measured results are for CDMA2000 HRPD:

2> set the preRegistrationStatusHRPD to the UE’s CDMA2000 upper layer’s HRPD preRegistrationStatus;
1> if the measured results are for CDMA2000 1xRTT:
   2> set the preRegistrationStatusHRPD to FALSE;
1> if the measured results are for WLAN:
   2> set the measResultListWLAN to include the quantities within the quantityConfigWLAN for up to maxReportCells WLAN(s), determined according to the following:
      3> include WLAN the UE is connected to, if any;
      3> if reportAnyWLAN is set to TRUE:
         4> consider WLAN with any WLAN identifiers to be applicable for measurement reporting;
      3> else:
         4> consider only WLANs which do not match all WLAN identifiers of any entry within wlan-MobilitySet in VarWLAN-MobilityConfig to be applicable for measurement reporting;
      3> include applicable WLAN in order of decreasing WLAN RSSI, i.e. the best WLAN is included first;
   2> for each included WLAN:
      3> set wlan-Identifiers to include all WLAN identifiers that can be acquired for the WLAN measured;
      3> set connectedWLAN to TRUE if the UE is connected to the WLAN measured;
      3> if reportQuantityWLAN exists within the ReportConfigInterRAT within the VarMeasConfig for this measId:
         4> if bandRequestWLAN is set to TRUE:
            5> set bandWLAN to include WLAN band of the WLAN measured;
         4> if carrierInfoRequestWLAN is set to TRUE:
            5> set carrierInfoWLAN to include WLAN carrier information of the WLAN measured if it can be acquired;
         4> if availableAdmissionCapacityRequestWLAN is set to TRUE:
            5> set the measResult to include availableAdmissionCapacityWLAN if it can be acquired;
         4> if backhaulDL-BandwidthRequestWLAN is set to TRUE:
            5> set the measResult to include backhaulDL-BandwidthWLAN if it can be acquired;
         4> if backhaulUL-BandwidthRequestWLAN is set to TRUE:
            5> set the measResult to include backhaulUL-BandwidthWLAN if it can be acquired;
         4> if channelUtilizationRequestWLAN is set to TRUE:
            5> set the measResult to include channelUtilizationWLAN if it can be acquired;
         4> if stationCountRequestWLAN is set to TRUE:
            5> set the measResult to include stationCountWLAN if it can be acquired;
   1> submit the MeasurementReport message to lower layers for transmission, upon which the procedure ends;

### 5.5.5.2 Determination of available NR measurement results

When configured to report measurement results of the serving and the best neighbouring cells on NR serving frequencies, the UE shall consider NR measurement results to be available as follows:
1> only SSB based results are available and only if configured to measure these for the concerned serving frequency;

1> for the serving cell:

2> include cell quantities RSRP and RSRQ while SINR is included if the UE is configured to measure this quantity on an NR frequency, possibly different from the concerned serving frequency, but only if configured by NR measConfig;

2> include beam results and beam quantities if the UE is configured to measure these on an NR frequency, possibly different from the concerned serving frequency, but only if configured by NR measConfig;

1> for a neighbouring cell:

2> include cell quantities, beam results and beam quantities if the UE is configured to measure these on an NR frequency, possibly different from the concerned serving frequency, but only if configured by NR measConfig.

1> filter available results according to the applicable field in NR quantityConfig:

5.5.5.3 Selection of NR sorting quality

When configured to report the best cells or beams, the UE shall determine the quantity that is used to order and select as follows:

1> consider the quantities the UE reports as candidate sorting quantities i.e. as follows:

2> for NR cells for which measurement reporting is triggered (i.e. NR cells included in cellsTriggered):

3> the quantities defined by reportQuantityCellNR, when used for sorting cells;

3> the quantities defined by reportQuantityRS-IndexNR, when used for sorting beams;

2> for cells on NR serving frequencies:

3> the available quantities of available NR measurement results as specified in 5.5.5.2;

1> if reportType is set to eventTriggered; and if eventId is set to eventB1 or eventB2:

2> consider the trigger quantity to be the sorting quantity;

1> if reportType is set to periodical:

2> if there is a single candidate sorting quantity;

3> consider the concerned quantity to be the sorting quantity;

2> else:

3> if RSRP is one of the candidate sorting quantities;

4> consider RSRP to be the sorting quantity;

3> else:

4> consider RSRQ to be the sorting quantity;

5.5.6 Measurement related actions

5.5.6.1 Actions upon handover and re-establishment

E-UTRAN applies the handover procedure as follows:

- when performing the handover procedure, as specified in 5.3.5.4, ensure that a measObjectId corresponding to each handover target serving frequency is configured as a result of the procedures described in this sub-clause and in 5.3.5.4;
when changing the band while the physical frequency remains unchanged, E-UTRAN releases the measObject corresponding to the source frequency and adds a measObject corresponding to the target frequency (i.e. it does not reconfigure the measObject);

E-UTRAN applies the re-establishment procedure as follows:

- when performing the connection re-establishment procedure, as specified in 5.3.7, ensure that a measObjectId corresponding each target serving frequency is configured as a result of the procedure described in this sub-clause and the subsequent connection reconfiguration procedure immediately following the re-establishment procedure;
- in the first reconfiguration following the re-establishment when changing the band while the physical frequency remains unchanged, E-UTRAN releases the measObject corresponding to the source frequency and adds a measObject corresponding to the target frequency (i.e. it does not reconfigure the measObject);

The UE shall:

1> for each measId included in the measIdList within VarMeasConfig:
   2> if the triggerType is set to periodical:
      3> remove this measId from the measIdList within VarMeasConfig;
1> if the procedure was triggered due to a handover or successful re-establishment and the procedure involves a change of primary frequency, update the measId values in the measIdList within VarMeasConfig as follows:
   2> if a measObjectId value corresponding to the target primary frequency exists in the measObjectList within VarMeasConfig:
      3> for each measId value in the measIdList:
         4> if the measId value is linked to the measObjectId value corresponding to the source primary frequency:
            5> link this measId value to the measObjectId value corresponding to the target primary frequency;
         4> else if the measId value is linked to the measObjectId value corresponding to the target primary frequency:
            5> link this measId value to the measObjectId value corresponding to the source primary frequency;
   2> else:
      3> remove all measId values that are linked to the measObjectId value corresponding to the source primary frequency;
1> remove all measurement reporting entries within VarMeasReportList;
1> stop the periodical reporting timer or timer T321, whichever one is running, as well as associated information (e.g. timeToTrigger) for all measId;
1> release the measurement gaps, if activated;

NOTE: If the UE requires measurement gaps to perform inter-frequency or inter-RAT measurements, the UE resumes the inter-frequency and inter-RAT measurements after the E-UTRAN has setup the measurement gaps.

5.5.6.2 Speed dependant scaling of measurement related parameters

The UE shall adjust the value of the following parameter configured by the E-UTRAN depending on the UE speed: timeToTrigger. The UE shall apply 3 different levels, which are selected as follows:

The UE shall:

1> perform mobility state detection using the mobility state detection as specified in TS 36.304 [4] with the following modifications:
2> counting handovers instead of cell reselections;
2> applying the parameter applicable for RRC_CONNECTED as included in **speedStatePars** within **VarMeasConfig**;

1> if high mobility state is detected:
2> use the **timeToTrigger** value multiplied by **sf-High** within **VarMeasConfig**;
1> else if medium mobility state is detected:
2> use the **timeToTrigger** value multiplied by **sf-Medium** within **VarMeasConfig**;
1> else:
2> no scaling is applied;

### 5.5.7 Inter-frequency RSTD measurement indication

#### 5.5.7.1 General

![InterFreqRSTDMeasurementIndication](image)

**Figure 5.5.7.1-1: Inter-frequency RSTD measurement indication**

The purpose of this procedure is to indicate to the network that the UE is going to start/stop OTDOA inter-frequency RSTD measurements which require measurement gaps as specified in [16, 8.1.2.6]. The procedure is also used to indicate to the network that the UE is going to start/stop OTDOA intra-frequency RSTD measurements which require measurement gaps. This procedure is also used to indicate to the network the measurement gap that the category M1 or M2 UE prefers to perform RSTD measurements with dense PRS configuration, as specified in TS 36.133 [16], Table 8.1.2.1-3.

**NOTE:** It is a network decision to configure the measurement gap.

#### 5.5.7.2 Initiation

The UE shall:

1> if and only if upper layers indicate to start performing inter-frequency RSTD measurements and the UE requires measurement gaps for these measurements while measurement gaps are either not configured or not sufficient:

2> initiate the procedure to indicate start;

**NOTE 1:** The UE verifies the measurement gap situation only upon receiving the indication from upper layers. If at this point in time sufficient gaps are available, the UE does not initiate the procedure. Unless it receives a new indication from upper layers, the UE is only allowed to further repeat the procedure in the same PCell once per frequency if the provided measurement gaps are insufficient.

1> if and only if upper layers indicate to stop performing inter-frequency RSTD measurements:

2> initiate the procedure to indicate stop;

**NOTE 2:** The UE may initiate the procedure to indicate stop even if it did not previously initiate the procedure to indicate start.
5.5.7.3 Actions related to transmission of *InterFreqRSTDMeasurementIndication* message

The UE shall set the contents of *InterFreqRSTDMeasurementIndication* message as follows:

1. if the procedure is initiated to indicate start or stop of inter-frequency RSTD measurements:
   2. set the *rstd-InterFreqIndication* as follows:
      3. if the procedure is initiated to indicate start of inter-frequency RSTD measurements:
         4. set the *rstd-InterFreqInfoList* according to the information received from upper layers;
         4. for category M1 or M2 UE, if the procedure is initiated to indicate the measurement gap that the UE prefers to perform RSTD measurements with dense PRS configuration:
            5. set the *measPRS-Offset-r15* according to the UE preference;
      3. else if the procedure is initiated to indicate stop of inter-frequency RSTD measurements:
         4. set the *rstd-InterFreqIndication* to the value *stop*;
   1. else:
      2. set the *rstd-InterFreqIndication* as follows:
         3. if the procedure is initiated to indicate start of intra-frequency RSTD measurements:
            4. set the *carrierFreq* in the *rstd-InterFreqInfoList* to the carrier frequency of the serving cell;
            4. for category M1 or M2 UE, if the procedure is initiated to indicate the measurement gap that the UE prefers to perform RSTD measurements with dense PRS configuration:
               5. set the *measPRS-Offset-r15* according to the UE preference;
         3. else if the procedure is initiated to indicate stop of intra-frequency RSTD measurements:
            4. set the *rstd-InterFreqIndication* to the value *stop*;
   1. submit the *InterFreqRSTDMeasurementIndication* message to lower layers for transmission, upon which the procedure ends;

5.6 Other

5.6.0 General

For NB-IoT, only a subset of the procedures described in this sub-clause apply.

Table 5.6.0-1 specifies the procedures that are applicable to NB-IoT. All other procedures are not applicable to NB-IoT; this is not further stated in the corresponding procedures.

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5.6.1 DL information transfer

5.6.1.1 General

The purpose of this procedure is to transfer NAS, (tunnelled) non-3GPP dedicated information or time reference information from E-UTRAN to a UE in RRC_CONNECTED.

5.6.1.2 Initiation

E-UTRAN initiates the DL information transfer procedure whenever there is a need to transfer NAS, non-3GPP dedicated information or time reference information. E-UTRAN initiates the DL information transfer procedure by sending the DLInformationTransfer message.

5.6.1.3 Reception of the DLInformationTransfer by the UE

Upon receiving DLInformationTransfer message, the UE shall:

1> if the UE is a NB-IoT UE; or
1> if the dedicatedInfoType is present and set to dedicatedInfoNAS:
2> forward the dedicatedInfoNAS to the NAS upper layers.
1> if the dedicatedInfoType is present and set to dedicatedInfoCDMA2000-1XRTT or to dedicatedInfoCDMA2000-HRPD:
2> forward the dedicatedInfoCDMA2000 to the CDMA2000 upper layers;
1> if timeReferenceInfo is included:
2> calculate the time reference based on the included time, timeInfoType and referenceSFN in timeReferenceInfo;
2> calculate the inaccuracy of the time reference based on the uncertainty and other implementation-related inaccuracies, if uncertainty is included in timeReferenceInfo;
2> inform upper layers of the time reference and, if uncertainty is included in timeReferenceInfo, of the inaccuracy of the time reference.

5.6.2 UL information transfer

5.6.2.1 General

The purpose of this procedure is to transfer NAS, (tunnelled) non-3GPP dedicated information or time reference information from E-UTRAN to a UE in RRC_CONNECTED.
The purpose of this procedure is to transfer NAS or (tunnelled) non-3GPP dedicated information from the UE to E-UTRAN.

5.6.2.2 Initiation

A UE in RRC_CONNECTED initiates the UL information transfer procedure whenever there is a need to transfer NAS or non-3GPP dedicated information, except at RRC connection establishment or resume in which case the NAS information is piggybacked to the **RRCConnectionSetupComplete** or **RRCConnectionResumeComplete** message correspondingly. The UE initiates the UL information transfer procedure by sending the **ULInformationTransfer** message. When CDMA2000 information has to be transferred, the UE shall initiate the procedure only if SRB2 is established.

5.6.2.3 Actions related to transmission of **ULInformationTransfer** message

The UE shall set the contents of the **ULInformationTransfer** message as follows:

1> if there is a need to transfer NAS information:
   2> if the UE is a NB-IoT UE:
      3> set the **dedicatedInfoNAS** to include the information received from upper layers;
   2> else, set the **dedicatedInfoType** to include the **dedicatedInfoNAS**;
1> if there is a need to transfer CDMA2000 1XRTT information:
   2> set the **dedicatedInfoType** to include the **dedicatedInfoCDMA2000-1XRTT**;
1> if there is a need to transfer CDMA2000 HRPD information:
   2> set the **dedicatedInfoType** to include the **dedicatedInfoCDMA2000-HRPD**;
1> upon RRC connection establishment, if UE supports the Control Plane CIoT EPS optimisation and UE does not need UL gaps during continuous uplink transmission:
   2> configure lower layers to stop using UL gaps during continuous uplink transmission in FDD for **ULInformationTransfer** message and subsequent uplink transmission in RRC_CONNECTED except for UL transmissions as specified in TS36.211 [21];
1> submit the **ULInformationTransfer** message to lower layers for transmission, upon which the procedure ends;

5.6.2.4 Failure to deliver **ULInformationTransfer** message

The UE shall:

1> if the UE is a NB-IoT UE, AS security is not started and radio link failure occurs before the successful delivery of **ULInformationTransfer** messages has been confirmed by lower layers; or
1> if mobility (i.e. handover, RRC connection re-establishment) occurs before the successful delivery of **ULInformationTransfer** messages has been confirmed by lower layers:
   2> inform upper layers about the possible failure to deliver the information contained in the concerned **ULInformationTransfer** messages;
5.6.2a    UL information transfer for MR-DC

5.6.2a.1    General

![Diagram: ULInformationTransferMRDC]

Figure 5.6.2a.1-1: UL information transfer MR-DC

The purpose of this procedure is to transfer from the UE to E-UTRAN MR-DC dedicated information e.g. the NR RRC Measurement Report message.

5.6.2a.2    Initiation

A UE in RRC_CONNECTED initiates the UL information transfer procedure whenever there is a need to transfer MR DC dedicated information as specified in TS 38.331 [82]. I.e. the procedure is not used during an RRC connection reconfiguration involving NR connection reconfiguration, in which case the MR DC information is piggybacked to the RRCConnectionReconfigurationComplete message.

5.6.2a.3    Actions related to transmission of ULInformationTransferMRDC message

The UE shall set the contents of the ULInformationTransferMRDC message as follows:

1> if there is a need to transfer MR DC dedicated information:

2> set the ul-DCCH-MessageNR to include the MR DC dedicated information to be transferred;

1> submit the ULInformationTransferMRDC message to lower layers for transmission, upon which the procedure ends;

5.6.2a.4    Void

5.6.3    UE capability transfer

5.6.3.1    General

![Diagram: UECapabilityEnquiry]

UECapabilityInformation

UECapabilityEnquiry

Figure 5.6.3.1-1: UE capability transfer

The purpose of this procedure is to transfer UE radio access capability information from the UE to E-UTRAN.

If the UE has changed its E-UTRAN radio access capabilities, the UE shall request higher layers to initiate the necessary NAS procedures (see TS 23.401 [41]) that would result in the update of UE radio access capabilities using a new RRC connection.

NOTE: Change of the UE's GERAN UE radio capabilities in RRC_IDLE is supported by use of Tracking Area Update.
5.6.3.2 Initiation

E-UTRAN initiates the procedure to a UE in RRC_CONNECTED when it needs (additional) UE radio access capability information.

5.6.3.3 Reception of the UECapabilityEnquiry by the UE

The UE shall:

1> for NB-IoT, set the contents of UECapabilityInformation message as follows:
   2> include the UE Radio Access Capability Parameters within the ue-Capability;
   2> include ue-RadioPagingInfo;
   2> submit the UECapabilityInformation message to lower layers for transmission, upon which the procedure ends;

1> else, set the contents of UECapabilityInformation message as follows:
   2> if the ue-CapabilityRequest includes eutra:
      3> include the UE-EUTRA-Capability within a ue-CapabilityRAT-Container and with the rat-Type set to eutra;
      3> if the UE supports FDD and TDD:
         4> set all fields of UECapabilityInformation, except field fdd-Add-UE-EUTRA-Capabilities and tdd-Add-UE-EUTRA-Capabilities (including their sub-fields), to include the values applicable for both FDD and TDD (i.e. functionality supported by both modes);
         4> if (some of) the UE capability fields have a different value for FDD and TDD:
            5> if for FDD, the UE supports additional functionality compared to what is indicated by the previous fields of UECapabilityInformation:
               6> include field fdd-Add-UE-EUTRA-Capabilities and set it to include fields reflecting the additional functionality applicable for FDD;
            5> if for TDD, the UE supports additional functionality compared to what is indicated by the previous fields of UECapabilityInformation:
               6> include field tdd-Add-UE-EUTRA-Capabilities and set it to include fields reflecting the additional functionality applicable for TDD;
      3> else (UE supports single xDD mode):
         4> set all fields of UECapabilityInformation, except field fdd-Add-UE-EUTRA-Capabilities and tdd-Add-UE-EUTRA-Capabilities (including their sub-fields), to include the values applicable for the xDD mode supported by the UE;

NOTE 1: The UE includes fields of XDD-Add-UE-EUTRA-Capabilities in accordance with the following:
- The field is included only if one or more of its sub-fields (or bits in the feature group indicators string) has a value that is different compared to the value signalled elsewhere within UE-EUTRA-Capability; (this value signalled elsewhere is also referred to as the Common value, that is supported for both XDD modes)
- For the fields that are included in XDD-Add-UE-EUTRA-Capabilities, the UE sets:
   - the sub-fields (or bits in the feature group indicators string) that are not allowed to be different to the same value as the Common value;
   - the sub-fields (or bits in the feature group indicators string) that are allowed to be different to a value indicating at least the same functionality as indicated by the Common value;
3> compile a list of band combinations, candidate for inclusion in the UECapabilityInformation message, comprising of band combinations supported by the UE according to the following priority order (i.e. listed in order of decreasing priority):

4> include all non-CA bands, regardless of whether UE supports carrier aggregation, only:
   - if the UE includes ue-Category-v1020 (i.e. indicating category 6 to 8); or
   - if for at least one of the non-CA bands, the UE supports more MIMO layers with TM9 and TM10 than implied by the UE category; or
   - if the UE supports TM10 with one or more CSI processes; or
   - if the UE supports 1024QAM in DL;

4> if the UECapabilityEnquiry message includes requestedFrequencyBands and UE supports requestedFrequencyBands:
   5> include all 2DL+1UL CA band combinations, only consisting of bands included in requestedFrequencyBands;
   5> include all other CA band combinations, only consisting of bands included in requestedFrequencyBands, and prioritized in the order of requestedFrequencyBands, (i.e. first include remaining band combinations containing the first-listed band, then include remaining band combinations containing the second-listed band, and so on);

4> else (no requested frequency bands):
   5> include all 2DL+1UL CA band combinations;
   5> include all other CA band combinations;

4> if UE supports maximumCCsRetrieval and if the UECapabilityEnquiry message includes the requestedMaxCCsDL and the requestedMaxCCsUL (i.e. both UL and DL maximums are given):
   5> remove from the list of candidates the band combinations for which the number of CCs in DL exceeds the value indicated in the requestedMaxCCsDL or for which the number of CCs in UL exceeds the value indicated in the requestedMaxCCsUL;
   5> indicate in requestedCCsUL the same value as received in requestedMaxCCsUL;
   5> indicate in requestedCCsDL the same value as received in requestedMaxCCsDL;

4> else if UE supports maximumCCsRetrieval and if the UECapabilityEnquiry message includes the requestedMaxCCsDL (i.e. only DL maximum limit is given):
   5> remove from the list of candidates the band combinations for which the number of CCs in DL exceeds the value indicated in the requestedMaxCCsDL;
   5> indicate value in requestedCCsDL the same value as received in requestedMaxCCsDL;

4> else if UE supports maximumCCsRetrieval and if the UECapabilityEnquiry message includes the requestedMaxCCsUL (i.e. only UL maximum limit is given):
   5> remove from the list of candidates the band combinations for which the number of CCs in UL exceeds the value indicated in the requestedMaxCCsUL;
   5> indicate in requestedCCsUL the same value as received in requestedMaxCCsUL;

4> if the UE supports reducedIntNonContComb and the UECapabilityEnquiry message includes requestReducedIntNonContComb:
   5> set reducedIntNonContCombRequested to true;
   5> remove from the list of candidates the intra-band non-contiguous CA band combinations which support is implied by another intra-band non-contiguous CA band combination included in the list of candidates as specified in TS 36.306 [5, 4.3.5.21]:
if the UE supports requestReducedFormat and UE supports skipFallbackCombinations and UECapabilityEnquiry message includes requestSkipFallbackComb:

set skipFallbackCombRequested to true;

for each band combination included in the list of candidates (including 2DL+1UL CA band combinations), starting with the ones with the lowest number of DL and UL carriers, that concerns a fallback band combination of another band combination included in the list of candidates as specified in TS 36.306 [5]:

remove the band combination from the list of candidates;

include differentFallbackSupported in the band combination included in the list of candidates whose fallback concerns the removed band combination, if its capabilities differ from the removed band combination;

if the UE supports requestReducedFormat and diffFallbackCombReport, and UECapabilityEnquiry message includes requestDiffFallbackCombList:

if the UE does not support skipFallbackCombinations or UECapabilityEnquiry message does not include requestSkipFallbackComb:

remove all band combination from the list of candidates;

for each CA band combination indicated in requestDiffFallbackCombList:

include the CA band combination, if not already in the list of candidates;

include the fallback combinations for which the supported UE capabilities are different from the capability of the CA band combination;

include CA band combinations indicated in requestDiffFallbackCombList into requestedDiffFallbackCombList;

if the UECapabilityEnquiry message includes requestReducedFormat and UE supports requestReducedFormat:

include in supportedBandCombinationReduced as many as possible of the band combinations included in the list of candidates, including the non-CA combinations, determined according to the rules and priority order defined above;

else

if the UECapabilityEnquiry message includes requestedFrequencyBands and UE supports requestedFrequencyBands:

include in supportedBandCombination as many as possible of the band combinations included in the list of candidates, including the non-CA combinations and up to 5DL+5UL CA band combinations, determined according to the rules and priority order defined above;

include in supportedBandCombinationAdd as many as possible of the remaining band combinations included in the list of candidates, (i.e. the candidates not included in supportedBandCombination), up to 5DL+5UL CA band combinations, determined according to the rules and priority order defined above;

else

include in supportedBandCombination as many as possible of the band combinations included in the list of candidates, including the non-CA combinations and up to 5DL+5UL CA band combinations, determined according to the rules defined above;

if it is not possible to include in supportedBandCombination all the band combinations to be included according to the above, selection of the subset of band combinations to be included is left up to UE implementation;
3> indicate in requestedBands the same bands and in the same order as included in requestedFrequencyBands, if received;

3> if the UE is a category 0, M1 or M2 UE, or supports any UE capability information in ue-RadioPagingInfo, according to TS 36.306 [5];

4> include ue-RadioPagingInfo and set the fields according to TS 36.306 [5];

3> for each band combination the UE included in a field of the UECapabilityInformation message in accordance with the previous:

4> include the baseband processing combination supported for the band combination into basebandProcessingCombList, unless it is already included;

4> for each fallback baseband processing combination of this baseband processing combination, as specified in TS 36.306 [5], for which supported baseband capabilities are different from this baseband processing combination:

5> include the fallback baseband processing combinations into basebandProcessingCombList;

3> if the UECapabilityEnquiry message includes request-sTTI-sPT-Capability and if the UE supports short TTI and/or SPT:

4> for each band combination the UE included in a field of the UECapabilityInformation message in accordance with the previous:

4> if the UE supports short TTI, include the short TTI capabilities for each of the band combinations using the STTI-SPT-BandCombinationParameters;

4> if the UE supports SPT, include the SPT capabilities for each of the band combinations using the STTI-SPT-BandCombinationParameters;

NOTE: The UE may have to add/repeat the band combinations to the list of band combinations included earlier, to include short TTI capabilities and/or SPT capabilities.

2> if the UE supports short TTI and/or SPT:

3> include in the UE radio access capabilities the IE sTTI-SPT-Supported and set to supported;

2> if the ue-CapabilityRequest includes geran-cs and if the UE supports GERAN CS domain:

3> include the UE radio access capabilities for GERAN CS within a ue-CapabilityRAT-Container and with the rat-Type set to geran-cs;

2> if the ue-CapabilityRequest includes geran-ps and if the UE supports GERAN PS domain:

3> include the UE radio access capabilities for GERAN PS within a ue-CapabilityRAT-Container and with the rat-Type set to geran-ps;

2> if the ue-CapabilityRequest includes utra and if the UE supports UTRA:

3> include the UE radio access capabilities for UTRA within a ue-CapabilityRAT-Container and with the rat-Type set to utra;

2> if the ue-CapabilityRequest includes cdma2000-1XRTT and if the UE supports CDMA2000 1xRTT:

3> include the UE radio access capabilities for CDMA2000 within a ue-CapabilityRAT-Container and with the rat-Type set to cdma2000-1XRTT;

2> if the ue-CapabilityRequest includes nr and if the UE supports NR:

3> include the UE radio access capabilities for NR within a ue-CapabilityRAT-Container, with the rat-Type set to nr and in accordance with requestedFreqBandsNR-MRDC and as specified in TS 38.331 [82], clause 5.6.1.

2> if the ue-CapabilityRequest includes eutra-nr and if the UE supports EN-DC:
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5.6.4 CSFB to 1x Parameter transfer

5.6.4.1 General

The purpose of this procedure is to transfer the CDMA2000 1xRTT parameters required to register the UE in the CDMA2000 1xRTT network for CSFB support.

5.6.4.2 Initiation

A UE in RRC_CONNECTED initiates the CSFB to 1x parameter transfer procedure upon request from the CDMA2000 upper layers. The UE initiates the CSFB to 1x parameter transfer procedure by sending the CSFBParametersRequestCDMA2000 message.

5.6.4.3 Actions related to transmission of CSFBParametersRequestCDMA2000 message

The UE shall:

1> submit the CSFBParametersRequestCDMA2000 message to lower layers for transmission using the current configuration;

5.6.4.4 Reception of the CSFBParametersResponseCDMA2000 message

Upon reception of the CSFBParametersResponseCDMA2000 message, the UE shall:

1> forward the rand and the mobilityParameters to the CDMA2000 1xRTT upper layers;

5.6.5 UE Information

5.6.5.1 General

The UE Information procedure is as follows:

1> include the UE radio access capabilities for EUTRA-NR within a ue-CapabilityRAT-Container, with the rat-Type set to eutra-nr and in accordance with requestedFreqBandsNR-MRDC and as specified in TS 38.331 [82, 5.6.1].

1> submit the UECapabilityInformation message to lower layers for transmission, upon which the procedure ends;

Figure 5.6.4.1-1: CSFB to 1x Parameter transfer

Figure 5.6.5.1-1: UE information procedure
The UE information procedure is used by E-UTRAN to request the UE to report information.

5.6.5.2 Initiation

E-UTRAN initiates the procedure by sending the *UEInformationRequest* message. E-UTRAN should initiate this procedure only after successful security activation.

5.6.5.3 Reception of the *UEInformationRequest* message

Upon receiving the *UEInformationRequest* message, the UE shall, only after successful security activation:

1. if *rach-ReportReq* is set to *true*, set the contents of the *rach-Report* in the *UEInformationResponse* message as follows:
   2. set the *numberOfPreamblesSent* to indicate the number of preambles sent by MAC for the last successfully completed random access procedure;
   3. if contention resolution was not successful as specified in TS 36.321 [6] for at least one of the transmitted preambles for the last successfully completed random access procedure:
      3. set the *contentionDetected* to *true*;
   2. else:
      3. set the *contentionDetected* to *false*;

1. if *rlf-ReportReq* is set to *true* and the UE has radio link failure information or handover failure information available in *VarRLF-Report* and if the RPLMN is included in *plmn-IdentityList* stored in *VarRLF-Report*:
   2. set *timeSinceFailure* in *VarRLF-Report* to the time that elapsed since the last radio link or handover failure in E-UTRA;
   2. set the *rlf-Report* in the *UEInformationResponse* message to the value of *rlf-Report* in *VarRLF-Report*;
   2. discard the *rlf-Report* from *VarRLF-Report* upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1. if *connEstFailReportReq* is set to *true* and the UE has connection establishment failure information in *VarConnEstFailReport* and if the RPLMN is equal to *plmn-Identity* stored in *VarConnEstFailReport*:
   2. set *timeSinceFailure* in *VarConnEstFailReport* to the time that elapsed since the last connection establishment failure in E-UTRA;
   2. set the *connEstFailReport* in the *UEInformationResponse* message to the value of *connEstFailReport* in *VarConnEstFailReport*;
   2. discard the *connEstFailReport* from *VarConnEstFailReport* upon successful delivery of the *UEInformationResponse* message confirmed by lower layers;

1. if the *logMeasReportReq* is present and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:
   2. if *VarLogMeasReport* includes one or more logged measurement entries, set the contents of the *logMeasReport* in the *UEInformationResponse* message as follows:
      3. include the *absoluteTimeStamp* and set it to the value of *absoluteTimeInfo* in the *VarLogMeasReport*;
      3. include the *traceReference* and set it to the value of *traceReference* in the *VarLogMeasReport*;
      3. include the *traceRecordingSessionRef* and set it to the value of *traceRecordingSessionRef* in the *VarLogMeasReport*;
      3. include the *tce-Id* and set it to the value of *tce-Id* in the *VarLogMeasReport*;
      3. include the *logMeasInfoList* and set it to include one or more entries from *VarLogMeasReport* starting from the entries logged first;
3> if the VarLogMeasReport includes one or more additional logged measurement entries that are not included in the logMeasInfoList within the UEInformationResponse message:

4> include the logMeasAvailable;

3> if the VarLogMeasReport includes one or more additional logged Bluetooth measurement entries that are not included in the logMeasInfoList within the UEInformationResponse message:

4> include the logMeasAvailableBT;

3> if the VarLogMeasReport includes one or more additional logged WLAN measurement entries that are not included in the logMeasInfoList within the UEInformationResponse message:

4> include the logMeasAvailableWLAN;

1> if mobilityHistoryReportReq is set to true:

2> include the mobilityHistoryReport and set it to include entries from VarMobilityHistoryReport;

2> include in the mobilityHistoryReport an entry for the current cell, possibly after removing the oldest entry if required, and set its fields as follows:

3> set visitedCellId to the global cell identity of the current cell;

3> set field timeSpent to the time spent in the current cell;

1> if the idleModeMeasurementReq is included in the UEInformationRequest and UE has stored VarMeasIdleReport:

2> set the measResultListIdle in the UEInformationResponse message to the value of idleMeasReport in the VarMeasIdleReport;

2> discard the VarMeasIdleReport upon successful delivery of the UEInformationResponse message confirmed by lower layers;

1> if flightPathInfoReq field is present and the UE has flight path information available:

2> include the flightPathInfoReport and set it to include the list of waypoints along the flight path;

2> if the includeTimeStamp is set to TRUE:

3> set the field timeStamp to the time when UE intends to arrive to each waypoint if this information is available at the UE;

1> if the logMeasReport is included in the UEInformationResponse:

2> submit the UEInformationResponse message to lower layers for transmission via SRB2;

2> discard the logged measurement entries included in the logMeasInfoList from VarLogMeasReport upon successful delivery of the UEInformationResponse message confirmed by lower layers;

1> else:

2> submit the UEInformationResponse message to lower layers for transmission via SRB1;

5.6.6 Logged Measurement Configuration

5.6.6.1 General
Figure 5.6.6.1-1: Logged measurement configuration

The purpose of this procedure is to configure the UE to perform logging of measurement results while in RRC_IDLE and to perform logging of measurement results for MBSFN in both RRC_IDLE and RRC_CONNECTED. The procedure applies to logged measurements capable UEs that are in RRC_CONNECTED.

NOTE: E-UTRAN may retrieve stored logged measurement information by means of the UE information procedure.

5.6.6.2 Initiation

E-UTRAN initiates the logged measurement configuration procedure to UE in RRC_CONNECTED by sending the `LoggedMeasurementConfiguration` message.

5.6.6.3 Reception of the `LoggedMeasurementConfiguration` by the UE

Upon receiving the `LoggedMeasurementConfiguration` message the UE shall:

1> discard the logged measurement configuration as well as the logged measurement information as specified in 5.6.7;
1> store the received `loggingDuration`, `loggingInterval` and `areaConfiguration`, if included, in `VarLogMeasConfig`;
1> if the `LoggedMeasurementConfiguration` message includes `plmn-IdentityList`:
  2> set `plmn-IdentityList` in `VarLogMeasReport` to include the RPLMN as well as the PLMNs included in `plmn-IdentityList`;
  1> else:
    2> set `plmn-IdentityList` in `VarLogMeasReport` to include the RPLMN;
1> store the received `absoluteTimeInfo`, `traceReference`, `traceRecordingSessionRef` and `tce-Id` in `VarLogMeasReport`;
1> store the received `targetMBSFN-AreaList`, if included, in `VarLogMeasConfig`;
1> start timer T330 with the timer value set to the `loggingDuration`;

5.6.6.4 T330 expiry

Upon expiry of T330 the UE shall:

1> release `VarLogMeasConfig`;

The UE is allowed to discard stored logged measurements, i.e. to release `VarLogMeasReport`, 48 hours after T330 expiry.
5.6.7 Release of Logged Measurement Configuration

5.6.7.1 General

The purpose of this procedure is to release the logged measurement configuration as well as the logged measurement information.

5.6.7.2 Initiation

The UE shall initiate the procedure upon receiving a logged measurement configuration in another RAT. The UE shall also initiate the procedure upon power off or detach.

The UE shall:

1. stop timer T330, if running;
2. if stored, discard the logged measurement configuration as well as the logged measurement information, i.e. release the UE variables VarLogMeasConfig and VarLogMeasReport;

5.6.8 Measurements logging

5.6.8.1 General

This procedure specifies the logging of available measurements by a UE in RRC_IDLE that has a logged measurement configuration and the logging of available measurements by a UE in both RRC_IDLE and RRC_CONNECTED if targetMBSFN-AreaList is included in VarLogMeasConfig.

5.6.8.2 Initiation

While T330 is running, the UE shall:

1. if measurement logging is suspended:
   2. if during the last logging interval the IDC problems detected by the UE is resolved, resume measurement logging;
   1. if not suspended, perform the logging in accordance with the following:

2. if targetMBSFN-AreaList is included in VarLogMeasConfig:
   3. if the UE is camping normally on an E-UTRA cell or is connected to E-UTRA; and
   3. if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport; and
   3. if the PCell (in RRC_CONNECTED) or cell where the UE is camping (in RRC_IDLE) is part of the area indicated by areaConfiguration if configured in VarLogMeasConfig:
   4. for MBSFN areas, indicated in targetMBSFN-AreaList, from which the UE is receiving MBMS service:
      5. perform MBSFN measurements in accordance with the performance requirements as specified in TS 36.133 [16];

NOTE 1: When configured to perform MBSFN measurement logging by targetMBSFN-AreaList, the UE is not required to receive additional MBSFN subframes, i.e. logging is based on the subframes corresponding to the MBMS services the UE is receiving.

5. perform logging at regular time intervals as defined by the loggingInterval in VarLogMeasConfig, but only for those intervals for which MBSFN measurement results are available as specified in TS 36.133 [16];

2. else if the UE is camping normally on an E-UTRA cell and if the RPLMN is included in plmn-IdentityList stored in VarLogMeasReport and, if the cell is part of the area indicated by areaConfiguration if configured in VarLogMeasConfig:
3> perform the logging at regular time intervals, as defined by the `loggingInterval` in `VarLogMeasConfig`;

2> when adding a logged measurement entry in `VarLogMeasReport`, include the fields in accordance with the following:

3> if the UE detected IDC problems during the last logging interval:
   4> if `measResultServCell` in `VarLogMeasReport` is not empty:
      5> include `InDeviceCoexDetected`;
      5> suspend measurement logging from the next logging interval;
   4> else:
      5> suspend measurement logging;

NOTE 1A: The UE may detect the start of IDC problems as early as Phase 1 as described in 23.4 of TS 36.300 [9].

3> set the `relativeTimeStamp` to indicate the elapsed time since the moment at which the logged measurement configuration was received;

3> if detailed location information became available during the last logging interval, set the content of the `locationInfo` as follows:
   4> include the `locationCoordinates`;

3> if `WLAN-NameList` is included in `VarLogMeasConfig`:
   4> if detailed WLAN measurements are available:
      5> include `logMeasResultListWLAN`, in order of decreasing RSSI for WLAN APs;

3> if `BT-NameList` is included in `VarLogMeasConfig`:
   4> if detailed Bluetooth measurements are available:
      5> include `logMeasResultListBT`, in order of decreasing RSSI for Bluetooth beacons;

3> if `targetMBSFN-AreaList` is included in `VarLogMeasConfig`:
   4> for each MBSFN area, for which the mandatory measurements result fields became available during the last logging interval:
      5> set the `rsrpResultMBSFN`, `rsrqResultMBSFN` to include measurement results that became available during the last logging interval;
      5> include the fields `signallingBLER-Result` or `dataBLER-MCH-ResultList` if the concerned BLER results are available,
      5> set the `mbsfn-AreaId` and `carrierFrequency` to indicate the MBSFN area in which the UE is receiving MBSFN transmission;

4> if in RRC_CONNECTED:
   5> set the `servCellIdentity` to indicate global cell identity of the PCell;
   5> set the `measResultServCell` to include the layer 3 filtered measured results of the PCell;
   5> if available, set the `measResultNeighCells` to include the layer 3 filtered measured results of SCell(s) and neighbouring cell(s) measurements that became available during the last logging interval, in order of decreasing RSRP, for at most the following number of cells: 6 intra-frequency and 3 inter-frequency cells per frequency and according to the following:
      6> for each cell included, include the optional fields that are available;
5> if available, optionally set the `measResultNeighCells` to include the layer 3 filtered measured results of neighbouring cell(s) measurements that became available during the last logging interval, in order of decreasing RSCP(UTRA)/RSSI(GERAN)/PilotStrength(cdma2000), for at most the following number of cells: 3 inter-RAT cells per frequency (UTRA, cdma2000)/set of frequencies (GERAN), and according to the following:

6> for each cell included, include the optional fields that are available;

4> if in RRC_IDLE:

5> set the `servCellIdentity` to indicate global cell identity of the serving cell;

5> set the `measResultServCell` to include the quantities of the serving cell;

5> if available, set the `measResultNeighCells`, in order of decreasing ranking-criterion as used for cell re-selection, to include neighbouring cell measurements that became available during the last logging interval for at most the following number of neighbouring cells: 6 intra-frequency and 3 inter-frequency neighbours per frequency and according to the following:

6> for each cell included, include the optional fields that are available;

5> if available, optionally set the `measResultNeighCells`, in order of decreasing ranking-criterion as used for cell re-selection, to include neighbouring cell measurements that became available during the last logging interval, for at most the following number of neighbouring cells: 3 inter-RAT cells per frequency (UTRA, cdma2000)/set of frequencies (GERAN), and according to the following:

6> for each cell included, include the optional fields that are available;

4> for the cells included according to the previous (i.e. covering previous and current serving cells as well as neighbouring EUTRA cells) include results according to the extended RSRQ if corresponding results are available according to the associated performance requirements defined in TS 36.133 [16];

4> for the cells included according to the previous (i.e. covering previous and current serving cells as well as neighbouring EUTRA cells) include RSRQ type if the result was based on measurements using a wider band or using all OFDM symbols;

NOTE 2: The UE includes the latest results in accordance with the performance requirements as specified in TS 36.133 [16]. E.g. RSRP and RSRQ results are available only if the UE has a sufficient number of results/receives a sufficient number of subframes during the logging interval.

3> else:

4> set the `servCellIdentity` to indicate global cell identity of the cell the UE is camping on;

4> set the `measResultServCell` to include the quantities of the cell the UE is camping on;

4> if available, set the `measResultNeighCells`, in order of decreasing ranking-criterion as used for cell re-selection, to include neighbouring cell measurements that became available during the last logging interval for at most the following number of neighbouring cells: 6 intra-frequency and 3 inter-frequency neighbours per frequency as well as 3 inter-RAT neighbours, per frequency/set of frequencies (GERAN) per RAT and according to the following:

5> for each neighbour cell included, include the optional fields that are available;

4> for the cells included according to the previous (i.e. covering previous and current serving cells as well as neighbouring EUTRA cells) include results according to the extended RSRQ if corresponding results are available according to the associated performance requirements defined in TS 36.133 [16];

4> for the cells included according to the previous (i.e. covering previous and current serving cells as well as neighbouring EUTRA cells) include RSRQ type if the result was based on measurements using a wider band or using all OFDM symbols;

NOTE 3: The UE includes the latest results of the available measurements as used for cell reselection evaluation in RRC_IDLE or as used for evaluation of reporting criteria or for measurement reporting according to 5.5.3 in RRC_CONNECTED, which are performed in accordance with the performance requirements as specified in TS 36.133 [16].
when the memory reserved for the logged measurement information becomes full, stop timer T330 and perform the same actions as performed upon expiry of T330, as specified in 5.6.6.4;

5.6.9 In-device coexistence indication

5.6.9.1 General

The purpose of this procedure is to inform E-UTRAN about (a change of) the In-Device Coexistence (IDC) problems experienced by the UE in RRC_CONNECTED, as described in TS 36.300 [9], and to provide the E-UTRAN with information in order to resolve them.

5.6.9.2 Initiation

A UE capable of providing IDC indications may initiate the procedure when it is configured to provide IDC indications and upon change of IDC problem information.

Upon initiating the procedure, the UE shall:

1> if configured to provide IDC indications:

2> if the UE did not transmit an InDeviceCoexIndication message since it was configured to provide IDC indications:

3> if on one or more frequencies for which a measObjectEUTRA is configured, the UE is experiencing IDC problems that it cannot solve by itself; or

3> if configured to provide IDC indications for UL CA; and if on one or more supported UL CA combination comprising of carrier frequencies for which a measurement object is configured, the UE is experiencing IDC problems that it cannot solve by itself; or

3> if configured to provide IDC indications for MR-DC, and if on one or more supported MR-DC combination comprising of at least one E-UTRA carrier frequency for which a measurement object is configured and at least one NR carrier frequency included in candidateServingFreqListNR, the UE is experiencing IDC problems that it cannot solve by itself; and

3> if at least one NR carrier frequency is affected by IDC problems in the supported MR-DC combination on which the UE is experiencing the IDC problems

4> initiate transmission of the InDeviceCoexIndication message in accordance with 5.6.9.3;

2> else:

3> if the set of frequencies, for which a measObjectEUTRA is configured and on which the UE is experiencing IDC problems that it cannot solve by itself, is different from the set indicated in the last transmitted InDeviceCoexIndication message; or

3> if for one or more of the frequencies in the previously reported set of frequencies, the interferenceDirection is different from the value indicated in the last transmitted InDeviceCoexIndication message; or
if the TDM assistance information is different from the assistance information included in the last transmitted InDeviceCoexIndication message; or

if configured to provide IDC indications for UL CA; and if the victimSystemType is different from the value indicated in the last transmitted InDeviceCoexIndication message; or

if configured to provide IDC indications for UL CA; and if the set of supported UL CA combinations on which the UE is experiencing IDC problems that it cannot solve by itself and that the UE includes in affectedCarrierFreqCombList according to 5.6.9.3, is different from the set indicated in the last transmitted InDeviceCoexIndication message; or

if configured to provide IDC indications for MR-DC, and if the set of supported MR-DC combinations on which the UE is experiencing IDC problems that it cannot solve by itself and that the UE includes in affectedCarrierFreqCombListMRDC according to 5.6.9.3, is different from the set indicated in the last transmitted InDeviceCoexIndication message:

initiate transmission of the InDeviceCoexIndication message in accordance with 5.6.9.3;

NOTE 1: The term "IDC problems" refers to interference issues applicable across several subframes/slots where not necessarily all the subframes/slots are affected.

NOTE 2: For the frequencies on which a serving cell or serving cells is configured that is activated, IDC problems consist of interference issues that the UE cannot solve by itself, during either active data exchange or upcoming data activity which is expected in up to a few hundred milliseconds.

For frequencies on which a SCell or SCells is configured that is deactivated, reporting IDC problems indicates an anticipation that the activation of the SCell or SCells would result in interference issues that the UE would not be able to solve by itself.

For a non-serving frequency, reporting IDC problems indicates an anticipation that if the non-serving frequency or frequencies became a serving frequency or serving frequencies then this would result in interference issues that the UE would not be able to solve by itself.

5.6.9.3 Actions related to transmission of InDeviceCoexIndication message

The UE shall set the contents of the InDeviceCoexIndication message as follows:

1> if there is at least one E-UTRA carrier frequency, for which a measurement object is configured, that is affected by IDC problems:

2> include the field affectedCarrierFreqList with an entry for each affected E-UTRA carrier frequency for which a measurement object is configured;

2> for each E-UTRA carrier frequency included in the field affectedCarrierFreqList, include interferenceDirection and set it accordingly;

2> include Time Domain Multiplexing (TDM) based assistance information, unless idc-HardwareSharingIndication is configured and the UE has no Time Domain Multiplexing based assistance information that could be used to resolve the IDC problems:

3> if the UE has DRX related assistance information that could be used to resolve the IDC problems:

4> include drx-CycleLength, drx-Offset and drx-ActiveTime;

3> else (the UE has desired subframe reservation patterns related assistance information that could be used to resolve the IDC problems):

4> include idc-SubframePatternList;

3> use the MCG as timing reference if TDM based assistance information regarding the SCG is included;

1> if the UE is configured to provide UL CA information and there is a supported UL CA combination comprising of carrier frequencies for which a measurement object is configured, that is affected by IDC problems:

2> include victimSystemType in ul-CA-AssistanceInfo;

2> if the UE sets victimSystemType to wlan or Bluetooth:
1> if \texttt{idc-HardwareSharingIndication} is configured, and there is at least one E-UTRA carrier frequency, for which a measurement object is configured, the UE is experiencing hardware sharing problems that it cannot solve by itself:

2> include the \texttt{hardwareSharingProblem} and set it accordingly;

1> if the UE is configured to provide IDC indications for MR-DC and there is a supported MR-DC band combination comprising of at least one E-UTRA carrier frequency for which a measurement object is configured and at least one NR carrier frequency included in \texttt{candidateServingFreqListNR}, that is affected by IDC problems:

2> for each entry of \texttt{affectedCarrierFreqCombInfoListMRDC} in \texttt{mrdc-AssistanceInfo};

3> include \texttt{victimSystemType};

3> include \texttt{interferenceDirection};

3> if the UE sets \texttt{victimSystemType} to \texttt{wlan} or \texttt{Bluetooth}:

4> include a set of at least one NR carrier frequency included in \texttt{candidateServingFreqListNR} and optionally one or more E-UTRA carrier frequency for which a measurement object is configured, that is affected by IDC problems;

3> else:

4> optionally include a set of at least one NR carrier frequency included in \texttt{candidateServingFreqListNR} and optionally one or more E-UTRA carrier frequency for which a measurement object is configured, that is affected by IDC problems;

NOTE 1: When sending an \texttt{InDeviceCoexIndication} message to inform E-UTRAN the IDC problems, the UE includes all assistance information (rather than providing e.g. the changed part(s) of the assistance information).

NOTE 2: Upon not anymore experiencing a particular IDC problem that the UE previously reported, the UE provides an IDC indication with the modified contents of the \texttt{InDeviceCoexIndication} message (e.g. by an empty message).

The UE shall submit the \texttt{InDeviceCoexIndication} message to lower layers for transmission.

\section*{5.6.10 UE Assistance Information}

\subsection*{5.6.10.1 General}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure5.6.10.1-1.png}
\caption{UE Assistance Information}
\end{figure}
The purpose of this procedure is to inform e-UTRAN of the UE's power saving preference and SPS assistance information, maximum PDSCH/PUSCH bandwidth configuration preference, overheating assistance information, or the UE's delay budget report carrying desired increment/decrement in the Uu air interface delay or connected mode DRX cycle length and for BL UEs or UEs in CE of the RLM event ("early-out-of-sync" or "early-in-sync") and RLM information. Upon configuring the UE to provide power preference indications e-UTRAN may consider that the UE does not prefer a configuration primarily optimised for power saving until the UE explicitly indicates otherwise.

5.6.10.2 Initiation

A UE capable of providing power preference indications in RRC_CONNECTED may initiate the procedure in several cases including upon being configured to provide power preference indications and upon change of power preference. A UE capable of providing SPS assistance information in RRC_CONNECTED may initiate the procedure in several cases including upon being configured to provide SPS assistance information and upon change of SPS assistance information. A UE capable of providing delay budget report in RRC_CONNECTED may initiate the procedure in several cases, including upon being configured to provide delay budget report and upon change of delay budget preference. A UE capable of CE mode and providing maximum PDSCH/PUSCH bandwidth preference in RRC_CONNECTED may initiate the procedure upon being configured to provide maximum PDSCH/PUSCH bandwidth preference and/or upon change of maximum PDSCH/PUSCH bandwidth preference. A UE capable of providing overheating assistance information in RRC_CONNECTED may initiate the procedure if it was configured to do so, upon detecting internal overheating, or upon detecting that it is no longer experiencing an overheating condition.

Upon initiating the procedure, the UE shall:

1> if configured to provide power preference indications:
   2> if the UE did not transmit a `UEAssistanceInformation` message with `powerPrefIndication` since it was configured to provide power preference indications; or
   2> if the current power preference is different from the one indicated in the last transmission of the `UEAssistanceInformation` message and timer T340 is not running:
      3> initiate transmission of the `UEAssistanceInformation` message in accordance with 5.6.10.3;

1> if configured to provide maximum PDSCH/PUSCH bandwidth preference:
   2> if the UE did not transmit a `UEAssistanceInformation` message with `bw-Preference` since it was configured to provide maximum PDSCH/PUSCH bandwidth preference; or
   2> if the current maximum PDSCH/PUSCH bandwidth preference is different from the one indicated in the last transmission of the `UEAssistanceInformation` message and timer T341 is not running:
      3> initiate transmission of the `UEAssistanceInformation` message in accordance with 5.6.10.3;

1> if configured to provide SPS assistance information:
   2> if the UE did not transmit a `UEAssistanceInformation` message with `sps-AssistanceInformation` since it was configured to provide SPS assistance information; or
   2> if the current SPS assistance information is different from the one indicated in the last transmission of the `UEAssistanceInformation` message:
      3> initiate transmission of the `UEAssistanceInformation` message in accordance with 5.6.10.3;

1> if configured to report RLM events:
   2> if "early-out-of-sync" event has been detected and T343 is not running; or
   2> if "early-in-sync" event has been detected and T344 is not running:
      3> initiate transmission of the `UEAssistanceInformation` message in accordance with 5.6.10.3;

1> if configured to provide delay budget report:
2> if the UE did not transmit a UEAssistanceInformation message with delayBudgetReport since it was configured to provide delay budget report; or

2> if the current delay budget is different from the one indicated in the last transmission of the UEAssistanceInformation message and timer T342 is not running:

3> initiate transmission of the UEAssistanceInformation message in accordance with 5.6.10.3;

1> if configured to provide overheating assistance information:

2> if the overheating condition has been detected and T345 is not running; or

2> if the current overheating assistance information is different from the one indicated in the last transmission of the UEAssistanceInformation message and timer T345 is not running:

3> initiate transmission of the UEAssistanceInformation message in accordance with 5.6.10.3;

5.6.10.3 Actions related to transmission of UEAssistanceInformation message

The UE shall set the contents of the UEAssistanceInformation message for power preference indications:

1> if configured to provide power preference indication and if the UE prefers a configuration primarily optimised for power saving:

2> set powerPrefIndication to lowPowerConsumption;

1> else if configured to provide power preference indication:

2> start or restart timer T340 with the timer value set to the powerPrefIndicationTimer;

2> set powerPrefIndication to normal;

The UE shall set the contents of the UEAssistanceInformation message for SPS assistance information:

1> if configured to provide SPS assistance information:

2> if there is any traffic for V2X sidelink communication which needs to report SPS assistance information:

3> include trafficPatternInfoListSL in the UEAssistanceInformation message;

2> if there is any traffic for uplink communication which needs to report SPS assistance information:

3> include trafficPatternInfoListUL in the UEAssistanceInformation message;

The UE shall set the contents of the UEAssistanceInformation message for bandwidth preference indications:

1> start timer T341 with the timer value set to the bw-PreferenceIndicationTimer;

1> set bw-Preference to its preferred configuration;

The UE shall set the contents of the UEAssistanceInformation message for delay budget report:

1> if configured to provide delay budget report:

2> if the UE prefers an adjustment in the connected mode DRX cycle length:

3> set delayBudgetReport to type1 according to a desired value;

2> else if the UE prefers coverage enhancement configuration change:

3> set delayBudgetReport to type2 according to a desired value;

2> start or restart timer T342 with the timer value set to the delayBudgetReportingProhibitTimer;

The UE shall set the contents of the UEAssistanceInformation message for the RLM report:

1> if T314 has expired:
2> set rlm-event to earlyOutOfSync;
2> start timer T343 with the timer value set to the rlmReportTimer.

1> if T315 has expired:
2> set rlm-event to earlyInSync;
2> start timer T344 with the timer value set to the rlmReportTimer;
2> if configured to report rlmReportRep-MPDCCH:
3> set excessRep-MPDCCH to the value indicated by lower layers;

The UE shall set the contents of the UEAssistanceInformation message for overheating assistance indication:

1> if the UE experiences internal overheating:
2> if the UE prefers to temporarily reduce its DL category and UL category:
3> include reducedUE-Category in the OverheatingAssistance IE;
3> set reducedUE-CategoryDL to the number to which the UE prefers to temporarily reduce its DL category;
3> set reducedUE-CategoryUL to the number to which the UE prefers to temporarily reduce its UL category;
2> if the UE prefers to temporarily reduce the number of maximum secondary component carriers:
3> include reducedMaxCCs in the OverheatingAssistance IE;
3> set reducedCCsDL to the number of maximum SCells the UE prefers to be temporarily configured in downlink;
3> set reducedCCsUL to the number of maximum SCells the UE prefers to be temporarily configured in uplink;
2> start timer T345 with the timer value set to the overheatingIndicationProhibitTimer;
1> else (if the UE no longer experiences an overheating condition):
2> do not include reducedUE-Category and reducedMaxCCs in OverheatingAssistance IE;
2> start timer T345 with the timer value set to the overheatingIndicationProhibitTimer;

The UE shall submit the UEAssistanceInformation message to lower layers for transmission.

NOTE 1: It is up to UE implementation when and how to trigger SPS assistance information.
NOTE 2: It is up to UE implementation to set the content of trafficPatternInfoListSL and trafficPatternInfoListUL.
NOTE 3: Traffic patterns for different Destination Layer 2 IDs are provided in different entries in trafficPatternInfoListSL.

5.6.11 Mobility history information

5.6.11.1 General

This procedure specifies how the mobility history information is stored by the UE, covering RRC_CONNECTED and RRC_IDLE.

5.6.11.2 Initiation

If the UE supports storage of mobility history information, the UE shall:

1> Upon change of cell, consisting of PCell in RRC_CONNECTED or serving cell in RRC_IDLE, to another E-UTRA or inter-RAT cell or when entering out of service:
2> include an entry in variable $\text{VarMobilityHistoryReport}$ possibly after removing the oldest entry, if necessary, according to following:

3> if the global cell identity of the previous PCell/ serving cell is available:

4> include the global cell identity of that cell in the field $\text{visitedCellId}$ of the entry;

3> else:

4> include the physical cell identity and carrier frequency of that cell in the field $\text{visitedCellId}$ of the entry;

3> set the field $\text{timeSpent}$ of the entry as the time spent in the previous PCell/ serving cell;

1> upon entering E-UTRA (in RRC_CONNECTED or RRC_IDLE) while previously out of service and/ or using another RAT:

2> include an entry in variable $\text{VarMobilityHistoryReport}$ possibly after removing the oldest entry, if necessary, according to following:

3> set the field $\text{timeSpent}$ of the entry as the time spent outside E-UTRA;

5.6.12 RAN-assisted WLAN interworking

5.6.12.1 General

The purpose of this procedure is to facilitate access network selection and traffic steering between E-UTRAN and WLAN.

If required by upper layers (see TS 24.312 [66], the UE shall provide an up-to-date set of the applicable parameters provided by $\text{wlan-OffloadConfigCommon}$ or $\text{wlan-OffloadConfigDedicated}$ to upper layers, and inform upper layers when no parameters are configured. The parameter set from either $\text{wlan-OffloadConfigCommon}$ or $\text{wlan-OffloadConfigDedicated}$ is selected as specified in subclauses 5.2.2.24, 5.3.12, 5.6.12.2 and 5.6.12.4.

5.6.12.2 Dedicated WLAN offload configuration

The UE shall:

1> if the received $\text{wlan-OffloadInfo}$ is set to $\text{release}$:

2> release $\text{wlan-OffloadConfigDedicated}$ and $t350$;

2> if the $\text{wlan-OffloadConfigCommon}$ corresponding to the RPLMN is broadcast by the cell:

3> apply the $\text{wlan-OffloadConfigCommon}$ corresponding to the RPLMN included in $\text{SystemInformationBlockType17}$;

1> else:

2> apply the received $\text{wlan-OffloadConfigDedicated}$;

5.6.12.3 WLAN offload RAN evaluation

The UE shall:

1> if the UE is configured with either $\text{wlan-OffloadConfigCommon}$ or $\text{wlan-OffloadConfigDedicated}$; and

1> if the UE is in RRC_IDLE or none of $\text{rclwi-Configuration}$, $\text{lwa-Configuration}$ and $\text{lwip-Configuration}$ is configured:

2> provide measurement results required for the evaluation of the network selection and traffic steering rules as defined in TS 24.312 [66] to upper layers;

2> evaluate the network selection and traffic steering rules as defined in TS 36.304 [4] using WLAN identifiers as indicated in other subclauses (either provided in $\text{steerToWLAN}$ included in $\text{rclwi-Configuration}$ or in $\text{wlan-Id-List}$ included in $\text{SystemInformationBlockType17}$);
5.6.12.4 T350 expiry or stop

The UE shall:

1> if T350 expires or is stopped:

2> release the wlan-OffloadConfigDedicated and t350;

2> release rclwi-Configuration if configured;

2> if the wlan-OffloadConfigCommon corresponding to the RPLMN is broadcast by the cell:

3> apply the wlan-OffloadConfigCommon and the wlan-Id-List corresponding to the RPLMN included in SystemInformationBlockType17;

5.6.12.5 Cell selection/ re-selection while T350 is running

The UE shall:

1> if, while T350 is running, the UE selects/ reselects a cell which is not the PCell when the wlan-OffloadDedicated was configured:

2> stop timer T350;

2> perform the actions as specified in 5.6.12.4;

5.6.13 SCG failure information

5.6.13.1 General

![Figure 5.6.13.1-1: SCG failure information](image)

The purpose of this procedure is to inform E-UTRAN about an SCG failure the UE has experienced i.e. SCG radio link failure, SCG change failure.

5.6.13.2 Initiation

A UE initiates the procedure to report SCG failures when SCG transmission is not suspended and when one of the following conditions is met:

1> upon detecting radio link failure for the SCG, in accordance with 5.3.11; or

1> upon SCG change failure, in accordance with 5.3.5.7a; or

1> upon stopping uplink transmission towards the PSCell due to exceeding the maximum uplink transmission timing difference when powerControlMode is configured to 1, in accordance with subclause 7.17.2 of TS 36.133 [29].

In case of DC, upon initiating the procedure, the UE shall:

1> suspend all SCG DRBs and suspend SCG transmission for split DRBs;

1> reset SCG-MAC;
stop T307;
initiate transmission of the \textit{SCGFailureInformation} message in accordance with 5.6.13.3;

5.6.13.3 Actions related to transmission of \textit{SCGFailureInformation} message

The UE shall set the contents of the \textit{SCGFailureInformation} message as follows:

1> if the UE initiates transmission of the \textit{SCGFailureInformation} message to provide SCG radio link failure information:
   2> include failureType and set it to the trigger for detecting SCG radio link failure;
1> else if the UE initiates transmission of the \textit{SCGFailureInformation} message to provide SCG change failure information:
   2> include failureType and set it to scg-ChangeFailure;
1> else if the UE initiates transmission of the \textit{SCGFailureInformation} message due to exceeding maximum uplink transmission timing difference:
   2> include failureType and set it to maxUL-TimingDiff;
1> set the \textit{measResultServFreqList} to include for each E-UTRA SCG cell that is configured, if any, within \textit{measResultSCell} the quantities of the concerned SCeLL, if available according to performance requirements in [16];
1> for each E-UTRA SCG serving frequency included in \textit{measResultServFreqList}, include within \textit{measResultBestNeighCell} the \textit{physCellId} and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;
1> set the \textit{measResultNeighCells} to include the best measured cells on non-serving E-UTRA frequencies, ordered such that the best cell is listed first, and based on measurements collected up to the moment the UE detected the failure, and set its fields as follows;
   2> if the UE was configured to perform measurements for one or more non-serving EUTRA frequencies and measurement results are available, include the \textit{measResultListEUTRA};
   2> for each neighbour cell included, include the optional fields that are available;

NOTE 1: The measured quantities are filtered by the L3 filter as configured in the mobility measurement configuration. The measurements are based on the time domain measurement resource restriction, if configured. Blacklisted cells are not required to be reported.

The UE shall submit the \textit{SCGFailureInformation} message to lower layers for transmission.

5.6.13a NR SCG failure information

5.6.13a.1 General

The purpose of this procedure is to inform E-UTRAN about an SCG failure the UE has experienced (e.g. SCG radio link failure, failure to successfully complete an SCG reconfiguration with sync), as specified in TS 38.331 [82, 5.7.3.2].
5.6.13a.2 Initiation

A UE initiates the procedure to report NR SCG failures when NR SCG transmission is not suspended and in accordance with TS 38.331 [82, 5.7.3.2]. Actions the UE shall perform upon initiating the procedure, other than related to the transmission of the SCGFailureInformationNR message are specified in TS 38.331 [82, 5.7.3.2].

5.6.13a.3 Actions related to transmission of SCGFailureInformationNR message

The UE shall set the contents of the SCGFailureInformationNR message as follows:

1> include failureType within failureReportSCG-NR and set it to indicate the SCG failure in accordance with TS 38.331 [82, 5.7.3.3];

1> include and set measResultSCG in accordance with TS 38.331 [82, 5.7.3.4];

1> for each NR frequency the UE is configured to measure by measConfig for which measurement results are available:

2> set the measResultFreqListNR to include the best measured cells, ordered such that the best cell is listed first using RSRP to order if RSRP measurement results are available for cells on this frequency, otherwise using RSRQ to order if RSRQ measurement results are available for cells on this frequency, otherwise using SINR to order, and based on measurements collected up to the moment the UE detected the failure, and for each cell that is included, include the optional fields that are available;

NOTE: Field measResultSCG is used to report available results for NR frequencies the UE is configured to measure by NR RRC signalling.

The UE shall submit the SCGFailureInformationNR message to lower layers for transmission.

5.6.14 LTE-WLAN Aggregation

5.6.14.1 Introduction

E-UTRAN can configure the UE to connect to a WLAN and configure bearers for LWA (referred to as LWA DRBs). The UE uses the WLAN parameters received from E-UTRAN in performing WLAN measurements. The UE also performs WLAN connection management as described in 5.6.15 while LWA is configured.

5.6.14.2 Reception of LWA configuration

Upon reception of LWA configuration, the UE shall:

1> if the received lwa-Configuration is set to release:

2> release the LWA configuration as described in 5.6.14.3;

1> else:

2> if the received lwa-Config includes lwa-WT-Counter:

3> determine the S-KWT key based on the K_{NB} key and received lwa-WT-Counter value, as specified in TS 33.401 [32];

3> forward the S-KWT key to upper layers to be used as a PMK or PSK for WLAN authentication;

2> if the received lwa-Config includes lwa-MobilityConfig:

3> if the received lwa-MobilityConfig includes wlan-ToReleaseList:

4> for each WLAN-Identifiers included in wlan-ToReleaseList:

5> remove the WLAN-Identifiers if already part of the current wlan-MobilitySet in VarWLAN-MobilityConfig;

3> if the received lwa-MobilityConfig includes wlan-ToAddList:

4> for each WLAN-Identifiers included in wlan-ToAddList:
5> add the \textit{WLAN-Identifiers} to the current \textit{wlan-MobilitySet} in \textit{VarWLAN-MobilityConfig};

3> if the received \textit{lwa-MobilityConfig} includes \textit{associationTimer}:

4> start or restart timer T351 with the timer value set to the \textit{associationTimer};

3> if the received \textit{lwa-MobilityConfig} includes \textit{successReportRequested}:

4> set \textit{successReportRequested} in \textit{VarWLAN-MobilityConfig} to the value of \textit{successReportRequested};

3> if the received \textit{lwa-MobilityConfig} includes \textit{wlan-SuspendConfig}:

4> set the field(s) in \textit{wlan-SuspendConfig} within \textit{VarWLAN-MobilityConfig} to the value(s) of field(s) included in \textit{wlan-SuspendConfig};

2> start WLAN Status Monitoring as described in 5.6.15.4;

5.6.14.3 Release of LWA configuration

To release the LWA configuration, the UE shall:

1> for each LWA DRB that is part of the current UE configuration:

2> disable data handling for this DRB at the LWAAP entity;

2> perform PDCP data recovery as specified in TS 36.323 [8];

1> delete any existing values in \textit{VarWLAN-MobilityConfig} and \textit{VarWLAN-Status};

1> stop timer T351, if running;

1> stop WLAN status monitoring and WLAN connection attempts for LWA;

1> indicate the release of LWA configuration, if configured, to upper layers;

5.6.15 WLAN connection management

5.6.15.1 Introduction

WLAN connection management procedures in this section are triggered as specified in other sections where the UE is using a WLAN connection for LWA, RCLWI or LWIP.

The UE stores the current WLAN mobility set, which is a set of one or more WLAN identifier(s) (e.g. BSSID, SSID, HESSID) in \textit{wlan-MobilitySet} in \textit{VarWLAN-MobilityConfig}. This WLAN mobility set can be configured and updated by the eNB. A WLAN is considered to be inside the WLAN mobility set if its identifiers match all WLAN identifiers of at least one entry in \textit{wlan-MobilitySet} and outside the WLAN mobility set otherwise. When the UE receives a new or updated WLAN mobility set, it initiates connection to a WLAN inside the WLAN mobility set, if not already connected to such a WLAN, and starts WLAN status monitoring as described in 5.6.15.4. The UE can perform WLAN mobility within the WLAN mobility set (connect or reconnect to a WLAN inside the WLAN mobility set) without any signalling to E-UTRAN.

The UE reports the WLAN connection status information to E-UTRAN as described in 5.6.15.2. The information in this report is based on the monitoring of WLAN connection as described in 5.6.15.4.

5.6.15.2 WLAN connection status reporting

5.6.15.2.1 General
The purpose of this procedure is to inform E-UTRAN about the status of WLAN connection for LWA, RCLWI, or LWIP.

5.6.15.2.2 Initiation

The UE in RRC_CONNECTED initiates the WLAN status reporting procedure when:

1> it connects successfully to a WLAN inside WLAN mobility set while T351 is running after a WLAN mobility set change; or
1> after a lwa-WT-Counter update or after a lwip-Counter update (if success report is requested by the eNB); or
1> its connection or connection attempts to all WLAN(s) inside WLAN mobility set fails in accordance with WLAN Status Monitoring described in 5.6.15.4; or
1> T351 expires; or
1> its WLAN connection to all WLAN(s) inside WLAN mobility set becomes temporarily unavailable; or
1> its WLAN connection to a WLAN inside the WLAN mobility set is successfully established after its previous WLAN Connection Status Report indicating WLAN temporary suspension;

Upon initiating the procedure, the UE shall:

1> initiate transmission of the WLANConnectionStatusReport message in accordance with 5.6.15.2.3;

5.6.15.2.3 Actions related to transmission of WLANConnectionStatusReport message

The UE shall set the contents of the WLANConnectionStatusReport message as follows:

1> set wlan-status to status in VarWLAN-Status;
1> submit the WLANConnectionStatusReport message to lower layers for transmission, upon which the procedure ends;

5.6.15.3 T351 Expiry (WLAN connection attempt timeout)

Upon T351 expiry, the UE shall:

1> set the status in VarWLAN-Status to failureTimeout;
1> perform WLAN connection status reporting procedure in 5.6.2;
1> stop WLAN status monitoring and WLAN connection attempts;

5.6.15.4 WLAN status monitoring

To perform WLAN status monitoring, the UE shall:

1> if UE is not configured with rclwi-Configuration and WLAN connection to a WLAN inside the WLAN mobility set is successfully established or maintained after a WLAN mobility set configuration update, after a lwa-WT-Counter update or after a lwip-Counter update:

2> set the status in VarWLAN-Status to successfulAssociation;
2> stop timer T351, if running;
if successReportRequested in VarWLAN-MobilityConfig is set to TRUE:

perform WLAN Connection Status Reporting procedure in 5.6.15.2;

1> if WLAN connection or connection attempts to all WLAN(s) inside WLAN mobility set fails:

2> if the failure is due to WLAN radio link issues:

3> set the status in VarWLAN-Status to failureWlanRadioLink;

2> else if the failure is due to UE internal problems related to WLAN:

3> set the status in VarWLAN-Status to failureWlanUnavailable;

NOTE 1: The UE internal problems related to WLAN include connection to another WLAN based on user preferences or turning off WLAN connection or connection rejection from WLAN or other WLAN problems.

3> remove all WLAN related measurement reporting entries within VarMeasReportList;

2> stop timer T351, if running;

2> perform WLAN Connection Status Reporting procedure in 5.6.15.2;

2> if the UE is configured with rclwi-Configuration:

3> release rclwi-Configuration and inform upper layers of a move-traffic-from-WLAN indication (see TS 24.302 [74]);

2> stop WLAN Status Monitoring and WLAN connection attempts;

1> if wlan-SuspendResumeAllowed in wlan-SuspendConfig within VarWLAN-MobilityConfig is set to TRUE:

2> if WLAN connection to all WLAN(s) inside WLAN mobility set becomes temporarily unavailable:

3> set the status in VarWLAN-Status to suspended;

3> if wlan-SuspendTriggersStatusReport in wlan-SuspendConfig within VarWLAN-MobilityConfig is set to TRUE:

4> trigger PDCP Status Report as specified in [8];

3> perform WLAN Connection Status Reporting procedure in 5.6.15.2;

2> if the status in VarWLAN-Status in the last WLAN Connection Status Report by this UE was suspended and WLAN connection to a WLAN inside the WLAN mobility set is successfully established:

3> set the status in VarWLAN-Status to resumed;

3> perform WLAN Connection Status Reporting procedure in 5.6.15.2;

5.6.16 RAN controlled LTE-WLAN interworking

5.6.16.1 General

The purpose of this procedure is to perform RAN-controlled LTE-WLAN interworking (RCLWI) i.e. control access network selection and traffic steering between E-UTRAN and WLAN.

5.6.16.2 WLAN traffic steering command

The UE shall:

1> if the received rclwi-Configuration is set to setup:

2> if the command is set to steerToWLAN:
3> inform the upper layers of a move-traffic-to-WLAN indication along with the WLAN identifier lists in
steerToWLAN (see TS 24.302 [74]);
3> store steerToWLAN in wlan-MobilitySet in VarWLAN-MobilityConfig;
3> perform the WLAN status monitoring procedure as specified in 5.6.15.4 using steerToWLAN as the
WLAN mobility set;
2> else:
3> inform the upper layers of a move-traffic-from-WLAN indication (see TS 24.302 [74]);
3> clear wlan-MobilitySet in VarWLAN-MobilityConfig;
3> stop performing the WLAN status monitoring procedure as specified in 5.6.15.4;
3> delete any existing values in VarWLAN-Status;
1> else (the rclwi-Configuration is released):
2> clear wlan-MobilitySet in VarWLAN-MobilityConfig;
2> stop performing the WLAN status monitoring procedure as specified in 5.6.15.4;
2> delete any existing values in VarWLAN-Status;
2> inform the upper layers of release of the rclwi-Configuration.

5.6.17 LTE-WLAN aggregation with IPsec tunnel

5.6.17.1 General

The WLAN resources that are used over the LWIP tunnel as described in TS 36.300 [9] established as part of LWIP
procedures are referred to as 'LWIP resources'. The purpose of this section is to specify procedures to indicate to higher
layers to initiate the establishment/release of the LWIP tunnel over WLAN and to indicate which DRB(s) shall use the
LWIP resources.

5.6.17.2 LWIP reconfiguration

The UE shall:
1> if the received lwip-Configuration is set to release:
   2> release the LWIP configuration, if configured, as described in 5.6.17.3;
1> else:
   2> if lwip-MobilityConfig is included:
      3> if the received lwip-MobilityConfig includes wlan-ToReleaseList:
         4> for each WLAN-Identifiers included in wlan-ToReleaseList:
            5> remove the WLAN-Identifiers if already part of the current wlan-MobilitySet in VarWLAN-
MobilityConfig;
      3> if the received lwip-MobilityConfig includes wlan-ToAddList:
         4> for each WLAN-Identifiers included in wlan-ToAddList:
            5> add the WLAN-Identifiers to the current wlan-MobilitySet in VarWLAN-MobilityConfig;
      3> if the received lwip-MobilityConfig includes associationTimer:
         4> start timer T351 with the timer value set according to the value of associationTimer;
      3> if the received lwip-MobilityConfig includes successReportRequested:
4> set successReportRequested in VarWLAN-MobilityConfig to the value of successReportRequested;

2> if tunnelConfigLWIP is included:

3> indicate to higher layers to configure the LWIP tunnel according to the received tunnelConfigLWIP [32];

3> if lwip-Counter is included:

4> determine the LWIP-PSK based on the KEtNB key and received lwip-Counter value, as specified in TS 33.401 [32];

4> forward the LWIP-PSK to upper layers for LWIP tunnel establishment;

2> start WLAN Status Monitoring as described in 5.6.15.4;

5.6.17.3 LWIP release

The UE shall:

1> delete any existing values in VarWLAN-MobilityConfig and VarWLAN-Status;

1> stop timer T351, if running;

1> release the lwip-Configuration;

1> indicate to higher layers to stop all DRBs from using the LWIP resources;

1> indicate to higher layers to release the LWIP tunnel [32];

1> stop WLAN status monitoring and WLAN connection attempts for LWIP;

5.6.18 Void

5.6.19 Application layer measurement reporting

5.6.19.1 General

![Figure 5.6.19.1-1: Application layer measurement reporting](image)

The purpose of this procedure is to inform E-UTRAN about application layer measurement report.

5.6.19.2 Initiation

A UE capable of application layer measurement reporting in RRC_CONNECTED may initiate the procedure when configured with application layer measurement, i.e. when measConfigAppLayer has been configured by E-UTRAN.

Upon initiating the procedure, the UE shall:

1> if configured with application layer measurement, and SRB4 is configured, and the UE has received application layer measurement report information from upper layers:

2> set the measReportAppLayerContainer in the MeasReportAppLayer message to the value of the application layer measurement report information;
submit the `MeasReport/AppLayer` message to lower layers for transmission via SRB4.

### 5.6.20 Idle Mode Measurements

#### 5.6.20.1 General

This procedure specifies the measurements done by a UE in RRC_IDLE when it has an IDLE mode measurement configuration and the storage of the available measurements by a UE in both RRC_IDLE and RRC_CONNECTED.

#### 5.6.20.2 Initiation

While T331 is running, the UE shall:

1. perform the measurements in accordance with the following:

   2. for each entry in `measIdleCarrierListEUTRA` within `VarMeasIdleConfig`:

      3. if UE supports carrier aggregation between serving carrier and the carrier frequency and bandwidth indicated by `carrierFreq` and `allowedMeasBandwidth` within the corresponding entry:

         4. perform measurements in the carrier frequency and bandwidth indicated by `carrierFreq` and `allowedMeasBandwidth` within the corresponding entry;

         NOTE: How the UE performs measurements in IDLE mode is up to UE implementation as long as the requirements in 36.133 [16] are met for measurement reporting. UE is not required to perform idle measurements if SIB2 idle measurement indication is not configured.

      4. if the `measCellList` is included:

         5. consider PCell and cells identified by each entry within the `measCellList` to be applicable for idle mode measurement reporting;

      4. else:

         5. consider PCell and up to `maxCellMeasIdle` strongest identified cells whose RSRP/RSRQ measurement results are above the value(s) provided in `qualityThreshold` (if any) to be applicable for idle mode measurement reporting;

         4. store measurement results for cells applicable for idle mode measurement reporting within the `VarMeasIdleReport`;

      3. else:

         4. do not consider the carrier frequency to be applicable for idle mode measurement reporting;

1. if `validityArea` is configured in `VarMeasIdleConfig` and UE reselects to a serving cell whose physical cell identity does not match any entry in `validityArea` for the corresponding carrier frequency:

   2. stop T331;

#### 5.6.20.3 T331 expiry or stop

The UE shall:

1. if T331 expires or is stopped:

   2. release the contents of `VarMeasIdleConfig`;

NOTE: It is up to UE implementation whether to continue IDLE mode measurements according to SIB5 configuration after T331 has expired or stopped.
5.6.21 Failure information

5.6.21.1 General

The purpose of this procedure is to inform E-UTRAN about a failure that the UE has experienced.

5.6.21.2 Initiation

A UE initiates the procedure to report failures, e.g. RLC entity failures when PDCP duplication is active and when one of the following conditions is met:

1> upon detecting radio link failure for an RLC entity, in accordance with 5.3.11.

Upon initiating the procedure, the UE shall:

1> suspend transmission over the RLC entity;
1> initiate transmission of the FailureInformation message in accordance with 5.6.21.3;

5.6.21.3 Actions related to transmission of FailureInformation message

When radio link failure is detected according to 5.3.11 the UE shall set the contents of the FailureInformation message as follows:

1> set logicalChannelIdentity to the logical channel identity of the RLC entity;
1> set cellGroupIndication to the cell group where the RLC entity is located;
1> set failureType to the type of failure that has been detected;

The UE shall submit the FailureInformation message to lower layers for transmission.

5.7 Generic error handling

5.7.1 General

The generic error handling defined in the subsequent sub-clauses applies unless explicitly specified otherwise e.g. within the procedure specific error handling.

The UE shall consider a value as not comprehended when it is set:

- to an extended value that is not defined in the version of the transfer syntax supported by the UE.
- to a spare or reserved value unless the specification defines specific behaviour that the UE shall apply upon receiving the concerned spare/ reserved value.

The UE shall consider a field as not comprehended when it is defined:

- as spare or reserved unless the specification defines specific behaviour that the UE shall apply upon receiving the concerned spare/ reserved field.
5.7.2 **ASN.1 violation or encoding error**

The UE shall:

1> when receiving an RRC message on the BCCH, BR-BCCH, PCCH, CCCH, MCCH, SC-MCCH or SBCCH for which the abstract syntax is invalid [13]:

2> ignore the message;

**NOTE:** This section applies in case one or more fields is set to a value, other than a spare, reserved or extended value, not defined in this version of the transfer syntax. E.g. in the case the UE receives value 12 for a field defined as INTEGER (1..11). In cases like this, it may not be possible to reliably detect which field is in the error hence the error handling is at the message level.

5.7.3 **Field set to a not comprehended value**

The UE shall, when receiving an RRC message on any logical channel:

1> if the message includes a field that has a value that the UE does not comprehend:

2> if a default value is defined for this field:

3> treat the message while using the default value defined for this field;

2> else if the concerned field is optional:

3> treat the message as if the field were absent and in accordance with the need code for absence of the concerned field;

2> else:

3> treat the message as if the field were absent and in accordance with sub-clause 5.7.4;

5.7.4 **Mandatory field missing**

The UE shall:

1> if the message includes a field that is mandatory to include in the message (e.g. because conditions for mandatory presence are fulfilled) and that field is absent or treated as absent:

2> if the RRC message was received on DCCH or CCCH:

3> ignore the message;

2> else:

3> if the field concerns a (sub-field of) an entry of a list (i.e. a SEQUENCE OF):

4> treat the list as if the entry including the missing or not comprehended field was not present;

3> else if the field concerns a sub-field of another field, referred to as the 'parent' field i.e. the field that is one nesting level up compared to the erroneous field:

4> consider the 'parent' field to be set to a not comprehended value;

4> apply the generic error handling to the subsequent 'parent' field(s), until reaching the top nesting level i.e. the message level;

3> else (field at message level):

4> ignore the message;

**NOTE 1:** The error handling defined in these sub-clauses implies that the UE ignores a message with the message type or version set to a not comprehended value.
NOTE 2: The nested error handling for messages received on logical channels other than DCCH and CCCH applies for errors in extensions also, even for errors that can be regarded as invalid E-UTRAN operation e.g. E-UTRAN not observing conditional presence.

The following ASN.1 further clarifies the levels applicable in case of nested error handling for errors in extension fields.

```asn1
ItemInfoList ::= SEQUENCE (SIZE (1..max)) OF ItemInfo

ItemInfo ::= SEQUENCE {
  itemIdentity      INTEGER (1..max),
  field1        Field1,
  field2        Field2 OPTIONAL, -- Need ON
  ...
  [[ field3-r9      Field3-r9 OPTIONAL, -- Cond Cond1
    field4-r9      Field4-r9 OPTIONAL -- Need ON
  ]]
}
```

```asn1
BroadcastInfoBlock1 ::= SEQUENCE {
  itemIdentity      INTEGER (1..max),
  field1        Field1,
  field2        Field2 OPTIONAL, -- Need ON
  nonCriticalExtension BroadcastInfoBlock1-v940-IEs OPTIONAL
}

BroadcastInfoBlock1-v940-IEs ::= SEQUENCE {
  field3-r9       Field3-r9 OPTIONAL, -- Cond Cond1
  field4-r9       Field4-r9 OPTIONAL, -- Need ON
  nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}
```

The UE shall, apply the following principles regarding the levels applicable in case of nested error handling:

- an extension additon group is not regarded as a level on its own. E.g. in the ASN.1 extract in the previous, a error regarding the conditionality of `field3` would result in the entire itemInfo entry to be ignored (rather than just the extension additon group containing `field3` and `field4`)

- a traditional `nonCriticalExtension` is not regarded as a level on its own. E.g. in the ASN.1 extract in the previous, a error regarding the conditionality of `field3` would result in the entire `BroadcastInfoBlock1` to be ignored (rather than just the non critical extension containing `field3` and `field4`).

5.7.5 Not comprehended field

The UE shall, when receiving an RRC message on any logical channel:

1> if the message includes a field that the UE does not comprehend:

2> treat the rest of the message as if the field was absent;

NOTE: This section does not apply to the case of an extension to the value range of a field. Such cases are addressed instead by the requirements in section 5.7.3.

5.8 MBMS

5.8.1 Introduction

5.8.1.1 General

In general the control information relevant only for UEs supporting MBMS is separated as much as possible from unicast control information. Most of the MBMS control information is provided on a logical channel specific for
MBMS common control information: the MCCH. E-UTRA employs one MCCH logical channel per MBSFN area. In case the network configures multiple MBSFN areas, the UE acquires the MBMS control information from the MCCHs that are configured to identify if services it is interested to receive are ongoing. The action applicable when the UE is unable to simultaneously receive MBMS and unicast services is up to UE implementation. In this release of the specification, an MBMS capable UE is only required to support reception of a single MBMS service at a time, and reception of more than one MBMS service (also possibly on more than one MBSFN area) in parallel is left for UE implementation. The MCCH carries the MBSFNAreaConfiguration message, which indicates the MBMS sessions that are ongoing as well as the (corresponding) radio resource configuration. The MCCH may also carry the MBMSCountingRequest message, when E-UTRAN wishes to count the number of UEs in RRC_CONNECTED that are receiving or interested to receive one or more specific MBMS services.

A limited amount of MBMS control information is provided on the BCCH. This primarily concerns the information needed to acquire the MCCH(s). This information is carried by means of a single MBMS specific SystemInformationBlock: SystemInformationBlockType13. An MBSFN area is identified solely by the mbsfn-AreaId in SystemInformationBlockType13. At mobility, the UE considers that the MBSFN area is continuous when the source cell and the target cell broadcast the same value in the mbsfn-AreaId.

5.8.1.2 Scheduling

The MCCH information is transmitted periodically, using a configurable repetition period. Scheduling information is not provided for MCCH i.e. both the time domain scheduling as well as the lower layer configuration are semi-statically configured, as defined within SystemInformationBlockType13.

For MBMS user data, which is carried by the MTCH logical channel, E-UTRAN periodically provides MCH scheduling information (MSI) at lower layers (MAC). This MCH information only concerns the time domain scheduling i.e. the frequency domain scheduling and the lower layer configuration are semi-statically configured. The periodicity of the MSI is configurable and defined by the MCH scheduling period.

5.8.1.3 MCCH information validity and notification of changes

Change of MCCH information only occurs at specific radio frames, i.e. the concept of a modification period is used. Within a modification period, the same MCCH information may be transmitted a number of times, as defined by its scheduling (which is based on a repetition period). The modification period boundaries are defined by SFN values for which SFN mod \( m = 0 \), where \( m \) is the number of radio frames comprising the modification period. The modification period is configured by means of SystemInformationBlockType13.

When the network changes (some of) the MCCH information, it notifies the UEs about the change during a first modification period. In the next modification period, the network transmits the updated MCCH information. These general principles are illustrated in figure 5.8.1.3-1, in which different colours indicate different MCCH information. Upon receiving a change notification, a UE interested to receive MBMS services acquires the new MCCH information immediately from the start of the next modification period. The UE applies the previously acquired MCCH information until the UE acquires the new MCCH information.

![Figure 5.8.1.3-1: Change of MCCH Information](image-url)

Indication of an MBMS specific RNTI, the M-RNTI (see TS 36.321 [6]), on PDCCH is used to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about an MCCH information change. When receiving an MCCH information change notification, the UE knows that the MCCH information will change at the next modification period boundary. The notification on PDCCH indicates which of the MCCHs will change, which is done by means of an 8-bit bitmap. Within this bitmap, the bit at the position indicated by the field notificationIndicator is used to indicate changes for that MBSFN area: if the bit is set to “1”, the corresponding MCCH will change. No further details are provided e.g. regarding which MCCH information will change. The MCCH information change notification is used to inform the UE about a change of MCCH information upon session start or about the start of MBMS counting.
The MCCH information change notifications on PDCCH are transmitted periodically and are carried on MBSFN subframes only except on MBMS-dedicated cell or FeMBMS/Unicast-mixed cell where the MCCH information change is provided on non-MBSFN subframes. These MCCH information change notification occasions are common for all MCCHs that are configured, and configurable by parameters included in SystemInformationBlockType13: a repetition coefficient, a radio frame offset and a subframe index. These common notification occasions are based on the MCCH with the shortest modification period.

NOTE 1: E-UTRAN may modify the MBMS configuration information provided on MCCH at the same time as updating the MBMS configuration information carried on BCCH i.e. at a coinciding BCCH and MCCH modification period. Upon detecting that a new MCCH is configured on BCCH, a UE interested to receive one or more MBMS services should acquire the MCCH, unless it knows that the services it is interested in are not provided by the corresponding MBSFN area.

A UE that is receiving an MBMS service via MRB shall acquire the MCCH information from the start of each modification period. A UE interested to receive MBMS from a carrier on which dl-Bandwidth included in MasterInformationBlock is set to n6 shall acquire the MCCH information at least once every MCCH modification period. A UE that is not receiving an MBMS service via MRB, as well as UEs that are receiving an MBMS service via MRB but potentially interested to receive other services not started yet in another MBSFN area from a carrier on which dl-Bandwidth included in MasterInformationBlock is other than n6, shall verify that the stored MCCH information remains valid by attempting to find the MCCH information change notification at least notificationRepetitionCoeff times during the modification period of the applicable MCCH(s), if no MCCH information change notification is received.

NOTE 2: In case the UE is aware which MCCH(s) E-UTRAN uses for the service(s) it is interested to receive, the UE may only need to monitor change notifications for a subset of the MCCHs that are configured, referred to as the 'applicable MCCH(s)' in the above.

5.8.2 MCCH information acquisition

5.8.2.1 General

An MBMS capable UE shall:

1> if the procedure is triggered by an MCCH information change notification:
start acquiring the **MBSFNAreaConfiguration** message and the **MBMSCountingRequest** message if present, from the beginning of the modification period following the one in which the change notification was received;

**NOTE 1:** The UE continues using the previously received MCCH information until the new MCCH information has been acquired.

1> if the UE enters an MBSFN area:

2> acquire the **MBSFNAreaConfiguration** message and the **MBMSCountingRequest** message if present, at the next repetition period;

1> if the UE is receiving an MBMS service:

2> start acquiring the **MBSFNAreaConfiguration** message and the **MBMSCountingRequest** message if present, that both concern the MBSFN area of the service that is being received, from the beginning of each modification period;

### 5.8.2.4 Actions upon reception of the **MBSFNAreaConfiguration** message

No UE requirements related to the contents of this **MBSFNAreaConfiguration** apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

### 5.8.2.5 Actions upon reception of the **MBMSCountingRequest** message

Upon receiving **MBMSCountingRequest** message, the UE shall perform the MBMS Counting procedure as specified in 5.8.4.

### 5.8.3 MBMS PTM radio bearer configuration

#### 5.8.3.1 General

The MBMS PTM radio bearer configuration procedure is used by the UE to configure RLC, MAC and the physical layer upon starting and/or stopping to receive an MRB. The procedure applies to UEs interested to receive one or more MBMS services.

**NOTE:** In case the UE is unable to receive an MBMS service due to capability limitations, upper layers may take appropriate action e.g. terminate a lower priority unicast service.

#### 5.8.3.2 Initiation

The UE applies the MRB establishment procedure to start receiving a session of a service it has an interest in. The procedure may be initiated e.g. upon start of the MBMS session, upon (re-)entry of the corresponding MBSFN service area, upon becoming interested in the MBMS service, upon removal of UE capability limitations inhibiting reception of the concerned service.

The UE applies the MRB release procedure to stop receiving a session. The procedure may be initiated e.g. upon stop of the MBMS session, upon leaving the corresponding MBSFN service area, upon losing interest in the MBMS service, when capability limitations start inhibiting reception of the concerned service.

#### 5.8.3.3 MRB establishment

Upon MRB establishment, the UE shall:

1> establish an RLC entity in accordance with the configuration specified in 9.1.1.4;

1> configure an MTCH logical channel in accordance with the received **logicalChannelIdentity**, applicable for the MRB, as included in the **MBSFNAreaConfiguration** message;

1> configure the physical layer in accordance with the **pmch-Config**, applicable for the MRB, as included in the **MBSFNAreaConfiguration** message;

1> inform upper layers about the establishment of the MRB by indicating the corresponding **tmgi** and **sessionId**;
5.8.3.4 MRB release

Upon MRB release, the UE shall:

1> release the RLC entity as well as the related MAC and physical layer configuration;
1> inform upper layers about the release of the MRB by indicating the corresponding tmgi and sessionId.

5.8.4 MBMS Counting Procedure

5.8.4.1 General

The MBMS Counting procedure is used by the E-UTRAN to count the number of RRC_CONNECTED mode UEs which are receiving via an MRB or interested to receive via an MRB the specified MBMS services.

The UE determines interest in an MBMS service, that is identified by the TMGI, by interaction with upper layers.

5.8.4.2 Initiation

E-UTRAN initiates the procedure by sending an MBMSCountingRequest message.

5.8.4.3 Reception of the MBMSCountingRequest message by the UE

Upon receiving the MBMSCountingRequest message, the UE in RRC_CONNECTED mode shall:

1> if the SystemInformationBlockType1, that provided the scheduling information for the systemInformationBlockType13 that included the configuration of the MCCH via which the MBMSCountingRequest message was received, contained the identity of the Registered PLMN; and

1> if the UE is receiving via an MRB or interested to receive via an MRB at least one of the services in the received countingRequestList:

2> if more than one entry is included in the mbsfn-AreaInfoList received in the SystemInformationBlockType13 that included the configuration of the MCCH via which the MBMSCountingRequest message was received:

3> include the mbsfn-AreaIndex in the MBMSCountingResponse message and set it to the index of the entry in the mbsfn-AreaInfoList within the received SystemInformationBlockType13 that corresponds with the MBSFN area used to transfer the received MBMSCountingRequest message;

2> for each MBMS service included in the received countingRequestList:

3> if the UE is receiving via an MRB or interested to receive via an MRB this MBMS service:

4> include an entry in the countingResponseList within the MBMSCountingResponse message with countingResponseService set it to the index of the entry in the countingRequestList within the received MBMSCountingRequest that corresponds with the MBMS service the UE is receiving or interested to receive;
2> submit the MBMSCountingResponse message to lower layers for transmission upon which the procedure ends;

NOTE 1: UEs that are receiving an MBMS User Service [56] by means of a Unicast Bearer Service [57] (i.e. via a DRB), but are interested to receive the concerned MBMS User Service [56] via an MBMS Bearer Service (i.e. via an MRB), respond to the counting request.

NOTE 2: If ciphering is used at upper layers, the UE does not respond to the counting request if it can not decipher the MBMS service for which counting is performed (see TS 22.146 [62, 5.3]).

NOTE 3: The UE treats the MBMSCountingRequest messages received in each modification period independently. In the unlikely case E-UTRAN would repeat an MBMSCountingRequest (i.e. including the same services) in a subsequent modification period, the UE responds again. The UE provides at most one MBMSCountingResponse message to multiple transmission attempts of an MBMSCountingRequest messages in a given modification period.

5.8.5 MBMS interest indication

5.8.5.1 General

![Diagram](image)

Figure 5.8.5.1-1: MBMS interest indication

The purpose of this procedure is to inform E-UTRAN that the UE is receiving or is interested to receive MBMS service(s) via an MRB or SC-MRB, and if so, to inform E-UTRAN about the priority of MBMS versus unicast reception.

5.8.5.2 Initiation

An MBMS or SC-PTM capable UE in RRC_CONNECTED may initiate the procedure in several cases including upon successful connection establishment, upon entering or leaving the service area, upon session start or stop, upon change of interest, upon change of priority between MBMS reception and unicast reception or upon change to a PCell broadcasting SystemInformationBlockType15.

Upon initiating the procedure, the UE shall:

1> if SystemInformationBlockType15 is broadcast by the PCell:
   2> ensure having a valid version of SystemInformationBlockType15 for the PCell;
   2> if the UE did not transmit an MBMSInterestIndication message since last entering RRC_CONNECTED state; or
   2> if since the last time the UE transmitted an MBMSInterestIndication message, the UE connected to a PCell not broadcasting SystemInformationBlockType15:
      3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:
         4> initiate transmission of the MBMSInterestIndication message in accordance with 5.8.5.4;
      2> else:
         3> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, has changed since the last transmission of the MBMSInterestIndication message; or
3> if the prioritisation of reception of all indicated MBMS frequencies compared to reception of any of the established unicast bearers has changed since the last transmission of the MBMSInterestIndication message:

4> initiate transmission of the MBMSInterestIndication message in accordance with 5.8.5.4;

NOTE: The UE may send an MBMSInterestIndication even when it is able to receive the MBMS services it is interested in i.e. to avoid that the network allocates a configuration inhibiting MBMS reception.

3> else if SystemInformationBlockType20 is broadcast by the PCell:

4> if since the last time the UE transmitted an MBMSInterestIndication message, the UE connected to a PCell not broadcasting SystemInformationBlockType20; or

4> if the set of MBMS services of interest determined in accordance with 5.8.5.3a is different from mbms-Services included in the last transmission of the MBMSInterestIndication message;

5> initiate the transmission of the MBMSInterestIndication message in accordance with 5.8.5.4.

5.8.5.3 Determine MBMS frequencies of interest

The UE shall:

1> consider a frequency to be part of the MBMS frequencies of interest if the following conditions are met:

2> at least one MBMS session the UE is receiving or interested to receive via an MRB or SC-MRB is ongoing or about to start; and

NOTE 1: The UE may determine whether the session is ongoing from the start and stop time indicated in the User Service Description (USD), see 3GPP TS 36.300 [9] or 3GPP TS 26.346 [57].

2> for at least one of these MBMS sessions SystemInformationBlockType15 acquired from the PCell includes for the concerned frequency one or more MBMS SAIs as indicated in the USD for this session; and

NOTE 2: The UE considers a frequency to be part of the MBMS frequencies of interest even though E-UTRAN may (temporarily) not employ an MRB or SC-MRB for the concerned session. I.e. the UE does not verify if the session is indicated on (SC-)MCCH

NOTE 3: The UE considers the frequencies of interest independently of any synchronization state, e.g. [9, Annex J.1]

2> the UE is capable of simultaneously receiving MRBs and/or is capable of simultaneously receiving SC-MRBs on the set of MBMS frequencies of interest, regardless of whether a serving cell is configured on each of these frequencies or not; and

2> the supportedBandCombination the UE included in UE-EUTRA-Capability contains at least one band combination including the set of MBMS frequencies of interest;

NOTE 4: Indicating a frequency implies that the UE supports SystemInformationBlockType13 or SystemInformationBlockType20 acquisition for the concerned frequency i.e. the indication should be independent of whether a serving cell is configured on that frequency.

NOTE 5: When evaluating which frequencies it can receive simultaneously, the UE does not take into account the serving frequencies that are currently configured i.e. it only considers MBMS frequencies it is interested to receive.

NOTE 6: The set of MBMS frequencies of interest includes at most one frequency for a given physical frequency. The UE only considers a physical frequency to be part of the MBMS frequencies of interest if it supports at least one of the bands indicated for this physical frequency in SystemInformationBlockType1 (for serving frequency) or SystemInformationBlockType15 (for neighbouring frequencies). In this case, E-UTRAN may assume the UE supports MBMS reception on any of the bands supported by the UE (i.e. according to supportedBandCombination).

5.8.5.3a Determine MBMS services of interest

The UE shall:
1> consider a MBMS service to be part of the MBMS services of interest if the following conditions are met:
   2> the UE is SC-PTM capable; and
   2> the UE is receiving or interested to receive this service via an SC-MRB; and
   2> one session of this service is ongoing or about to start; and
   2> one or more MBMS SAIs in the USD for this service is included in SystemInformationBlockType15 acquired from the PCell for a frequency belonging to the set of MBMS frequencies of interest, determined according to 5.8.5.3.

5.8.5.4 Actions related to transmission of MBMSInterestIndication message

The UE shall set the contents of the MBMSInterestIndication message as follows:

1> if the set of MBMS frequencies of interest, determined in accordance with 5.8.5.3, is not empty:
   2> include mbms-FreqList and set it to include the MBMS frequencies of interest sorted by decreasing order of interest, using the EARFCN corresponding with freqBandIndicator included in SystemInformationBlockType1 (for serving frequency), if applicable, and the EARFCN(s) as included in SystemInformationBlockType15 (for neighbouring frequencies);
   NOTE 1: The EARFCN included in mbms-FreqList is merely used to indicate a physical frequency the UE is interested to receive i.e. the UE may not support the band corresponding to the included EARFCN (but it does support at least one of the bands indicated in system information for the concerned physical frequency).
   2> include mbms-Priority if the UE prioritises reception of all indicated MBMS frequencies above reception of any of the unicast bearers;
   2> if SystemInformationBlockType20 is broadcast by the PCell:
      3> include mbms-Services and set it to indicate the set of MBMS services of interest determined in accordance with 5.8.5.3a;
   NOTE 2: If the UE prioritises MBMS reception and unicast data cannot be supported because of congestion on the MBMS carrier(s), E-UTRAN may initiate release of unicast bearers. It is up to E-UTRAN implementation whether all bearers or only GBR bearers are released. E-UTRAN does not initiate re-establishment of the released unicast bearers upon alleviation of the congestion.

The UE shall submit the MBMSInterestIndication message to lower layers for transmission.

5.8a SC-PTM

5.8a.1 Introduction

5.8a.1.1 General

SC-PTM control information is provided on a specific logical channel: the SC-MCCH. The SC-MCCH carries the SCPTMConfiguration message which indicates the MBMS sessions that are ongoing as well as the (corresponding) information on when each session may be scheduled, i.e. scheduling period, scheduling window and start offset. The SCPTMConfiguration message also provides information about the neighbour cells transmitting the MBMS sessions which are ongoing on the current cell. In this release of the specification, an SC-PTM capable UE is only required to support reception of a single MBMS service at a time, and reception of more than one MBMS service in parallel is left for UE implementation.

A limited amount of SC-PTM control information is provided on the BCCH or BR-BCCH. This primarily concerns the information needed to acquire the SC-MCCH.

NOTE: For BL UEs and UEs in CE, SC-MCCH transmission uses a 1.4 MHz channel bandwidth and a maximum TBS of 936 bits, see TS 36.213 [23]. For NB-IoT UEs, the maximum TBS for SC-MCCH transmission is 680 bits, see TS 36.213 [23].
5.8a.1.2 SC-MCCH scheduling

The SC-MCCH information (i.e. information transmitted in messages sent over SC-MCCH) is transmitted periodically, using a configurable repetition period. SC-MCCH transmissions (and the associated radio resources and MCS) are indicated on PDCCH.

5.8a.1.3 SC-MCCH information validity and notification of changes

Change of SC-MCCH information only occurs at specific radio frames, i.e. the concept of a modification period is used. Within a modification period, the same SC-MCCH information may be transmitted a number of times, as defined by its scheduling (which is based on a repetition period). The modification period boundaries are defined by SFN values for which SFN mod \(m=0\), where \(m\) is the number of radio frames comprising the modification period. The modification period is configured by means of SystemInformationBlockType20 (SystemInformationBlockType20-NB in NB-IoT). If H-SFN is provided in SystemInformationBlockType1-BR, modification period boundaries for BL UEs or UEs in CE are defined by SFN values for which \((H-SFN \times 1024 + SFN) \mod m=0\). The modification period boundaries for NB-IoT UEs are defined by SFN values for which \((H-SFN \times 1024 + SFN) \mod m=0\).

When the network changes (some of) the SC-MCCH information, it notifies the UEs, other than BL UEs, UEs in CE or NB-IoT UEs, about the change in the first subframe which can be used for SC-MCCH transmission in a repetition period. LSB bit in 8-bit bitmap when set to ‘1’ indicates the change in SC-MCCH. Upon receiving a change notification, a UE interested to receive MBMS services transmitted using SC-PTM acquires the new SC-MCCH information starting from the same subframe. The UE applies the previously acquired SC-MCCH information until the UE acquires the new SC-MCCH information.

When the network changes (some of) the SC-MCCH information for start of new MBMS service(s) transmitted using SC-PTM, it notifies BL UEs, UEs in CE or NB-IoT UEs about the change in every PDCCH which schedules the first SC-MCCH in a repetition period in the current modification period. The notification is transmitted with 1 bit. The bit, when set to ‘1’, indicates the start of new MBMS service(s), see TS 36.212 [22, 5.3.3.1.14 & 6.4.3.3]. Upon receiving a change notification, a BL UE, UE in CE or NB-IoT UE interested to receive MBMS services transmitted using SC-PTM acquires the new SC-MCCH information scheduled by the PDCCH. The BL UE, UE in CE or NB-IoT UE applies the previously acquired SC-MCCH information until the BL UE, UE in CE or NB-IoT UE acquires the new SC-MCCH information.

When the network changes SC-MTCH specific information e.g. start of new MBMS service(s) transmitted using SC-PTM or change of ongoing MBMS service(s) transmitted using SC-PTM, it notifies the BL UEs, UEs in CE or NB-IoT UEs in the PDCCH which schedules the SC-MTCH in the current modification period. The notification is transmitted with a 2 bit bitmap. The LSB in the 2-bit bitmap, when set to ‘1’, indicates the change of the on-going MBMS service and the MSB in the 2-bit bitmap, when set to ‘1’, indicates the start of new MBMS service(s), see TS 36.212 [22, 5.3.3.1.12 & 5.3.3.1.13 & 6.4.3.2]. In the case the network changes an on-going SC-MTCH transmission in the next modification period, it notifies the BL UEs, UEs in CE or NB-IoT UEs in the PDCCH which schedules this SC-MTCH in the current modification period. In the case the network starts new MBMS service(s) transmitted using SC-PTM, the network notifies the UEs which have on-going SC-MTCH in the PDCCH scheduling each of the SC-MTCH. Upon receiving such notification, a BL UE, UE in CE or NB-IoT UE acquires the new SC-MCCH information at the start of the next modification period. The BL UE, UE in CE or NB-IoT UE applies the previously acquired SC-MCCH information until the BL UE, UE in CE or NB-IoT UE acquires the new SC-MCCH information.

5.8a.1.4 Procedures

The SC-PTM capable UE receiving or interested to receive MBMS service(s) via SC-MRB applies SC-PTM procedures described in 5.8a and, except for NB-IoT UE, the MBMS interest indication procedure as specified in 5.8.5.
5.8a.2 SC-MCCH information acquisition

5.8a.2.1 General

![SCPTMConfiguration](image)

Figure 5.8a.2.1-1: SC-MCCH information acquisition

The UE applies the SC-MCCH information acquisition procedure to acquire the SC-PTM control information that is broadcast by the E-UTRAN. The procedure applies to SC-PTM capable UEs that are in RRC_IDLE except for BL UEs, UEs in CE and NB-IoT UEs, performing EDT procedure. This procedure also applies to SC-PTM capable UEs that are in RRC_CONNECTED except for BL UEs, UEs in CE or NB-IoT UEs.

5.8a.2.2 Initiation

A UE interested to receive MBMS services via SC-MRB shall apply the SC-MCCH information acquisition procedure upon entering the cell broadcasting SystemInformationBlockType20 (SystemInformationBlockType20-NB in NB-IoT) (e.g. upon power on, following UE mobility) and upon receiving a notification that the SC-MCCH information has changed. A UE, except for BL UE, UE in CE or NB-IoT UE, that is receiving an MBMS service via SC-MR shall apply the SC-MCCH information acquisition procedure to acquire the SC-MCCH information that corresponds with the service that is being received, at the start of each modification period. The BL UE, UE in CE or NB-IoT UE that is receiving an MBMS service via SC-MR shall apply the SC-MCCH information acquisition procedure upon receiving a notification that the SC-MCCH information that corresponds with the service that is being received is about to be changed. The BL UE, UE in CE or NB-IoT UE that is receiving an MBMS service via SC-MR may apply the SC-MCCH information acquisition procedure upon receiving a notification that the SC-MCCH information is about to be changed due to start of a new service.

Unless explicitly stated otherwise in the procedural specification, the SC-MCCH information acquisition procedure overwrites any stored SC-MCCH information, i.e. delta configuration is not applicable for SC-MCCH information and the UE discontinues using a field if it is absent in SC-MCCH information unless explicitly specified otherwise.

5.8a.2.3 SC-MCCH information acquisition by the UE

A SC-PTM capable UE shall:

1. if the procedure is triggered by an SC-MCCH information change notification and the UE has no ongoing MBMS service:
   2. except for a BL UE, UE in CE or NB-IoT UE, start acquiring the SCPTMConfiguration message from the subframe in which the change notification was received;
   2. for a BL UE, UE in CE or NB-IoT UE, acquire the SCPTMConfiguration message scheduled by the PDCCH in which the change notification was received;

NOTE 1: The UE continues using the previously received SC-MCCH information until the new SC-MCCH information has been acquired.

1. if the UE enters a cell broadcasting SystemInformationBlockType20 (SystemInformationBlockType20-NB in NB-IoT):
   2. acquire the SCPTMConfiguration message at the next repetition period;

1. if the UE is receiving an MBMS service via an SC-MR:
   2. except for BL UE, UE in CE or NB-IoT UE, start acquiring the SCPTMConfiguration message from the beginning of each modification period;
5.8a.2.4 Actions upon reception of the \textit{SCPTMConfiguration} message

No UE requirements related to the contents of this \textit{SCPTMConfiguration} apply other than those specified elsewhere e.g. within procedures using the concerned system information, the corresponding field descriptions.

5.8a.3 SC-PTM radio bearer configuration

5.8a.3.1 General

The SC-PTM radio bearer configuration procedure is used by the UE to configure RLC, MAC and the physical layer upon starting and/or stopping to receive an SC-MRB transmitted on SC-MTCH. The procedure applies to SC-PTM capable UEs that are in RRC_IDLE and to SC-PTM capable UEs that are not BL UEs, UEs in CE or NB-IoT UEs in RRC_CONNECTED, and are interested to receive one or more MBMS services via SC-MRB.

NOTE: In case the UE is unable to receive an MBMS service via an SC-MRB due to capability limitations, upper layers may take appropriate action e.g. terminate a lower priority unicast service.

5.8a.3.2 Initiation

The UE applies the SC-MRB establishment procedure to start receiving a session of a MBMS service it has an interest in. The procedure may be initiated e.g. upon start of the MBMS session, upon entering a cell providing via SC-MRB a MBMS service in which the UE has interest, upon becoming interested in the MBMS service, upon removal of UE capability limitations inhibiting reception of the concerned service.

The UE applies the SC-MRB release procedure to stop receiving a session. The procedure may be initiated e.g. upon stop of the MBMS session, upon leaving the cell where a SC-MRB is established, upon losing interest in the MBMS service, when capability limitations start inhibiting reception of the concerned service.

5.8a.3.3 SC-MRB establishment

Upon SC-MRB establishment, the UE shall:

1. establish an RLC entity in accordance with the configuration specified in 9.1.1.7;

1. configure a SC-MTCH logical channel applicable for the SC-MRB and instruct MAC to receive DL-SCH on the cell where the \textit{SCPTMConfiguration} message was received for the MBMS service for which the SC-MRB is established and using \textit{g-RNTI} and \textit{sc-mtch-SchedulingInfo} (if included) in this message for this MBMS service;

1. configure the physical layer in accordance with the \textit{sc-mtch-InfoList}, applicable for the SC-MRB, as included in the \textit{SCPTMConfiguration} message;

1. inform upper layers about the establishment of the SC-MRB by indicating the corresponding \textit{tmgi} and \textit{sessionId};

5.8a.3.4 SC-MRB release

Upon SC-MRB release, the UE shall:

1. release the RLC entity as well as the related MAC and physical layer configuration;

1. inform upper layers about the release of the SC-MRB by indicating the corresponding \textit{tmgi} and \textit{sessionId};
5.9 RN procedures

5.9.1 RN reconfiguration

5.9.1.1 General

The purpose of this procedure is to configure/reconfigure the RN subframe configuration and/or to update the system information relevant for the RN in RRC_CONNECTED.

5.9.1.2 Initiation

E-UTRAN may initiate the RN reconfiguration procedure to an RN in RRC_CONNECTED when AS security has been activated.

5.9.1.3 Reception of the RNReconfiguration by the RN

The RN shall:

1> if the rn-SystemInfo is included:

2> if the systemInformationBlockType1 is included:

3> act upon the received SystemInformationBlockType1 as specified in 5.2.2.7;

2> if the SystemInformationBlockType2 is included:

3> act upon the received SystemInformationBlockType2 as specified in 5.2.2.9;

1> if the rn-SubframeConfig is included:

2> reconfigure lower layers in accordance with the received subframeConfigPatternFDD or subframeConfigPatternTDD;

2> if the rpdcch-Config is included:

3> reconfigure lower layers in accordance with the received rpdcch-Config;

1> submit the RNReconfigurationComplete message to lower layers for transmission, upon which the procedure ends;

5.10 Sidelink

5.10.1 Introduction

The sidelink communication and associated synchronisation resource configuration applies for the frequency at which it was received/ acquired. Moreover, for a UE configured with one or more SCells, the sidelink communication and associated synchronisation resource configuration provided by dedicated signalling applies for the PCell/ the primary frequency. The sidelink discovery and associated synchronisation resource configuration applies for the frequency at which it was received/ acquired or the indicated frequency in the configuration. For a UE configured with one or more
SCells, the sidelink discovery and associated synchronisation resource configuration provided by dedicated signalling applies for the PCell/ the primary frequency / any other indicated frequency.

NOTE 1: Upper layers configure the UE to receive or transmit sidelink communication on a specific frequency, to monitor or transmit non-PS related sidelink discovery announcements on one or more frequencies or to monitor or transmit PS related sidelink discovery announcements on a specific frequency, but only if the UE is authorised to perform these particular ProSe related sidelink activities.

NOTE 2: It is up to UE implementation which actions to take (e.g. termination of unicast services, detach) when it is unable to perform the desired sidelink activities, e.g. due to UE capability limitations.

Sidelink communication consists of one-to-many and one-to-one sidelink communication. One-to-many sidelink communication consists of relay related and non-relay related one-to-many sidelink communication. One-to-one sidelink communication consists of relay related and non-relay related one-to-one sidelink communication. In relay related one-to-one sidelink communication the communicating parties consist of one sidelink relay UE and one sidelink remote UE.

Sidelink discovery consists of public safety related (PS related) and non-PS related sidelink discovery. PS related sidelink discovery consists of relay related and non-relay related PS related sidelink discovery. Upper layers indicate to RRC whether a particular sidelink announcement is PS related or non-PS related.

Upper layers indicate to RRC whether a particular sidelink procedure is V2X related or not.

The specification covers the use of UE to network sidelink relays by specifying the additional requirements that apply for a sidelink relay UE and a sidelink remote UE. I.e. for such UEs the regular sidelink UE requirements equally apply unless explicitly stated otherwise.

### 5.10.1a Conditions for sidelink communication operation

When it is specified that the UE shall perform sidelink communication operation only if the conditions defined in this section are met, the UE shall perform sidelink communication operation only if:

1. if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for sidelink communication operation belongs to the registered or equivalent PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for sidelink communication operation as defined in TS 36.304 [4, 11.4]; or

1. if the UE is camped on a serving cell (RRC_IDLE) on which it fulfils the conditions to support sidelink communication in limited service state as specified in TS 23.303 [68, 4.5.6]; and if either the serving cell is on the frequency used for sidelink communication operation or the UE is out of coverage on the frequency used for sidelink communication operation as defined in TS 36.304 [4, 11.4]; or

1. if the UE has no serving cell (RRC_IDLE);

### 5.10.1b Conditions for PS related sidelink discovery operation

When it is specified that the UE shall perform PS related sidelink discovery operation only if the conditions defined in this section are met, the UE shall perform PS related sidelink discovery operation only if:

1. if the UE's serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for PS related sidelink discovery operation belongs to the registered or other PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for PS related sidelink discovery operation as defined in TS 36.304 [4, 11.4]; or

1. if the UE is camped on a serving cell (RRC_IDLE) on which it fulfils the conditions to support sidelink discovery in limited service state as specified in TS 23.303 [68, 4.5.6]; and if either the serving cell is on the frequency used for PS related sidelink discovery operation or the UE is out of coverage on the frequency used for PS related sidelink discovery operation as defined in TS 36.304 [4, 11.4]; or

1. if the UE has no serving cell (RRC_IDLE);
5.10.1c Conditions for non-PS related sidelink discovery operation

When it is specified that the UE shall perform non-PS related sidelink discovery operation only if the conditions defined in this section are met, the UE shall perform non-PS related sidelink discovery operation only if:

1> if the UE’s serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is suitable; and if the selected cell on the frequency used for non-PS related sidelink discovery operation belongs to the registered or other PLMN as specified in TS 24.334 [69].

5.10.1d Conditions for V2X sidelink communication operation

When it is specified that the UE shall perform V2X sidelink communication operation only if the conditions defined in this section are met, the UE shall perform V2X sidelink communication operation only if:

1> if the UE’s serving cell is suitable (RRC_IDLE or RRC_CONNECTED); and if either the selected cell on the frequency used for V2X sidelink communication operation belongs to the registered or equivalent PLMN as specified in TS 24.334 [69] or the UE is out of coverage on the frequency used for V2X sidelink communication operation as defined in TS 36.304 [4, 11.4]; or

1> if the UE’s serving cell (for RRC_IDLE or RRC_CONNECTED) fulfils the conditions to support V2X sidelink communication in limited service state as specified in TS 23.285 [78, 4.4.8]; and if either the serving cell is on the frequency used for V2X sidelink communication operation or the UE is out of coverage on the frequency used for V2X sidelink communication operation as defined in TS 36.304 [4, 11.4]; or

1> if the UE has no serving cell (RRC_IDLE);

5.10.2 Sidelink UE information

5.10.2.1 General

![Figure 5.10.2-1: Sidelink UE information](image)

The purpose of this procedure is to inform E-UTRAN that the UE is interested or no longer interested to receive sidelink communication or discovery, to receive V2X sidelink communication, as well as to request assignment or release of transmission resources for sidelink communication or discovery announcements or V2X sidelink communication or sidelink discovery gaps, to report parameters related to sidelink discovery from system information of inter-frequency/PLMN cells and to report the synchronization reference used by the UE for V2X sidelink communication.

5.10.2.2 Initiation

A UE capable of sidelink communication or V2X sidelink communication or sidelink discovery that is in RRC_CONNECTED may initiate the procedure to indicate it is (interested in) receiving sidelink communication or V2X sidelink communication or sidelink discovery in several cases including upon successful connection establishment, upon change of interest, upon change to a PCell broadcasting SystemInformationBlockType18 or SystemInformationBlockType19 or SystemInformationBlockType21 including sl-V2X-ConfigCommon. A UE capable of sidelink communication or V2X sidelink communication or sidelink discovery may initiate the procedure to request assignment of dedicated resources for the concerned sidelink communication transmission or discovery announcements or V2X sidelink communication transmission or to request sidelink discovery gaps for sidelink discovery transmission or sidelink discovery reception and a UE capable of inter-frequency/PLMN sidelink discovery parameter reporting may
initiate the procedure to report parameters related to sidelink discovery from system information of inter-
frequency/PLMN cells.

NOTE 1: A UE in RRC_IDLE that is configured to transmit sidelink communication / V2X sidelink 
communication / sidelink discovery announcements, while SystemInformationBlockType18/
SystemInformationBlockType19/ SystemInformationBlockType21 including sl-V2X-ConfigCommon or
SystemInformationBlockType26 does not include the resources for transmission (in normal conditions),
initiates connection establishment in accordance with 5.3.3.1a.

Upon initiating the procedure, the UE shall:

1> if SystemInformationBlockType18 is broadcast by the PCell:

2> ensure having a valid version of SystemInformationBlockType18 for the PCell;

2> if configured by upper layers to receive sidelink communication:

3> if the UE did not transmit a SidelinkUEInformation message since last entering RRC_CONNECTED 
state; or

3> if since the last time the UE transmitted a SidelinkUEInformation message the UE connected to a PCell 
not broadcasting SystemInformationBlockType18; or

NOTE 2: After handover/ re-establishment from a source PCell not broadcasting SystemInformationBlockType18 
the UE repeats the same interest information that it provided previously as such a source PCell may not 
forward the interest information.

3> if the last transmission of the SidelinkUEInformation message did not include commRxInterestedFreq; or

if the frequency configured by upper layers to receive sidelink communication on has changed since the 
last transmission of the SidelinkUEInformation message:

4> initiate transmission of the SidelinkUEInformation message to indicate the sidelink communication 
reception frequency of interest in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the SidelinkUEInformation message included commRxInterestedFreq;

4> initiate transmission of the SidelinkUEInformation message to indicate it is no longer interested in 
sidelink communication reception in accordance with 5.10.2.3;

2> if configured by upper layers to transmit non-relay related one-to-many sidelink communication:

3> if the UE did not transmit a SidelinkUEInformation message since last entering RRC_CONNECTED 
state; or

3> if since the last time the UE transmitted a SidelinkUEInformation message the UE connected to a PCell 
not broadcasting SystemInformationBlockType18; or

3> if the last transmission of the SidelinkUEInformation message did not include commTxResourceReq; or if

the information carried by the commTxResourceReq has changed since the last transmission of the 
SidelinkUEInformation message:

4> initiate transmission of the SidelinkUEInformation message to indicate the non-relay related one-to-
many sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the SidelinkUEInformation message included commTxResourceReq;

4> initiate transmission of the SidelinkUEInformation message to indicate it no longer requires non-relay 
related one-to-many sidelink communication transmission resources in accordance with 5.10.2.3;

2> if configured by upper layer to transmit relay related one-to-many sidelink communication:

3> if the UE did not transmit a SidelinkUEInformation message since entering RRC_CONNECTED state; or
3> if since the last time the UE transmitted a SidelinkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType18, connected to a PCell not broadcasting SystemInformationBlockType19 or broadcasting SystemInformationBlockType19 not including discConfigRelay; or

3> if the last transmission of SidelinkUEInformation message did not include commTxResourceReqRelay; or if the information carried by the commTxResourceReqRelay has changed since the last transmission of the SidelinkUEInformation message:

4> if the UE is acting as sidelink relay UE:

5> initiate transmission of the SidelinkUEInformation message to indicate the relay related one-to-many sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the SidelinkUEInformation message included commTxResourceReqRelay:

4> initiate transmission of the SidelinkUEInformation message to indicate it no longer requires relay related one-to-many sidelink communication transmission resources in accordance with 5.10.2.3;

2> if configured by upper layers to transmit non-relay related one-to-one sidelink communication:

3> if the UE did not transmit a SidelinkUEInformation message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a SidelinkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType18 or connected to a PCell broadcasting SystemInformationBlockType18 not including commTxResourceUC-ReqAllowed; or

3> if the last transmission of the SidelinkUEInformation message did not include commTxResourceReqUC; or if the information carried by the commTxResourceReqUC has changed since the last transmission of the SidelinkUEInformation message:

4> if commTxResourceUC-ReqAllowed is included in SystemInformationBlockType18:

5> initiate transmission of the SidelinkUEInformation message to indicate the non-relay related one-to-one sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the SidelinkUEInformation message included commTxResourceReqUC:

4> initiate transmission of the SidelinkUEInformation message to indicate it no longer requires non-relay related one-to-one sidelink communication transmission resources in accordance with 5.10.2.3;

2> if configured by upper layers to transmit relay related one-to-one sidelink communication:

3> if the UE did not transmit a SidelinkUEInformation message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a SidelinkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType18, connected to a PCell not broadcasting SystemInformationBlockType19 or broadcasting SystemInformationBlockType19 not including discConfigRelay; or

3> if the last transmission of the SidelinkUEInformation message did not include commTxResourceReqRelayUC; or if the information carried by the commTxResourceReqRelayUC has changed since the last transmission of the SidelinkUEInformation message:

4> if the UE is acting as sidelink relay UE; or
if the UE has a selected sidelink relay UE; and if SystemInformationBlockType19 is broadcast by the PCell and includes discConfigRelay; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met;

5> initiate transmission of the SidetlinkUEInformation message to indicate the relay related one-to-one sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

else:

if the last transmission of the SidetlinkUEInformation message included commTxResourceReqRelayUC:

4> initiate transmission of the SidetlinkUEInformation message to indicate it no longer requires relay related one-to-one sidelink communication transmission resources in accordance with 5.10.2.3;

if SystemInformationBlockType19 is broadcast by the PCell:

2> ensure having a valid version of SystemInformationBlockType19 for the PCell;

2> if configured by upper layers to receive sidelink discovery announcements on a serving frequency or on one or more frequencies included in discInterFreqList, if included in SystemInformationBlockType19 of the PCell:

3> if the UE did not transmit a SidetlinkUEInformation message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a SidetlinkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType19; or

3> if the last transmission of the SidetlinkUEInformation message did not include discRxInterest:

4> initiate transmission of the SidetlinkUEInformation message to indicate it is interested in sidelink discovery reception in accordance with 5.10.2.3;

else:

3> if the last transmission of the SidetlinkUEInformation message included discRxInterest:

4> initiate transmission of the SidetlinkUEInformation message to indicate it is no longer interested in sidelink discovery reception in accordance with 5.10.2.3;

2> if the UE is configured by upper layers to transmit non-PS related sidelink discovery announcements on the primary frequency or on one or more frequencies included in discInterFreqList, if included in SystemInformationBlockType19 of the PCell, with discTxResourcesInterFreq included within discResourcesNonPS and not set to noTxOnCarrier:

3> if the UE did not transmit a SidetlinkUEInformation message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a SidetlinkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType19 or connected to a PCell broadcasting SystemInformationBlockType19 not including discTxResourcesInterFreq within discResourcesNonPS or discTxResourcesInterFreq did not include all frequencies for which the UE will request resources; or

3> if the last transmission of the SidetlinkUEInformation message did not include discTxResourceReq; or if the non-PS related sidelink discovery announcement resources required by the UE have changed (i.e. resulting in a change of discTxResourceReq) since the last transmission of the SidetlinkUEInformation message:

4> initiate transmission of the SidetlinkUEInformation message to indicate the non-PS related sidelink discovery announcement resources required by the UE in accordance with 5.10.2.3;

else:

3> if the last transmission of the SidetlinkUEInformation message included discTxResourceReq:
4> initiate transmission of the **SidelinkUEInformation** message to indicate it no longer requires non-PS related sidelink discovery announcement resources in accordance with 5.10.2.3;

2> if configured by upper layers to transmit PS related sidelink discovery announcements on the primary frequency or, in case of non-relay PS related sidelink discovery announcements, on a frequency included in **discInterFreqList**, if included in **SystemInformationBlockType19**, with **discTxResourcesInterFreq** included within **discResourcesPS** and not set to **noTxOnCarrier**;

3> if the UE did not transmit a **SidelinkUEInformation** message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a **SidelinkUEInformation** message the UE connected to a PCell not broadcasting **SystemInformationBlockType19**, connected to a PCell broadcasting **SystemInformationBlockType19** not including **discConfigPS**, or in case of non-relay PS related transmission: (connected to a PCell broadcasting **SystemInformationBlockType19** not including **discTxResourcesInterFreq** within **discResourcesPS** or for which **discTxResourcesInterFreq** did not include all frequencies for which the UE will request resources), or in case of relay related PS sidelink discovery announcements: (connected to a PCell broadcasting **SystemInformationBlockType19** not including **discConfigRelay**) sidelink; or

3> if the last transmission of the **SidelinkUEInformation** message did not include **discTxResourceReqPS**; or if the PS related sidelink discovery announcement resources required by the UE have changed (i.e. resulting in a change of **discTxResourceReqPS**) since the last transmission of the **SidelinkUEInformation** message:

4> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements; or

4> if the UE is acting as sidelink relay UE; and if **SystemInformationBlockType19** includes **discConfigRelay**; and if the sidelink relay UE threshold conditions as specified in 5.10.10.4 are met; or

4> if the UE is selecting a sidelink relay UE / has a selected sidelink relay UE; and if **SystemInformationBlockType19** includes **discConfigRelay**; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met:

5> initiate transmission of the **SidelinkUEInformation** message to indicate the PS related sidelink discovery announcement resources required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the **SidelinkUEInformation** message included **discTxResourceReqPS**:

4> initiate transmission of the **SidelinkUEInformation** message to indicate it no longer requires PS related sidelink discovery announcement resources in accordance with 5.10.2.3;

2> if configured by upper layers to monitor or transmit sidelink discovery announcements; and if the UE requires sidelink discovery gaps, to perform such actions:

3> if the UE did not transmit a **SidelinkUEInformation** message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a **SidelinkUEInformation** message the UE connected to a PCell not broadcasting **SystemInformationBlockType19** or connected to a PCell broadcasting **SystemInformationBlockType19** not including **gapRequestsAllowedCommon** while at the same time the UE was not configured with **gapRequestsAllowedDedicated**; or

3> if the last transmission of the **SidelinkUEInformation** message did not include the gaps required to monitor or transmit the sidelink discovery announcements (i.e. UE requiring gaps to monitor discovery announcements while **discRxGapReq** was not included or UE requiring gaps to transmit discovery announcements while **discTxGapReq** was not included); or if the sidelink discovery gaps required by the UE have changed (i.e. resulting in a change of **discRxGapReq** or **discTxGapReq**) since the last transmission of the **SidelinkUEInformation** message:

4> if the UE is configured with **gapRequestsAllowedDedicated** set to true; or

4> if the UE is not configured with **gapRequestsAllowedDedicated** and **gapRequestsAllowedCommon** is included in **SystemInformationBlockType19**:
5> initiate transmission of the SidelnkUEInformation message to indicate the sidelink discovery gaps required by the UE in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the SidelnkUEInformation message included discTxGapReq or discRxGapReq:
4> initiate transmission of the SidelnkUEInformation message to indicate it no longer requires sidelink discovery gaps in accordance with 5.10.2.3;

2> if the UE acquired the relevant parameters from the system information of one or more cells on a carrier included in the discSysInfoToReportConfig and T370 is running:

3> if the UE has configured lower layers to transmit or monitor the sidelink discovery announcements on those cells:
4> initiate transmission of the SidelnkUEInformation message to report the acquired system information parameters and stop T370;

1> if SystemInformationBlockType21 including sl-V2X-ConfigCommon is broadcast by the PCell:

2> ensure having a valid version of SystemInformationBlockType21 and SystemInformationBlockType26, if broadcast, for the PCell;

2> if configured by upper layers to receive V2X sidelink communication on a primary frequency or on one or more frequencies included in v2x-InterFreqInfoList, if included in SystemInformationBlockType21 or SystemInformationBlockType26 of the PCell:

3> if the UE did not transmit a SidelnkUEInformation message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a SidelnkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType21 including sl-V2X-ConfigCommon; or

3> if the last transmission of the SidelnkUEInformation message did not include v2x-CommRxInterestedFreqList; or if the frequency(ies) configured by upper layers to receive V2X sidelink communication on has changed since the last transmission of the SidelnkUEInformation message:
4> initiate transmission of the SidelnkUEInformation message to indicate the V2X sidelink communication reception frequency(ies) of interest in accordance with 5.10.2.3;

2> else:

3> if the last transmission of the SidelnkUEInformation message included v2x-CommRxInterestedFreqList:
4> initiate transmission of the SidelnkUEInformation message to indicate it is no longer interested in V2X sidelink communication reception in accordance with 5.10.2.3;

2> if configured by upper layers to transmit V2X sidelink communication on a primary frequency or on one or more frequencies included in v2x-InterFreqInfoList, if included in SystemInformationBlockType21 or SystemInformationBlockType26 of the PCell:

3> if the UE did not transmit a SidelnkUEInformation message since last entering RRC_CONNECTED state; or

3> if since the last time the UE transmitted a SidelnkUEInformation message the UE connected to a PCell not broadcasting SystemInformationBlockType21 including sl-V2X-ConfigCommon; or

3> if the last transmission of the SidelnkUEInformation message did not include v2x-CommTxResourceReq; or if the information carried by the v2x-CommTxResourceReq has changed since the last transmission of the SidelnkUEInformation message:
4> initiate transmission of the SidelnkUEInformation message to indicate the V2X sidelink communication transmission resources required by the UE in accordance with 5.10.2.3;

2> else:
3> if the last transmission of the SidelinkUEInformation message included v2x-CommTxResourceReq:

4> initiate transmission of the SidelinkUEInformation message to indicate it no longer requires V2X sidelink communication transmission resources in accordance with 5.10.2.3;

5.10.2.3 Actions related to transmission of SidelinkUEInformation message

The UE shall set the contents of the SidelinkUEInformation message as follows:

1> if the UE initiates the procedure to indicate it is (no more) interested to receive sidelink communication or discovery or receive V2X sidelink communication or to request (configuration/release) of sidelink communication or V2X sidelink communication or sidelink discovery transmission resources (i.e. UE includes all concerned information, irrespective of what triggered the procedure):

2> if SystemInformationBlockType18 is broadcast by the PCell:

3> if configured by upper layers to receive sidelink communication:

   4> include commRxInterestedFreq and set it to the sidelink communication frequency;

3> if configured by upper layers to transmit non-relay related one-to-many sidelink communication:

   4> include commTxResourceReq and set its fields as follows:

      5> set carrierFreq to indicate the sidelink communication frequency i.e. the same value as indicated in commRxInterestedFreq if included;

      5> set destinationInfoList to include the non-relay related one-to-many sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;

3> if configured by upper layers to transmit non-relay related one-to-one sidelink communication; and

3> if commTxResourceUC-ReqAllowed is included in SystemInformationBlockType18:

   4> include commTxResourceReqUC and set its fields as follows:

      5> set carrierFreq to indicate the one-to-one sidelink communication frequency i.e. the same value as indicated in commRxInterestedFreq if included;

      5> set destinationInfoList to include the non-relay related one-to-one sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;

3> if configured by upper layers to transmit relay related one-to-one sidelink communication; and

3> if SystemInformationBlockType19 is broadcast by the PCell including discConfigRelay; and

3> if the UE is acting as sidelink relay UE; or if the UE has a selected sidelink relay UE; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met:

   4> include commTxResourceReqRelayUC and set its fields as follows:

      5> set destinationInfoList to include the one-to-one sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;

   4> include ue-Type and set it to relayUE if the UE is acting as sidelink relay UE and to remoteUE otherwise;

3> if configured by upper layers to transmit relay related one-to-many sidelink communication; and

3> if SystemInformationBlockType19 is broadcast by the PCell including discConfigRelay; and

3> if the UE is acting as sidelink relay UE:

   4> include commTxResourceReqRelay and set its fields as follows:

      5> set destinationInfoList to include the one-to-many sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;
2> if SystemInformationBlockType19 is broadcast by the PCell:

3> if configured by upper layers to receive sidelink discovery announcements on a serving frequency or one or more frequencies included in discInterFreqList, if included in SystemInformationBlockType19:

4> include discRxInterest;

3> if the UE is configured by upper layers to transmit non-PS related sidelink discovery announcements:

4> for each frequency on which the UE is configured to transmit non-PS related sidelink discovery announcements that concerns the primary frequency or that is included in discResourcesNonPS and not set to noTxOnCarrier:

5> for the first frequency, include discTxResourceReq and set it to indicate the number of discovery messages for sidelink discovery announcement(s) for which it requests E-UTRAN to assign dedicated resources as well as the concerned frequency, if different from the primary;

5> for any additional frequency, include discTxResourceReqAddFreq and set it to indicate the number of discovery messages for sidelink discovery announcement(s) for which it requests E-UTRAN to assign dedicated resources as well as the concerned frequency;

3> if configured by upper layers to transmit PS related sidelink discovery announcements; and

3> if the frequency on which the UE is configured to transmit PS related sidelink discovery announcements either concerns the primary frequency or, in case of non-relay PS related sidelink discovery announcements, is included in discInterFreqList with discTxResourcesInterFreq included within discResourcesPS and not set to noTxOnCarrier:

4> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements and SystemInformationBlockType19 includes discConfigPS; or

4> if the UE is acting as sidelink relay UE; and if SystemInformationBlockType19 includes discConfigRelay; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met:

5> include discTxResourceReqPS and set it to indicate the number of discovery messages for PS related sidelink discovery announcement(s) for which it requests E-UTRAN to assign dedicated resources as well as the concerned frequency, if different from the primary;

2> if SystemInformationBlockType21 is broadcast by the PCell and SystemInformationBlockType21 includes sl-V2X-ConfigCommon:

3> if configured by upper layers to receive V2X sidelink communication:

4> include v2x-CommRxInterestedFreqList and set it to the frequency(ies) for V2X sidelink communication reception;

3> if configured by upper layers to transmit V2X sidelink communication:

4> if configured by upper layers to transmit P2X related V2X sidelink communication:

5> include p2x-CommTxType set to true;

4> include v2x-CommTxResourceReq and set its fields as follows for each frequency on which the UE is configured for V2X sidelink communication transmission:

5> set carrierFreqCommTx to indicate the frequency for V2X sidelink communication transmission;

5> set v2x-TypeTxSync to the current synchronization reference type used on the associated carrierFreqCommTx for V2X sidelink communication transmission;
5> set v2x-DestinationInfoList to include the V2X sidelink communication transmission destination(s) for which it requests E-UTRAN to assign dedicated resources;

1> else if the UE initiates the procedure to request sidelink discovery transmission and/ or reception gaps:

2> if the UE is configured with gapRequestsAllowedDedicated set to true; or

2> if the UE is not configured with gapRequestsAllowedDedicated and gapRequestsAllowedCommon is included in SystemInformationBlockType19:

3> if the UE requires sidelink discovery gaps to monitor the sidelink discovery announcements the UE is configured to monitor by upper layers:

4> include discRxGapReq and set it to indicate, for each frequency that either concerns the primary frequency or is included in discInterFreqList on which the UE is configured to monitor sidelink discovery announcements and for which it requires sidelink discovery gaps to do so, the gap pattern(s) as well as the concerned frequency, if different from the primary;

3> if the UE requires sidelink discovery gaps to transmit the sidelink discovery announcements the UE is configured to transmit by upper layers:

4> include discTxGapReq and set it to indicate, for each frequency that either concerns the primary or is included in discInterFreqList on which the UE is configured to transmit sidelink discovery announcements and for which it requires sidelink discovery gaps to do so, the gap pattern(s) as well as the concerned frequency, if different from the primary;

1> else if the UE initiates the procedure to report the system information parameters related to sidelink discovery of carriers other than the primary:

2> include discSysInfoReportFreqList and set it to report the system information parameter acquired from the cells on those carriers;

The UE shall submit the SidelinkUEInformation message to lower layers for transmission.

5.10.3 Sidelink communication monitoring

A UE capable of sidelink communication that is configured by upper layers to receive sidelink communication shall:

1> if the conditions for sidelink communication operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> if the cell chosen for sidelink communication reception broadcasts SystemInformationBlockType18 including commRxPool:

4> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated by commRxPool;

NOTE 1: If commRxPool includes one or more entries including rxParametersNCell, the UE may only monitor such entries if the associated PSS/SSS or SLSSIDs is detected. When monitoring such pool(s), the UE applies the timing of the concerned PSS/SSS or SLSS.

2> else (i.e. out of coverage on the sidelink carrier):

3> configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources that were preconfigured (i.e. preconfigComm in SL-Preconfiguration defined in 9.3);

NOTE 2: The UE may monitor in accordance with the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UE's own timing.
5.10.4 Sidelink communication transmission

A UE capable of sidelink communication that is configured by upper layers to transmit non-relay related sidelink communication and has related data to be transmitted or a UE capable of relay related sidelink communication that is configured by upper layers to transmit relay related sidelink communications and satisfies the conditions for relay related sidelink communication specified in this section shall:

1> if the conditions for sidelink communication operation as defined in 5.10.1a are met:

2> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

3> if the UE is in RRC_CONNECTED and uses the PCell for sidelink communication:

4> if the UE is configured, by the current PCell/ the PCell in which physical layer problems or radio link failure was detected, with commTxResources set to scheduled:

5> if T310 or T311 is running; and if the PCell at which the UE detected physical layer problems or radio link failure broadcasts SystemInformationBlockType18 including commTxPoolExceptional; or

5> if T301 is running and the cell on which the UE initiated connection re-establishment broadcasts SystemInformationBlockType18 including commTxPoolExceptional:

6> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in commTxPoolExceptional;

5> else:

6> configure lower layers to request E-UTRAN to assign transmission resources for sidelink communication;

4> else if the UE is configured with commTxPoolNormalDedicated or commTxPoolNormalDedicatedExt:

5> if priorityList is included for the entries of commTxPoolNormalDedicated or commTxPoolNormalDedicatedExt:

6> configure lower layers to transmit the sidelink control information and the corresponding data using the one or more pools of resources indicated by commTxPoolNormalDedicated or commTxPoolNormalDedicatedExt i.e. indicate all entries of this field to lower layers;

5> else:

6> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in commTxPoolNormalDedicated;

3> else (i.e. sidelink communication in RRC_IDLE or on cell other than PCell in RRC_CONNECTED):

4> if the cell chosen for sidelink communication transmission broadcast
SystemInformationBlockType18:

5> if SystemInformationBlockType18 includes commTxPoolNormalCommon:

6> if priorityList is included for the entries of commTxPoolNormalCommon or commTxPoolNormalCommonExt:

7> configure lower layers to transmit the sidelink control information and the corresponding data using the one or more pools of resources indicated by commTxPoolNormalCommon and/or commTxPoolNormalCommonExt i.e. indicate all entries of these fields to lower layers;

6> else:

7> configure lower layers to transmit the sidelink control information and the corresponding data using the pool of resources indicated by the first entry in commTxPoolNormalCommon;
5> else if \textit{SystemInformationBlockType18} includes \textit{commTxPoolExceptional}:

6> from the moment the UE initiates connection establishment until receiving an 
\textit{RRCConnectionReconfiguration} including sl-CommConfig or until receiving an 
\textit{RRCConnectionRelease} or an \textit{RRCConnectionReject};

7> configure lower layers to transmit the sidelink control information and the 
 corresponding data using the pool of resources indicated by the first entry in 
\textit{commTxPoolExceptional};

2> else (i.e. out of coverage on sidelink carrier):

3> if \textit{priorityList} is included for the entries of \textit{preconfigComm} in \textit{SL-Preconfiguration} defined in 9.3:

4> configure lower layers to transmit the sidelink control information and the corresponding data using 
the one or more pools of resources indicated \textit{preconfigComm} i.e. indicate all entries of this field to 
lower layers and in accordance with the timing of the selected SyncRef UE, or if the UE does not have 
a selected SyncRef UE, based on the UEs own timing;

3> else:

4> configure lower layers to transmit the sidelink control information and the corresponding data using 
the pool of resources that were preconfigured i.e. indicated by the first entry in \textit{preconfigComm} in \textit{SL-} 
\textit{Preconfiguration} defined in 9.3 and in accordance with the timing of the selected SyncRef UE, or if 
the UE does not have a selected SyncRef UE, based on the UEs own timing;

The conditions for relay related sidelink communication are as follows:

1> if the transmission concerns sidelink relay communication; and the UE is capable of sidelink relay or sidelink 
remote operation:

2> if the UE is in RRC_IDLE; and if the UE has a selected sidelink relay UE: configure lower layers to transmit 
the sidelink control information and the corresponding data using the resources, as specified previously in 
this section, only if the following condition is met:

3> if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met; and if the UE configured 
lower layers with a pool of resources included in \textit{SystemInformationBlockType18} (i.e. 
\textit{commTxPoolNormalCommon}, \textit{commTxPoolNormalCommonExt} or \textit{commTxPoolExceptional}); and 
\textit{commTxAllowRelayCommon} is included in \textit{SystemInformationBlockType18};

2> if the UE is in RRC_CONNECTED: configure lower layers to transmit the sidelink control information and 
the corresponding data using the resources, as specified previously in this section, only if the following 
condition is met:

3> if the UE configured lower layers with resources provided by dedicated signalling (i.e. 
\textit{commTxResources}); and the UE is configured with \textit{commTxAllowRelayDedicated} set to \textit{true};

5.10.5 Sidelink discovery monitoring

A UE capable of non-PS related sidelink discovery that is configured by upper layers to monitor non-PS related sidelink 
discovery announcements shall:

1> for each frequency the UE is configured to monitor non-PS related sidelink discovery announcements on, 
prioritising the frequencies included in \textit{discInterFreqList}, if included in \textit{SystemInformationBlockType19}:

2> if the PCell or the cell the UE is camping on indicates the pool of resources to monitor sidelink discovery 
announcements on by \textit{discRxResourcesInterFreq} in \textit{discResourcesNonPS} within \textit{discInterFreqList} in 
\textit{SystemInformationBlockType19}:

3> configure lower layers to monitor sidelink discovery announcements using the pool of resources indicated 
by \textit{discRxResourcesInterFreqIn discResourcesNonPS} within \textit{SystemInformationBlockType19};

2> else if the cell used for sidelink discovery monitoring broadcasts \textit{SystemInformationBlockType19}:

3> configure lower layers to monitor sidelink discovery announcements using the pool of resources indicated 
by \textit{discRxPool} in \textit{SystemInformationBlockType19};
2> if the UE is configured with discRxGapConfig and requires sidelink discovery gaps to monitor sidelink discovery announcements on the concerned frequency;

3> configure lower layers to monitor the concerned frequency using the sidelink discovery gaps indicated by discRxGapConfig;

2> else:

3> configure lower layers to monitor the concerned frequency without affecting normal operation;

A UE capable of PS related sidelink discovery that is configured by upper layers to monitor PS related sidelink discovery announcements shall:

1> if out of coverage on the frequency, as defined in TS 36.304 [4, 11.4]:

2> configure lower layers to monitor sidelink discovery announcements using the pool of resources that were preconfigured (i.e. indicated by discRxPoolList within preconfigDisc in SL-Preconfiguration defined in 9.3);

1> else if configured by upper layers to monitor non-relay PS related discovery announcements; and if the PCell or the cell the UE is camping on indicates a pool of resources to monitor sidelink discovery announcements on by discRxResourcesInterFreq in discResourcesPS within discResourcesPSList in SystemInformationBlockType19:

2> configure lower layers to monitor sidelink discovery announcements using the pool of resources indicated by discRxResourcesInterFreq in discResourcesPS in SystemInformationBlockType19;

1> else if configured by upper layers to monitor PS related sidelink discovery announcements; and if the cell used for sidelink discovery monitoring broadcasts SystemInformationBlockType19:

2> configure lower layers to monitor sidelink discovery announcements using the pool of resources indicated by discRxPoolPS in SystemInformationBlockType19;

1> if the UE is configured with discRxGapConfig and requires sidelink discovery gaps to monitor sidelink discovery announcements on the concerned frequency;

2> configure lower layers to monitor the concerned frequency using the sidelink discovery gaps indicated by discRxGapConfig;

1> else:

2> configure lower layers to monitor the concerned frequency without affecting normal operation;

NOTE 1: The requirement not to affect normal UE operation also applies for the acquisition of sidelink discovery related system and synchronisation information from inter-frequency cells.

NOTE 2: The UE is not required to monitor all pools simultaneously.

NOTE 3: It is up to UE implementation to decide whether a cell is sufficiently good to be used to monitor sidelink discovery announcements.

NOTE 4: If discRxPool, discRxPoolPS or discRxResourcesInterFreq includes one or more entries including rxParameters, the UE may only monitor such entries if the associated SLSSIDs are detected. When monitoring such pool(s) the UE applies the timing of the corresponding SLSS.

5.10.6 Sidelink discovery announcement

A UE capable of non-PS related sidelink discovery that is configured by upper layers to transmit non-PS related sidelink discovery announcements shall, for each frequency the UE is configured to transmit such announcements on:

NOTE: In case the configured resources are insufficient it is up to UE implementation to decide which sidelink discovery announcements to transmit.

1> if the frequency used to transmit sidelink discovery announcements concerns the serving frequency (RRC_IDLE) or primary frequency (RRC_CONNECTED):

2> if the UE's serving cell (RRC_IDLE) or PCell (RRC_CONNECTED) is suitable as defined in TS 36.304 [4]:
3> if the UE is in RRC_CONNECTED (i.e. PCell is used for sidelink discovery announcement):

4> if the UE is configured with discTxResources set to scheduled:

5> configure lower layers to transmit the sidelink discovery announcement using the assigned resources indicated by scheduled in discTxResources;

4> else if the UE is configured with discTxPoolDedicated (i.e. discTxResources set to ue-Selected):

5> select an entry of the list of resource pool entries in discTxPoolDedicated and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

3> else if T300 is not running (i.e. UE in RRC_IDLE, announcing via serving cell):

4> if SystemInformationBlockType19 of the serving cell includes discTxPoolCommon:

5> select an entry of the list of resource pool entries in discTxPoolCommon and configure lower layers to transmit the sidelink discovery announcements as specified in 5.10.6a;

1> else if, for the frequency used to transmit sidelink discovery announcements on, the UE is configured with dedicated resources (i.e. with discTxResources-r12, if discTxCarrierFreq is included in discTxInterFreqInfo, or with discTxResources within discTxInfoInterFreqListAdd in discTxInterFreqInfo); and the conditions for non-PS related sidelink discovery operation as defined in 5.10.1c are met:

2> if the UE is configured with discTxResources set to scheduled:

3> configure lower layers to transmit the sidelink discovery announcement using the assigned resources indicated by scheduled in discTxResources;

2> else if the UE is configured with discTxResources set to ue-Selected:

3> select an entry of the list of resource pool entries in ue-Selected and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

1> else if the frequency used to transmit sidelink discovery announcements on is included in discInterFreqList within SystemInformationBlockType19 of the serving cell/ PCell, and discTxResourcesInterFreq within discResourcesNonPS in the corresponding entry of discInterFreqList is set to discTxPoolCommon (i.e. serving cell/ PCell broadcasts pool of resources) and the conditions for non-PS related sidelink discovery operation as defined in 5.10.1c are met; or

1> else if discTxPoolCommon is included in SystemInformationBlockType19 acquired from cell selected on the sidelink discovery announcement frequency; and the conditions for non-PS related sidelink discovery operation as defined in 5.10.1c are met:

2> select an entry of the list of resource pool entries in discTxPoolCommon and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

1> if the UE is configured with discTxGapConfig and requires sidelink discovery gaps to transmit sidelink discovery announcements on the concerned frequency:

2> configure lower layers to transmit on the concerned frequency using the sidelink discovery gaps indicated by discTxGapConfig;

1> else:

2> configure lower layers to transmit on the concerned frequency without affecting normal operation;

A UE capable of PS related sidelink discovery that is configured by upper layers to transmit PS related sidelink discovery announcements shall:

1> if out of coverage on the frequency used to transmit PS related sidelink discovery announcements as defined in TS 36.304 [4, 11.4] and the conditions for PS -related sidelink discovery operation as defined in 5.10.1b are met:

2> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements; or

2> if the UE is selecting a sidelink relay UE/ has a selected sidelink relay UE:
3> configure lower layers to transmit sidelink discovery announcements using the pool of resources that were preconfigured and in accordance with the following:

4> randomly select, using a uniform distribution, an entry of preconfigDisc in SL-Preconfiguration defined in 9.3;

4> using the timing of the selected SyncRef UE, or if the UE does not have a selected SyncRef UE, based on the UEs own timing;

1> else if the frequency used to transmit sidelink discovery announcements concerns the serving frequency (RRC_IDLE) or primary frequency (RRC_CONNECTED) and the conditions for PS related sidelink discovery operation as defined in 5.10.1b are met:

2> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements; or

2> if the UE is acting as sidelink relay UE; and if the UE is in RRC_IDLE; and if the sidelink relay UE threshold conditions as specified in 5.10.10.4 are met; or

2> if the UE is acting as sidelink relay UE; and if the UE is in RRC_CONNECTED; or

2> if the UE is selecting a sidelink relay UE / has a selected sidelink relay UE; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met:

3> if the UE is configured with discTxPoolPS-Dedicated; or

3> if the UE is in RRC_IDLE; and if discTxPoolPS-Common is included in SystemInformationBlockType19:

4> select an entry of the list of resource pool entries and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

3> else if the UE is configured with discTxResourcesPS set to scheduled:

4> configure lower layers to transmit the sidelink discovery announcement using the assigned resources indicated by scheduled in discTxResourcesPS;

1> else if, for the frequency used to transmit sidelink discovery announcements on, the UE is configured with dedicated resources (i.e. with discTxResourcesPS in discTxInterFreqInfo within sl-DiscConfig); and the conditions for PS related sidelink discovery operation as defined in 5.10.1b are met:

2> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements:

3> if the UE is configured with discTxResourcesPS set to scheduled:

4> configure lower layers to transmit the sidelink discovery announcement using the assigned resources indicated by scheduled in discTxResourcesPS;

3> else if the UE is configured with discTxResourcesPS set to ue-Selected:

4> select an entry of the list of resource pool entries in ue-Selected and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

1> else if the frequency used to transmit sidelink discovery announcements on is included in discInterFreqList within SystemInformationBlockType19 of the serving cell/ PCell, while discTxResourcesInterFreq within discResourcesPS in the corresponding entry of discInterFreqList is set to discTxPoolCommon (i.e. serving cell/ PCell broadcasts pool of resources) and the conditions for PS related sidelink discovery operation as defined in 5.10.1b are met:

2> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements:

3> select an entry of the list of resource pool entries in discTxPoolCommon and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

1> else if discTxPoolPS-Common is included in SystemInformationBlockType19 acquired from cell selected on the sidelink discovery announcement frequency; and the conditions for PS related sidelink discovery operation as defined in 5.10.1b are met:

2> if configured by upper layers to transmit non-relay PS related sidelink discovery announcements:
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> select an entry of the list of resource pool entries in discTxPoolPS-Common and configure lower layers to use it to transmit the sidelink discovery announcements as specified in 5.10.6a;

1> if the UE is configured with discTxGapConfig and requires gaps to transmit sidelink discovery announcements on the concerned frequency;

2> configure lower layers to transmit on the concerned frequency using the gaps indicated by discTxGapConfig,

1> else:

2> configure lower layers to transmit on the concerned frequency without affecting normal operation;

5.10.6a Sidelink discovery announcement pool selection

A UE that is configured with a list of resource pool entries for sidelink discovery announcement transmission (i.e. by SL-DiscTxPoolList) shall:

1> if poolSelection is set to rsrpBased:

2> select a pool from the list of pools the UE is configured with for which the RSRP measurement of the reference cell selected as defined in 5.10.6b, after applying the layer 3 filter defined by quantityConfig as specified in 5.5.3.2, is in-between threshLow and threshHigh;

1> else:

2> randomly select, using a uniform distribution, a pool from the list of pools the UE is configured with;

1> configure lower layers to transmit the sidelink discovery announcement using the selected pool of resources;

NOTE 1: When performing resource pool selection based on RSRP, the UE uses the latest results of the available measurements used for cell reselection evaluation in RRC_IDLE/ for measurement report triggering evaluation in RRC_CONNECTED, which are performed in accordance with the performance requirements specified in TS 36.133 [16].

5.10.6b Sidelink discovery announcement reference carrier selection

A UE capable of sidelink discovery that is configured by upper layers to transmit sidelink discovery announcements shall:

1> for each frequency the UE is transmitting sidelink discovery announcements on, select a cell to be used as reference for synchronisation and DL measurements in accordance with the following:

2> if the frequency concerns the primary frequency:

3> use the PCell as reference;

2> else if the frequency concerns a secondary frequency:

3> use the concerned SCell as reference;

2> else if the UE is configured with discTxRefCarrierDedicated for the frequency:

3> use the cell indicated by this field as reference;

2> else if the UE is configured with refCarrierCommon for the frequency:

3> use the serving cell (RRC_IDLE)/ PCell (RRC_CONNECTED) as reference;

2> else:

3> use the DL frequency paired with the one used to transmit sidelink discovery announcements on as reference;
5.10.7 Sidelink synchronisation information transmission

5.10.7.1 General

The purpose of this procedure is to provide synchronisation information to a UE. For sidelink discovery, the synchronisation information concerns a Sidelink Synchronisation Signal (SLSS) and, in case of PS related discovery, also timing information and some additional configuration parameters (i.e. the MasterInformationBlock-SL message), while for sidelink communication or V2X sidelink communication it concerns an SLSS and the MasterInformationBlock-SL-V2X message. A UE transmits synchronisation information either when E-UTRAN configures it to do so by dedicated signalling (i.e. network based), or when not configured by dedicated signalling (i.e. UE based) and E-UTRAN broadcasts (in coverage) or pre-configures a threshold (out of coverage).

The synchronisation information transmitted by the UE may be derived from information/signals received from E-UTRAN (in coverage) or received from a UE acting as synchronisation reference for the transmitting UE or received from GNSS. In the remainder, the UE acting as synchronisation reference is referred to as SyncRef UE.
5.10.7.2 Initiation

A UE capable of SLSS transmission shall, when transmitting sidelink discovery announcements in accordance with 5.10.6 and when the following conditions are met:

1> if in coverage on the frequency used for sidelink discovery, as defined in TS 36.304 [4, 11.4]:

2> if in RRC_CONNECTED; and if networkControlledSyncTx is configured and set to on; or

2> if networkControlledSyncTx is not configured; and syncTxThreshIC is included in SystemInformationBlockType19; and the RSRP measurement of the reference cell, selected as defined in 5.10.6b, is below the value of syncTxThreshIC:

3> if the sidelink discovery announcements are not PS related; or if syncTxPeriodic is not included:

4> transmit SLSS on the frequency used for sidelink discovery in accordance with 5.10.7.3 and TS 36.211 [21];

3> else:

4> transmit SLSS on the frequency used for sidelink discovery in accordance with 5.10.7.3 and TS 36.211 [21];

4> transmit the MasterInformationBlock-SL message on the frequency used for sidelink discovery, in the same subframe as SLSS, and in accordance with 5.10.7.4;

1> else (i.e. out of coverage, PS):

2> if syncTxThreshOoC is included in the preconfigured sidelink parameters (i.e. SL-Preconfiguration defined in 9.3); and the UE has not selected SyncRef UE or the S-RSRP measurement result of the selected SyncRef UE is below the value of syncTxThreshOoC:

3> transmit SLSS on the frequency used for sidelink discovery in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the MasterInformationBlock-SL message on the frequency used for sidelink discovery, in the same subframe as SLSS, and in accordance with 5.10.7.4;

A UE capable of sidelink communication that is configured by upper layers to transmit sidelink communication shall, irrespective of whether or not it has data to transmit:

1> if the conditions for sidelink communication operation as defined in 5.10.1a are met:

2> if in RRC_CONNECTED; and if networkControlledSyncTx is configured and set to on:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the MasterInformationBlock-SL message, in the same subframe as SLSS, and in accordance with 5.10.7.4;

A UE shall, when transmitting sidelink communication in accordance with 5.10.4 and when the following conditions are met:

1> if in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

2> if the UE is in RRC_CONNECTED; and networkControlledSyncTx is not configured; and syncTxThreshIC is included in SystemInformationBlockType18; and the RSRP measurement of the cell chosen for sidelink communication transmission is below the value of syncTxThreshIC; or

2> if the UE is in RRC_IDLE; and syncTxThreshIC is included in SystemInformationBlockType18; and the RSRP measurement of the cell chosen for sidelink communication transmission is below the value of syncTxThreshIC:

3> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

3> transmit the MasterInformationBlock-SL message, in the same subframe as SLSS, and in accordance with 5.10.7.4;
A UE capable of V2X sidelink communication and SLSS/PSBCH transmission shall, when transmitting non-P2X related V2X sidelink communication in accordance with 5.10.13, and if the conditions for V2X sidelink communication operation as defined in 5.10.1d are met and when the following conditions are met:

1> if in coverage on the frequency used for V2X sidelink communication, as defined in TS 36.304 [4, 11.4]; and has selected GNSS or the cell as synchronization reference as defined in 5.10.13.3; or

1> if out of coverage on the frequency used for V2X sidelink communication, as defined in TS 36.304 [4, 11.4], and the frequency used to transmit V2X sidelink communication is included in v2x-InterFreqInfoList in RRCConnectionReconfiguration or in v2x-InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26 of the serving cell/ PCell; and has selected GNSS or the cell as synchronization reference as defined in 5.10.13.3:

2> if syncFreqList is not included in RRCConnectionReconfiguration nor in SystemInformationBlockType26; or

2> if syncFreqList is included in RRCConnectionReconfiguration or in SystemInformationBlockType26; and if none of the frequency(ies) selected as specified in TS 36.321 [6] is included in the syncFreqList or the concerned frequency is selected as the synchronisation carrier frequency in accordance with 5.10.8a; or

2> if syncFreqList and slss-TxMultiFreq are included in RRCConnectionReconfiguration or in SystemInformationBlockType26; and if the UE has selected a frequency other than the concerned frequency as the synchronisation carrier frequency; and if slss-TxDisabled corresponding to the concerned frequency is not configured in RRCConnectionReconfiguration; and if the concerned frequency has been selected for V2X sidelink communication transmission as specified in TS 36.321 [6] and is included in syncFreqList; and if UE is capable of SLSS/PSBCH transmission on the concerned frequency:

3> if in RRC_CONNECTED; and if networkControlledSyncTx is configured and set to on; or

3> if networkControlledSyncTx is not configured; and for the concerned frequency syncTxThreshIC is configured; and the RSRP measurement of the reference cell, selected as defined in 5.10.13.3, for V2X sidelink communication transmission is below the value of syncTxThreshIC:

4> transmit SLSS on the frequency used for V2X sidelink communication in accordance with 5.10.7.3 and TS 36.211 [21];

4> transmit the MasterInformationBlock-SL-V2X message on the frequency used for V2X sidelink communication, in the same subframe as SLSS, and in accordance with 5.10.7.4;

1> else:

2> for the frequency used for V2X sidelink communication, if syncOffsetIndicators is included in SL-V2X-Preconfiguration:

3> If syncFreqList is not included in SL-V2X-Preconfiguration; or

3> if syncFreqList is included in SL-V2X-Preconfiguration, and if none of the frequency(ies) selected as specified in TS 36.321 [6] is included in the syncFreqList or the concerned frequency is selected as the synchronisation carrier frequency in accordance with 5.10.8a; or

3> if syncFreqList and slss-TxMultiFreq are included in SL-V2X-Preconfiguration, and if the UE has selected a frequency other than the concerned frequency as the synchronisation carrier frequency; and if slss-TxDisabled corresponding to the concerned frequency is not configured in SL-V2X-Preconfiguration; and if the concerned frequency has been selected for V2X sidelink communication transmission as specified in TS 36.321 [6] and included in syncFreqList; and if the UE is capable of SLSS/PSBCH transmission on the frequency:
4> if \textit{syncTxThreshOoC} is included in \textit{SL-V2X-Preconfiguration}; and the UE is not directly synchronized to GNSS, and the UE has no selected SyncRef UE or the S-RSRP measurement result of the selected SyncRef UE is below the value of \textit{syncTxThreshOoC}; or

4> if the UE selects GNSS as the synchronization reference source:

5> transmit SLSS in accordance with 5.10.7.3 and TS 36.211 [21];

5> transmit the \textit{MasterInformationBlock-SL-V2X} message, in the same subframe as SLSS, and in accordance with 5.10.7.4;

**NOTE 1:** In the case of limited transmission capabilities on multiple carrier frequencies, when the UE is configured with \textit{syncFreqList}, whether to transmit SLSS/PSBCH on a frequency, which is selected for V2X sidelink communication transmission as specified in TS 36.321 [6] and is other than the synchronisation carrier frequency, is up to UE implementation.

5.10.7.3 Transmission of SLSS

The UE shall select the SLSSID and the subframe in which to transmit SLSS as follows:

1> if triggered by sidelink discovery announcement and in coverage on the frequency used for sidelink discovery, as defined in TS 36.304 [4, 11.4]:

2> select the SLSSID included in the entry of \textit{discSyncConfig} included in the received \textit{SystemInformationBlockType19}, that includes \textit{txParameters};

2> use \textit{syncOffsetIndicator} corresponding to the selected SLSSID;

2> for each pool used for the transmission of discovery announcements (each corresponding to the selected SLSSID):

3> if a subframe indicated by \textit{syncOffsetIndicator} corresponds to the first subframe of the discovery transmission pool;

4> if \textit{discTxGapConfig} is configured and includes the concerned subframe; or the subframe is not used for regular uplink transmission:

5> select the concerned subframe;

3> else

4> if \textit{discTxGapConfig} is configured and includes the concerned subframe; or the subframe is not used for regular uplink transmission:

5> select the subframe indicated by \textit{syncOffsetIndicator} that precedes and which, in time domain, is nearest to the first subframe of the discovery transmission pool;

3> if the sidelink discovery announcements concern PS; and if \textit{syncTxPeriodic} is included:

4> additionally select each subframe that periodically occurs 40 subframes after the selected subframe;

1> if triggered by sidelink communication and in coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]:

2> select the SLSSID included in the entry of \textit{commSyncConfig} that is included in the received \textit{SystemInformationBlockType18} and includes \textit{txParameters};

2> use \textit{syncOffsetIndicator} corresponding to the selected SLSSID;

2> if in RRC\_CONNECTED; and if \textit{networkControlledSyncTx} is configured and set to \textit{on}:

3> select the subframe(s) indicated by \textit{syncOffsetIndicator};

2> else (when transmitting communication):

3> select the subframe(s) indicated by \textit{syncOffsetIndicator} within the SC period in which the UE intends to transmit sidelink control information or data;
1> if triggered by V2X sidelink communication and in coverage on the frequency used for V2X sidelink communication, as defined in TS 36.304 [4, 11.4]; or

1> if triggered by V2X sidelink communication, and out of coverage on the frequency used for V2X sidelink communication, and the concerned frequency is included in v2x-InterFreqInfoList in RRCConnectionReconfiguration or in v2x-InterFreqInfoList within SystemInformationBlockType21 of the serving cell/ PCell;

2> if the UE has selected GNSS as synchronization reference in accordance with 5.10.8.2:

   3> select SLSSID 0;

   3> use syncOffsetIndicator included in the entry of v2x-SyncConfig corresponding to the concerned frequency in v2x-InterFreqInfoList or within SystemInformationBlockType21, that includes txParameters and gnss-Sync;

   3> select the subframe(s) indicated by syncOffsetIndicator;

2> if the UE has selected a cell as synchronization reference in accordance with 5.10.8.2:

   3> select the SLSSID included in the entry of v2x-SyncConfig configured for the concerned frequency in v2x-InterFreqInfoList or within SystemInformationBlockType21, that includes txParameters and does not include gnss-Sync;

   3> use syncOffsetIndicator corresponding to the selected SLSSID;

   3> select the subframe(s) indicated by syncOffsetIndicator;

1> else if triggered by V2X sidelink communication and the UE has GNSS as the synchronization reference:

2> select SLSSID 0;

2> if syncOffsetIndicator3 is configured for the frequency used for V2X sidelink communication in SL-V2X-Preconfiguration:

   3> select the subframe(s) indicated by syncOffsetIndicator3;

2> else:

   3> select the subframe(s) indicated by syncOffsetIndicator1;

1> else:

2> select the synchronisation reference UE (i.e. SyncRef UE) as defined in 5.10.8;

2> if the UE has a selected SyncRef UE and inCoverage in the MasterInformationBlock-SL or MasterInformationBlock-SL-V2X message received from this UE is set to TRUE; or

2> if the UE has a selected SyncRef UE and inCoverage in the MasterInformationBlock-SL or MasterInformationBlock-SL-V2X message received from this UE is set to FALSE while the SLSS from this UE is part of the set defined for out of coverage, see TS 36.211 [21]:

   3> select the same SLSSID as the SLSSID of the selected SyncRef UE;

   3> select the subframe in which to transmit the SLSS according to the syncOffsetIndicator1 or syncOffsetIndicator2 included in the preconfigured sidelink parameters (i.e. preconfigSync in SL-Preconfiguration or v2x-CommPreconfigSync in SL-V2X-Preconfiguration defined in 9.3) corresponding to the concerned frequency, such that the subframe timing is different from the SLSS of the selected SyncRef UE;

2> else if the UE has a selected SyncRef UE and the SLSS from this UE was transmitted on the subframe indicated by syncOffsetIndicator3 that is included in the syncOffsetIndicators in SL-V2X-Preconfiguration, and is corresponding to the frequency used for V2X sidelink communication:

   3> select SLSSID 169;

   3> select the subframe(s) indicated by syncOffsetIndicator2;
else if the UE has a selected SyncRef UE:

1. select the SLSSID from the set defined for out of coverage having an index that is 168 more than the index of the SLSSID of the selected SyncRef UE, see TS 36.211 [21];

2. select the subframe in which to transmit the SLSS according to `syncOffsetIndicator1` or `syncOffsetIndicator2` included in the preconfigured sidelink parameters (i.e. `preconfigSync` in SL-Preconfiguration or `v2x-CommPreconfigSync` in SL-V2X-Preconfiguration defined in 9.3), such that the subframe timing is different from the SLSS of the selected SyncRef UE;

else (i.e. no SyncRef UE selected):

1. if triggered by V2X sidelink communication, randomly select, using a uniform distribution, an SLSSID from the set of sequences defined for out of coverage except SLSSID 168 and 169, see TS 36.211 [21];

2. else, randomly select, using a uniform distribution, an SLSSID from the set of sequences defined for out of coverage, see TS 36.211 [21];

3. select the subframe in which to transmit the SLSS according to the `syncOffsetIndicator1` or `syncOffsetIndicator2` (arbitrary selection between these) included in the preconfigured sidelink parameters (i.e. `preconfigSync` in SL-Preconfiguration or `v2x-CommPreconfigSync` in SL-V2X-Preconfiguration defined in 9.3);

5.10.7.4 Transmission of `MasterInformationBlock-SL` or `MasterInformationBlock-SL-V2X` message

The UE shall set the contents of the `MasterInformationBlock-SL` or `MasterInformationBlock-SL-V2X` message as follows:

1. if in coverage on the frequency used for the sidelink operation that triggered this procedure as defined in TS 36.304 [4, 11.4]:

   2. set `inCoverage` to `TRUE`;

   3. set `sl-Bandwidth` to the value of `ul-Bandwidth` as included in the received `SystemInformationBlockType2` of the cell chosen for the concerned sidelink operation;

   4. if `tdd-Config` is included in the received `SystemInformationBlockType1`:

      5. set `subframeAssignmentSL` to the value representing the same meaning as of `subframeAssignment` that is included in `tdd-Config` in the received `SystemInformationBlockType1`;

   5. else:

      6. set `subframeAssignmentSL` to `none`;

   7. if triggered by sidelink communication; and if `syncInfoReserved` is included in an entry of `commSyncConfig` from the received `SystemInformationBlockType18`:

      8. set `reserved` to the value of `syncInfoReserved` in the received `SystemInformationBlockType18`;

   8. if triggered by sidelink discovery; and if `syncInfoReserved` is included in an entry of `discSyncConfig` from the received `SystemInformationBlockType19`:

      9. set `reserved` to the value of `syncInfoReserved` in the received `SystemInformationBlockType19`;

   9. if triggered by V2X sidelink communication; and if `syncInfoReserved` is included in an entry of `v2x-SyncConfig` from the received `SystemInformationBlockType21` or `SystemInformationBlockType26`:

      10. set `reserved` to the value of `syncInfoReserved` in the received `SystemInformationBlockType21` or `SystemInformationBlockType26`;

   10. else:

      11. set all bits in `reserved` to 0;
1> else if out of coverage on the frequency used for V2X sidelink communication as defined in TS 36.304 [4, 11.4];
and the concerned frequency is included in v2x-InterFreqInfoList in RRCConnectionReconfiguration or in v2x-
InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26 of the serving cell/ PCell:

2> set inCoverage to TRUE;
2> set sl-Bandwidth to the value of the corresponding field included in v2x-InterFreqInfoList;
2> set subframeAssignmentSL and reserved to the value of the corresponding field included in the preconfigured
sidelink parameters (i.e. v2x-CommPreconfigGeneral in SL-V2X-Preconfiguration defined in 9.3);

1> else if out of coverage on the frequency used for V2X sidelink communication as defined in TS 36.304 [4, 11.4];
and the UE selects GNSS timing as the synchronization reference source and syncOffsetIndicator3 is not
included in SL-V2X-Preconfiguration:

2> set inCoverage to TRUE;
2> set sl-Bandwidth, subframeAssignmentSL and reserved to the value of the corresponding field included in the
preconfigured sidelink parameters (i.e. v2x-CommPreconfigGeneral in SL-V2X-Preconfiguration defined in
9.3);

1> else if the UE has a selected SyncRef UE (as defined in 5.10.8) and if the SyncRef UE is selected on the concern
frequency:

2> set inCoverage to FALSE;
2> set sl-Bandwidth, subframeAssignmentSL and reserved to the value of the corresponding field included in the
received MasterInformationBlock-SL or MasterInformationBlock-SL-V2X;

1> else:

2> set inCoverage to FALSE;
2> set sl-Bandwidth, subframeAssignmentSL and reserved to the value of the corresponding field included in the
preconfigured sidelink parameters (i.e. preconfigGeneral in SL-Preconfiguration or v2x-
CommPreconfigGeneral in SL-V2X-Preconfiguration defined in 9.3);

1> set directFrameNumber and directSubframeNumber according to the subframe used to transmit the SLSS, as
specified in 5.10.7.3;

1> submit the MasterInformationBlock-SL or MasterInformationBlock-SL-V2X message to lower layers for
transmission upon which the procedure ends;

5.10.7.5 Void

5.10.8 Sidelink synchronisation reference

5.10.8.1 General

The purpose of this procedure is to select a synchronisation reference and used a.o. when transmitting sidelink
communication, V2X sidelink communication, sidelink discovery or synchronisation information.

5.10.8.2 Selection and reselection of synchronisation reference

The UE shall:

1> if triggered by V2X sidelink communication, and in coverage on the frequency for V2X sidelink
communication; or

1> if triggered by V2X sidelink communication, and out of coverage on the frequency for V2X sidelink
communication, and the frequency used to transmit V2X sidelink communication is included in v2x-
InterFreqInfoList in RRCConnectionReconfiguration or in v2x-InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26 of the serving cell/ PCell:

2> If syncFreqList is not included in RRCConnectionReconfiguration nor in SystemInformationBlockType26; or
If `syncFreqList` is included in `RRConnectionReconfiguration` or in `SystemInformationBlockType26`, and none of the frequency(ies) selected as specified in TS 36.321 [6] is included in the `syncFreqList`, or

If `syncFreqList` is included in `RRConnectionReconfiguration` or in `SystemInformationBlockType26`, and no synchronisation carrier frequency is selected as specified in 5.10.8a:

1> if `typeTxSync` is configured for the concerned frequency and set to `enb`:
   2> select a cell as the synchronization reference source as defined in 5.10.13.3;
   3> else if `typeTxSync` for the concerned frequency is not configured or is set to `gnss`, and GNSS is reliable in accordance with TS 36.101 [42] and TS 36.133 [16]:
      4> select GNSS as the synchronization reference source;
   3> else (i.e., there is no GNSS which is reliable in accordance with TS 36.101 [42] and TS 36.133 [16]):
      4> search SLSSID=0 on the concerned frequency to detect candidate SLSS, in accordance with TS 36.133 [16];
      4> when evaluating the detected SLSS, apply layer 3 filtering as specified in 5.5.3.2 using the preconfigured `filterCoefficient` as defined in 9.3, before using the S-RSRP measurement results;
      4> if the S-RSRP of the SyncRef UE identified by the detected SLSS exceeds the minimum requirement defined in TS 36.133 [16]:
         5> select the SyncRef UE;
      4> else (i.e., no SLSSID=0 detected):
         5> select a cell as the synchronization reference source as defined in 5.10.13.3;

2> If `syncFreqList` is included in `RRConnectionReconfiguration` or in `SystemInformationBlockType26`, and the UE has selected a synchronisation carrier frequency as specified in 5.10.8a:

3> consider the synchronisation reference source (i.e. eNB, GNSS or SyncRef UE) that is selected on the synchronisation carrier frequency as the synchronization reference;

1> else, if triggered by V2X sidelink communication, and out of coverage on the frequency for V2X sidelink communication, and for the frequency used for V2X sidelink communication, if `syncPriority` in `SL-V2X-Preconfiguration` is set to `gnss` and GNSS is reliable in accordance with TS 36.101 [42] and TS 36.133 [16]:

2> select GNSS as the synchronization reference source;

1> else, for the frequency used for sidelink communication, V2X sidelink communication or sidelink discovery, if out of coverage on that frequency as defined in TS 36.304 [4, 11.4]:

2> if triggered by sidelink communication or sidelink discovery; or

2> if triggered by V2X sidelink communication, and `syncFreqList` is not included in `SL-V2X-Preconfiguration`;

2> if triggered by V2X sidelink communication, and `syncFreqList` is included in `SL-V2X-Preconfiguration`, and none of the frequency(ies) selected as specified in TS 36.321 [6] is included in the `syncFreqList`;

2> If triggered by V2X sidelink communication, and `syncFreqList` is included in `SL-V2X-Preconfiguration`, and no synchronisation carrier frequency is selected as specified in 5.10.8a:

3> perform a full search (i.e. covering all subframes and all possible SLSSID) to detect candidate SLSS, in accordance with TS 36.133 [16]

3> when evaluating the one or more detected SLSSID, apply layer 3 filtering as specified in 5.5.3.2 using the preconfigured `filterCoefficient` as defined in 9.3, before using the S-RSRP measurement results;

3> if the UE has selected a SyncRef UE:
4> if the S-RSRP of the strongest candidate SyncRef UE exceeds the minimum requirement TS 36.133 [16] by \textit{syncRefMinHyst} and the strongest candidate SyncRef UE belongs to the same priority group as the current SyncRef UE and the S-RSRP of the strongest candidate SyncRef UE exceeds the S-RSRP of the current SyncRef UE by \textit{syncRefDiffHyst}; or

4> if the S-RSRP of the strongest candidate SyncRef UE exceeds the minimum requirement TS 36.133 [16] by \textit{syncRefMinHyst} and the strongest candidate SyncRef UE belongs to a higher priority group than the current SyncRef UE; or

4> if GNSS becomes reliable in accordance with TS 36.101 [42] and TS 36.133 [16], and GNSS belongs to a higher priority group than the current SyncRef UE; or

4> if the S-RSRP of the current SyncRef UE is less than the minimum requirement defined in TS 36.133 [16]:

5> consider no SyncRef UE to be selected;

3> if the UE has selected GNSS as the synchronization reference for V2X sidelink communication:

4> if the S-RSRP of the candidate SyncRef UE exceeds the minimum requirement defined in TS 36.133 [16] by \textit{syncRefMinHyst} and the candidate SyncRef UE belongs to a higher priority group than GNSS; or

4> if GNSS becomes not reliable in accordance with TS 36.101 [42] and TS 36.133 [16]:

5> consider GNSS not to be selected;

3> if the UE has not selected a SyncRef UE and has not selected GNSS as synchronization reference source:

4> if not concerning V2X sidelink communication, and if the UE detects one or more SLSSID\textdquotesingle{s} for which the S-RSRP exceeds the minimum requirement defined in TS 36.133 [16] by \textit{syncRefMinHyst} and for which the UE received the corresponding \textit{MasterInformationBlock-SL} message (candidate SyncRef UEs), select a SyncRef UE according to the following priority group order:

5> UEs of which \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL} message received from this UE, is set to \textit{TRUE}, starting with the UE with the highest S-RSRP result (priority group 1);

5> UEs of which SLSSID is part of the set defined for in coverage, starting with the UE with the highest S-RSRP result (priority group 2);

5> Other UEs, starting with the UE with the highest S-RSRP result (priority group 3);

4> for V2X sidelink communication, if the UE detects one or more SLSSID\textdquotesingle{s} for which the S-RSRP exceeds the minimum requirement defined in TS 36.133 [16] by \textit{syncRefMinHyst} and for which the UE received the corresponding \textit{MasterInformationBlock-SL-V2X} message (candidate SyncRef UEs), or if the UE detects GNSS that is reliable in accordance with TS 36.101 [42] and TS 36.133 [16], select a synchronization reference according to the following priority group order:

5> if \textit{syncPriority} corresponding to the concerned frequency in \textit{SL-V2X-Preconfiguration} is set to \textit{enb}:

6> UEs of which SLSSID is part of the set defined for in coverage, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{TRUE}, starting with the UE with the highest S-RSRP result (priority group 1);

6> UE of which SLSSID is part of the set defined for in coverage, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE}, starting with the UE with the highest S-RSRP result (priority group 2);

6> GNSS that is reliable in accordance with TS 36.101 [42] and TS 36.133 [16] (priority group 3);

6> UEs of which SLSSID is 0, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{TRUE}, or of which SLSSID is 0 and SLSSID is transmitted on subframes indicated by \textit{syncOffsetIndicator3}, starting with the UE with the highest S-RSRP result (priority group 4);
6> UEs of which SLSSID is 0 and is not transmitted on subframes indicated by \texttt{syncOffsetIndicator3}, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{FALSE}, starting with the UE with the highest S-RSRP result (priority group 5);

6> UEs of which SLSSID is 169, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{FALSE}, starting with the UE with the highest S-RSRP result (priority group 5);

6> Other UEs, starting with the UE with the highest S-RSRP result (priority group 6);

5> if \texttt{syncPriority} corresponding to the concerned frequency in \texttt{SL-V2X-Preconfiguration} is set to \texttt{gnss}:

6> GNSS that is reliable in accordance with TS 36.101 [42] and TS 36.133 [16] (priority group 1);

6> UEs of which SLSSID is part of the set defined for in coverage, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{TRUE}, starting with the UE with the highest S-RSRP result (priority group 2);

6> UEs of which SLSSID is 0, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{TRUE}, or of which SLSSID is 0 and SLSS is transmitted on subframes indicated by \texttt{syncOffsetIndicator3}, starting with the UE with the highest S-RSRP result (priority group 2);

6> UE of which SLSSID is part of the set defined for in coverage, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{FALSE}, starting with the UE with the highest S-RSRP result (priority group 3);

6> UEs of which SLSSID is 0 and is not transmitted on subframes indicated by \texttt{syncOffsetIndicator3}, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{FALSE}, starting with the UE with the highest S-RSRP result (priority group 3);

6> UEs of which SLSSID is 169, and \texttt{inCoverage}, included in the \texttt{MasterInformationBlock-SL-V2X} message received from this UE, is set to \texttt{FALSE}, starting with the UE with the highest S-RSRP result (priority group 3);

6> Other UEs, starting with the UE with the highest S-RSRP result (priority group 4);

2> If triggered by V2X sidelink communication, and \texttt{syncFreqList} is included in \texttt{SL-V2X-Preconfiguration}, and the UE has selected a synchronisation carrier frequency as specified in 5.10.8a;

3> consider the synchronisation reference source (i.e. eNB, GNSS or SyncRef UE) that selected on the synchronisation carrier frequency as the synchronisation reference;

5.10.8a Selection and reselection of synchronisation carrier frequency

For the frequency(ies) which are in coverage for the UE as defined in TS 36.304 [4, 11.4] and which have been selected for V2X sidelink communication as specified in TS 36.321 [6], and/or for the frequency(ies) which are out of coverage for the UE and included in v2x-InterFreqInfoList within RRCConnectionReconfiguration or SystemInformationBlockType21 or SystemInformationBlockType26 of the serving cell/ PCell and which have been selected for V2X sidelink communication as specified in TS 36.321 [6], the UE capable of V2X sidelink communication and synchronisation carrier frequency selection shall:

1> If \texttt{syncFreqList} is included in RRCConnectionReconfiguration or in SystemInformationBlockType26, and includes at least one of the concerned frequency(ies):

2> if no synchronisation carrier frequency is selected:

3> If \texttt{typeTxSync} is configured for the concerned frequency(ies) and set to \texttt{enb}; or

3> if \texttt{typeTxSync} for the concerned frequency(ies) is not configured or is set to \texttt{gnss}, and GNSS is reliable in accordance with TS 36.101 [42] and TS 36.133 [16]:

\texttt{ETSI}
4> select one frequency from the concerned frequency(ies) which are included in syncFreqList as the synchronisation carrier frequency.

3> else (i.e., there is no GNSS which is reliable in accordance with TS 36.101 [42] and TS 36.133 [16]):

4> select the synchronisation reference source(s) on the concerned frequency(ies) which are included in syncFreqList according to 5.10.8.2:

4> if SyncRef UE(s) with SLSSID=0 is detected on at least one frequency from the concerned frequency(ies):

5> select one frequency from the concerned frequency(ies) with the SyncRef UE(s) with SLSSID=0 detected as the synchronisation carrier frequency;

4> else (i.e., no SLSSID=0 detected and UE selects a cell as the synchronisation reference source):

5> select one frequency from the concerned frequencies which are included in syncFreqList as the synchronisation carrier frequency;

2> else (i.e. the synchronisation carrier frequency is selected):

3> If the UE selects GNSS as the synchronisation reference source, and GNSS is unreliable in accordance with TS 36.101 [42] and TS 36.133 [16]; or

3> If the UE selects a cell as the synchronisation reference source, and the cell cannot fulfil the S criterion in accordance with TS 36.304 [4]; or

3> If the UE selects a SyncRef UE and the S-RSRP of the current SyncRef UE is less than the minimum requirement defined in TS 36.133 [16]; or

3> If the synchronisation carrier frequency is not selected for V2X sidelink communication as specified in TS 36.321 [6]:

4> consider no synchronisation carrier frequency is selected;

For the frequency(ies) which are out of coverage for the UE and not included in v2x-InterFreqInfoList within RRCConnectionReconfiguration nor SystemInformationBlockType21 nor SystemInformationBlockType26 of the serving cell/ PCell and which have been selected for V2X sidelink carrier communication as specified in TS 36.321 [6], the UE capable of V2X sidelink communication and selection of synchronisation carrier frequency selection shall:

1> If syncFreqList is included in SL-V2X-Preconfiguration, and at least one of the concerned frequency(ies) is included in syncFreqList:

2> if no synchronisation carrier frequency is selected:

3> if syncPriority in SL-V2X-Preconfiguration is set to gnss and GNSS is reliable in accordance with TS 36.101 [42] and TS 36.133 [16]:

4> select one frequency from the concerned frequency(ies) which are included in syncFreqList as the synchronisation carrier frequency.

3> else:

4> select the synchronisation reference source(s) on the concerned frequency(ies) which are included in SyncFreqList according to 5.10.8.2;

4> select the frequency with the highest synchronisation reference source priority as the synchronisation carrier frequency, according to the following priority group order:

5> if syncPriority corresponding to the concerned frequency(ies) in SL-V2X-Preconfiguration is set to enb:

6> the frequency(ies) with SyncRef UE of which SLSSID is part of the set defined for in coverage, and inCoverage, included in the MasterInformationBlock-SL-V2X message received from this UE, is set to TRUE (priority group 1);
6. the frequency(ies) with SyncRef UE of which SLSSID is part of the set defined for in coverage, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE} (priority group 2);

6. the frequency(ies) using GNSS as synchronisation reference source (priority group 3);

6. the frequency(ies) with SyncRef UE of which SLSSID is 0, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{TRUE}, or of which SLSSID is 0 and SLSS is transmitted on subframes indicated by \textit{syncOffsetIndicator3} (priority group 4);

6. the frequency(ies) with SyncRef UE of which SLSSID is 0 and is not transmitted on subframes indicated by \textit{syncOffsetIndicator3}, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE} (priority group 5);

6. the frequency(ies) with SyncRef UE of which SLSSID is 169, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE} (priority group 5);

6. the frequency(ies) with other SyncRef UE (priority group 6);

5. if \textit{syncPriority} corresponding to the concerned frequency(ies) in \textit{SL-V2X-Preconfiguration} is set to \textit{gnss}:

6. the frequency(ies) with SyncRef UE of which SLSSID is part of the set defined for in coverage, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{TRUE} (priority group 1);

6. the frequency(ies) with SyncRef UE of which SLSSID is 0, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{TRUE}, or of which SLSSID is 0 and SLSS is transmitted on subframes indicated by \textit{syncOffsetIndicator3} (priority group 1);

6. the frequency(ies) with SyncRef UE of which SLSSID is part of the set defined for in coverage, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE} (priority group 2);

6. the frequency(ies) with SyncRef UE of which SLSSID is 0 and is not transmitted on subframes indicated by \textit{syncOffsetIndicator3}, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE} (priority group 2);

6. the frequency(ies) with SyncRef UE of which SLSSID is 169, and \textit{inCoverage}, included in the \textit{MasterInformationBlock-SL-V2X} message received from this UE, is set to \textit{FALSE} (priority group 2);

6. the frequency(ies) with other SyncRef UE (priority group 3);

2. else (i.e. the synchronisation carrier frequency is selected):

3. If the UE selects GNSS as the synchronisation reference source, and GNSS is unreliable in accordance with TS 36.101 [42] and TS 36.133 [16]; or

3. If the UE selects a SyncRef UE and the S-RSRP of the current SyncRef UE is less than the minimum requirement defined in TS 36.133 [16]; or

3. If the synchronisation carrier frequency is not selected for V2X sidelink communication as specified in TS 36.321 [6];

4. consider no synchronisation carrier frequency is selected;

NOTE 1: If more than one selected carrier frequencies satisfy the condition as the synchronisation carrier frequency for V2X sidelink communication, how to select one synchronisation carrier frequency is up to UE implementation.

NOTE 2: All concerned carrier frequency(ies) have the same \textit{typeTxSync} and \textit{syncPriority} configured.
5.10.9  Sidelink common control information

5.10.9.1  General

The sidelink common control information is carried by a single message, the MasterInformationBlock-SL (MIB-SL) message for sidelink discovery and sidelink communication or the MasterInformationBlock-SL-V2X (MIB-SL-V2X) message for V2X sidelink communication. The MIB-SL or MIB-SL-V2X includes timing information as well as some configuration parameters and is transmitted via SL-BCH.

The MIB-SL for sidelink discovery and sidelink communication uses a fixed schedule with a periodicity of 40 ms without repetitions. In particular, the MIB-SL is scheduled in subframes indicated by syncOffsetIndicator-r12 i.e. for which \((10*DFN + \text{subframe number}) \mod 40 = \text{syncOffsetIndicator-r12}\).

The MIB-SL-V2X for V2X sidelink communication uses a fixed schedule with a periodicity of 160 ms without repetitions. In particular, the MIB-SL-V2X is scheduled in subframes indicated by SL-OffsetIndicatorSync i.e. for which \((10*DFN + \text{subframe number}) \mod 160 = \text{SL-OffsetIndicatorSync}\).

The sidelink common control information may change at any transmission i.e. neither a modification period nor a change notification mechanism is used.

A UE configured to receive or transmit sidelink communication or PS related sidelink discovery shall:

1> if the UE has a selected SyncRef UE, as specified in 5.10.8.2:

2> ensure having a valid version of the MasterInformationBlock-SL message of that SyncRefUE;

A UE configured to receive or transmit V2X sidelink communication shall:

1> if the UE has a selected SyncRef UE, as specified in 5.10.8.2:

2> ensure having a valid version of the MasterInformationBlock-SL-V2X message of that SyncRefUE;

5.10.9.2  Actions related to reception of MasterInformationBlock-SL/ MasterInformationBlock-SL-V2X message

Upon receiving MasterInformationBlock-SL or MasterInformationBlock-SL-V2X, the UE shall:

1> apply the values of sl-Bandwidth, subframeAssignmentSL, directFrameNumber and directSubframeNumber included in the received MasterInformationBlock-SL or MasterInformationBlock-SL-V2X message;

5.10.10  Sidelink relay UE operation

5.10.10.1  General

This procedure is used by a UE supporting sidelink relay UE operation and involves evaluation of the AS-layer conditions that need to be met in order for upper layers to configure a sidelink relay UE to receive/ transmit relay related PS sidelink discovery/ relay related sidelink communication. The AS-layer conditions merely comprise of being configured with radio resources that can be used for transmission.

A UE that fulfils the criteria specified in 5.10.10.2 and 5.10.10.3 and that is configured by higher layers accordingly is acting as a sidelink relay UE.

5.10.10.2  AS-conditions for relay related sidelink communication transmission by sidelink relay UE

A UE capable of sidelink relay UE operation shall inform upper layers that it is configured with radio resources that can be used for relay related sidelink communication transmission if the following conditions are met:

1> if in RRC_CONNECTED; and if the UE is configured with commTxResources; and the UE is configured with commTxAllowRelayDedicated set to true;
5.10.10.3  AS-conditions for relay PS related sidelink discovery transmission by sidelink relay UE

A UE capable of sidelink relay UE operation shall inform upper layers that it is configured with radio resources that can be used for relay PS related sidelink discovery transmission if the following conditions are met:

1> if in RRC_IDLE; and if the UE's serving cell is suitable as defined in TS 36.304 [4]; and if SystemInformationBlockType19 includes discConfigPS including discTxPoolPS-Common and discConfigRelay; and if the sidelink relay UE threshold conditions as specified in 5.10.10.4 are met;

1> else if in RRC_CONNECTED; and if discTxResourcesPS is configured;

5.10.10.4  Sidelink relay UE threshold conditions

A UE capable of sidelink relay UE operation shall:

1> if the threshold conditions specified in this section were not met:

2> if neither threshHigh nor threshLow is included in relayUE-Config within SystemInformationBlockType19:

3> consider the threshold conditions to be met (entry);

2> else if threshHigh is not included in relayUE-Config within SystemInformationBlockType19; or the RSRP measurement of the PCell, or the cell on which the UE camps, is below threshHigh by hystMax (also included within relayUE-Config); and

2> if threshLow is not included in relayUE-Config within SystemInformationBlockType19; or the RSRP measurement of the PCell, or the cell on which the UE camps, is above threshLow by hystMin (also included within relayUE-Config):

3> consider the threshold conditions to be met (entry);

1> else:

2> if threshHigh is included in relayUE-Config within SystemInformationBlockType19; and the RSRP measurement of the PCell, or the cell on which the UE camps, is above threshHigh (also included within relayUE-Config); or

2> if threshLow is included in relayUE-Config within SystemInformationBlockType19; and the RSRP measurement of the PCell, or the cell on which the UE camps, is below threshLow (also included within relayUE-Config);

3> consider the threshold conditions not to be met (leave);

5.10.11  Sidelink remote UE operation

5.10.11.1  General

This procedure is used by a UE supporting sidelink remote UE operation and involves evaluation of the AS-layer conditions that need to be met in order for upper layers to configure a sidelink remote UE to receive/ transmit relay related sidelink PS discovery/ relay related sidelink communication. The AS-layer conditions merely comprise of being configured with radio resources that can be used for transmission, as well as whether or not having a selected sidelink relay UE.

5.10.11.2  AS-conditions for relay related sidelink communication transmission by sidelink remote UE

A UE capable of sidelink remote UE operation shall inform upper layers whether it is configured with radio resources that can be used for relay related sidelink communication transmission if the following conditions are met:

1> if the UE is out of coverage; and is preconfigured with SL-Preconfiguration including discTxPoolList and preconfigRelay;

1> else if in RRC_IDLE; and if the UE's serving cell is suitable as defined in TS 36.304 [4]; and if SystemInformationBlockType18 includes commTxPoolNormalCommon and commTxAllowRelayCommon; and if
5.10.11.3 AS-conditions for relay PS related sidelink discovery transmission by sidelink remote UE

A UE capable of sidelink remote UE operation shall inform upper layers whether it is configured with radio resources that can be used for relay PS related sidelink discovery transmission if the following conditions are met:

1. if the UE is out of coverage; and is preconfigured with SL-Preconfiguration including discTxPoolList and preconfigRelay;

2. else if in RRC_IDLE; and if the UE's serving cell is suitable as defined in TS 36.304 [4]; and if SystemInformationBlockType19 includes discConfigPS including discTxPoolPS-Common and discConfigRelay; and if the sidelink remote UE threshold conditions as specified in 5.10.11.5 are met;

3. else if in RRC_CONNECTED; and if discTxResourcesPS is configured;

5.10.11.4 Selection and reselection of sidelink relay UE

A UE capable of sidelink remote UE operation that is configured by upper layers to search for a sidelink relay UE shall:

1. if out of coverage on the frequency used for sidelink communication, as defined in TS 36.304 [4, 11.4]; or

2. if the serving frequency is used for sidelink communication and the RSRP measurement of the cell on which the UE camps (RRC_IDLE)/ the PCell (RRC_CONNECTED) is below threshHigh within remoteUE-Config:

3. search for candidate sidelink relay UEs, in accordance with TS 36.133 [16]

4. when evaluating the one or more detected sidelink relay UEs, apply layer 3 filtering as specified in 5.5.3.2 across measurements that concern the same ProSe Relay UE ID and using the filterCoefficient in SystemInformationBlockType19 (in coverage) or the preconfigured filterCoefficient as defined in 9.3(out of coverage), before using the SD-RSRP measurement results;

NOTE 1: The details of the interaction with upper layers are up to UE implementation.

5. if the UE does not have a selected sidelink relay UE:

6. select a candidate sidelink relay UE which SD-RSRP exceeds q-RxLevMin included in either reselectionInfoIC (in coverage) or reselectionInfoOoC (out of coverage) by minHyst;

7. else if SD-RSRP of the currently selected sidelink relay UE is below q-RxLevMin included in either reselectionInfoIC (in coverage) or reselectionInfoOoC (out of coverage); or if upper layers indicate not to use the currently selected sidelink relay: (i.e. sidelink relay UE reselection):

8. select a candidate sidelink relay UE which SD-RSRP exceeds q-RxLevMin included in either reselectionInfoIC (in coverage) or reselectionInfoOoC (out of coverage) by minHyst;

9. else if the UE did not detect any candidate sidelink relay UE which SD-RSRP exceeds q-RxLevMin included in either reselectionInfoIC (in coverage) or reselectionInfoOoC (out of coverage) by minHyst:

10. consider no sidelink relay UE to be selected;

NOTE 2: The UE may perform sidelink relay UE reselection in a manner resulting in selection of the sidelink relay UE, amongst all candidate sidelink relay UEs meeting higher layer criteria, that has the best radio link quality. Further details, including interaction with upper layers, are up to UE implementation.

5.10.11.5 Sidelink remote UE threshold conditions

A UE capable of sidelink remote UE operation shall:

1. if the threshold conditions specified in this section were not met:
if \( \text{threshHigh} \) is not included in \( \text{remoteUE-Config} \) within \( \text{SystemInformationBlockType19} \); or

if \( \text{threshHigh} \) is included in \( \text{remoteUE-Config} \) within \( \text{SystemInformationBlockType19} \); and the RSRP measurement of the PCell, or the cell on which the UE camps, is below \( \text{threshHigh} \) by \( \text{hystMax} \) (also included within \( \text{remoteUE-Config} \));

consider the threshold conditions to be met (entry);

else:

if \( \text{threshHigh} \) is included in \( \text{remoteUE-Config} \) within \( \text{SystemInformationBlockType19} \); and the RSRP measurement of the PCell, or the cell on which the UE camps, is above \( \text{threshHigh} \) (also included within \( \text{remoteUE-Config} \));

consider the threshold conditions not to be met (leave);

5.10.12 V2X sidelink communication monitoring

A UE capable of V2X sidelink communication that is configured by upper layers to receive V2X sidelink communication shall:

if the conditions for sidelink operation as defined in 5.10.1d are met:

if in coverage on the frequency used for V2X sidelink communication, as defined in TS 36.304 [4, 11.4]:

if the frequency used to receive V2X sidelink communication is included in \( \text{v2x-InterFreqInfoList} \) within \( \text{RRCCConnectionReconfiguration} \) or in \( \text{v2x-InterFreqInfoList} \) within \( \text{SystemInformationBlockType21} \) or \( \text{SystemInformationBlockType26} \) of the serving cell/Pcell, and \( \text{v2x-CommRxPool} \) is included in \( \text{SL-V2X-InterFreqUE-Config} \) within \( \text{v2x-UE-ConfigList} \) in the entry of \( \text{v2x-InterFreqInfoList} \) for the concerned frequency:

configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated in \( \text{v2x-CommRxPool} \);

else:

if the cell chosen for V2X side link communication reception broadcasts \( \text{SystemInformationBlockType21} \) including \( \text{v2x-CommRxPool} \) in \( \text{sl-V2X-ConfigCommon} \) or,

if the UE is configured with \( \text{v2x-CommRxPool} \) included in \( \text{mobilityControlInfoV2X} \) in \( \text{RRCCConnectionReconfiguration} \):

configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated in \( \text{v2x-CommRxPool} \);

else (i.e. out of coverage on the frequency used for V2X sidelink communication, as defined in TS 36.304 [4, 11.4]):

if the frequency used to receive V2X sidelink communication is included in \( \text{v2x-InterFreqInfoList} \) within \( \text{RRCCConnectionReconfiguration} \) or in \( \text{v2x-InterFreqInfoList} \) within \( \text{SystemInformationBlockType21} \) or \( \text{SystemInformationBlockType26} \) of the serving cell/Pcell, and \( \text{v2x-CommRxPool} \) is included in \( \text{SL-V2X-InterFreqUE-Config} \) within \( \text{v2x-UE-ConfigList} \) in the entry of \( \text{v2x-InterFreqInfoList} \) for the concerned frequency:

configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources indicated in \( \text{v2x-CommRxPool} \);

else:

configure lower layers to monitor sidelink control information and the corresponding data using the pool of resources that were preconfigured (i.e. \( \text{v2x-CommRxPoolList} \) in \( \text{SL-V2X-Preconfiguration} \) defined in 9.3);
5.10.13 V2X sidelink communication transmission

5.10.13.1 Transmission of V2X sidelink communication

A UE capable of V2X sidelink communication that is configured by upper layers to transmit V2X sidelink communication and has related data to be transmitted shall:

1> if the conditions for sidelink operation as defined in 5.10.1d are met;

2> if in coverage on the frequency used for V2X sidelink communication as defined in TS 36.304 [4, 11.4]; or

2> if the frequency used to transmit V2X sidelink communication is included in v2x-InterFreqInfoList in RRCConnectionReconfiguration or in v2x-InterFreqInfoList within SystemInformationBlockType21 or SystemInformationBlockType26;

3> if the UE is in RRC_CONNECTED and uses the PCell or the frequency included in v2x-InterFreqInfoList for V2X sidelink communication:

4> if the UE is configured, by the current PCell with commTxResources set to scheduled;

5> if T310 or T311 is running; and if the PCell at which the UE detected physical layer problems or radio link failure broadcasts SystemInformationBlockType21 including v2x-CommTxPoolExceptional in sl-V2X-ConfigCommon, or v2x-CommTxPoolExceptional is included in v2x-InterFreqInfoList for the concerned frequency in SystemInformationBlockType21 or SystemInformationBlockType26; or

5> if T301 is running and the cell on which the UE initiated connection re-establishment broadcasts SystemInformationBlockType21 including v2x-CommTxPoolExceptional in sl-V2X-ConfigCommon, or v2x-CommTxPoolExceptional is included in v2x-InterFreqInfoList for the concerned frequency in SystemInformationBlockType21 or SystemInformationBlockType26; or

5> if T304 is running and the UE is configured with v2x-CommTxPoolExceptional included in mobilityControlInfoV2X in RRCConnectionReconfiguration or in v2x-InterFreqInfoList for the concerned frequency in RRCConnectionReconfiguration:

6> configure lower layers to transmit the sidelink control information and the corresponding data based on random selection using the pool of resources indicated by v2x-CommTxPoolExceptional as defined in TS 36.321 [6];

5> else:

6> configure lower layers to request E-UTRAN to assign transmission resources for V2X sidelink communication;

4> else if the UE is configured with v2x-CommTxPoolNormalDedicated or v2x-CommTxPoolNormal or p2x-CommTxPoolNormal in the entry of v2x-InterFreqInfoList for the concerned frequency in sl-V2X-ConfigDedicated in RRCConnectionReconfiguration:

5> if the UE is configured to transmit non-P2X related V2X sidelink communication and a result of sensing on the resources configured in v2x-CommTxPoolNormalDedicated or v2x-CommTxPoolNormal in the entry of v2x-InterFreqInfoList for the concerned frequency in RRCConnectionReconfiguration is not available in accordance with TS 36.213 [23]; or

5> if the UE is configured to transmit P2X related V2X sidelink communication and selects to use partial sensing according to 5.10.13.1a, and a result of partial sensing on the resources configured in v2x-CommTxPoolNormalDedicated or p2x-CommTxPoolNormal in the entry of v2x-InterFreqInfoList for the concerned frequency in RRCConnectionReconfiguration is not available in accordance with TS 36.213 [23]; or

5> if v2x-CommTxPoolExceptional is included in mobilityControlInfoV2X in RRCConnectionReconfiguration (i.e., handover case); or

6> if v2x-CommTxPoolExceptional is included in the entry of v2x-InterFreqInfoList for the concerned frequency in RRCConnectionReconfiguration; or
6> if the PCell broadcasts SystemInformationBlockType21 including v2x-CommTxPoolExceptional in sl-V2X-ConfigCommon or v2x-CommTxPoolExceptional in v2x-InterFreqInfoList for the concerned frequency or broadcasts SystemInformationBlockType26 including v2x-CommTxPoolExceptional in v2x-InterFreqInfoList for the concerned frequency:

7> configure lower layers to transmit the sidelink control information and the corresponding data based on random selection using the pool of resources indicated by v2x-CommTxPoolExceptional as defined in TS 36.321 [6];

5> else if the UE is configured to transmit P2X related V2X sidelink communication:

6> select a resource pool according to 5.10.13.2;

6> perform P2X related V2X sidelink communication according to 5.10.13.1a;

5> else if the UE is configured to transmit non-P2X related V2X sidelink communication:

6> configure lower layers to transmit the sidelink control information and the corresponding data based on sensing (as defined in TS 36.321 [6] and TS 36.213 [23]) using one of the resource pools indicated by v2x-commTxPoolNormalDedicated or v2x-CommTxPoolNormal in the entry of v2x-InterFreqInfoList for the concerned frequency, which is selected according to 5.10.13.2;

3> else:

4> if the cell chosen for V2X sidelink communication transmission broadcasts SystemInformationBlockType21 or SystemInformationBlockType26:

5> if the UE is configured to transmit non-P2X related V2X sidelink communication, and if SystemInformationBlockType21 includes v2x-CommTxPoolNormalCommon or v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency, or SystemInformationBlockType26 includes v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency, and if a result of sensing on the resources configured in v2x-CommTxPoolNormalCommon or v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency is available in accordance with TS 36.213 [23]:

6> configure lower layers to transmit the sidelink control information and the corresponding data based on sensing (as defined in TS 36.321 [6] and TS 36.213 [23]) using one of the resource pools indicated by v2x-commTxPoolNormalDedicated or v2x-CommTxPoolNormal in the entry of v2x-InterFreqInfoList for the concerned frequency, which is selected according to 5.10.13.2;

5> else if the UE is configured to transmit P2X related V2X sidelink communication, and if SystemInformationBlockType21 includes p2x-CommTxPoolNormalCommon or p2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency, or SystemInformationBlockType26 includes p2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency, and if the UE selects to use random selection according to 5.10.13.1a, or selects to use partial sensing according to 5.10.13.1a and a result of partial sensing on the resources configured in p2x-CommTxPoolNormalCommon or p2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency is available in accordance with TS 36.213 [23]:

6> select a resource pool from p2x-CommTxPoolNormalCommon or p2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency according to 5.10.13.2, but ignoring zoneConfig in SystemInformationBlockType21 or SystemInformationBlockType26;

6> perform P2X related V2X sidelink communication according to 5.10.13.1a;

5> else if SystemInformationBlockType21 includes v2x-CommTxPoolExceptional in sl-V2X-ConfigCommon or v2x-CommTxPoolExceptional in v2x-InterFreqInfoList for the concerned frequency, or SystemInformationBlockType26 includes v2x-CommTxPoolExceptional in v2x-InterFreqInfoList for the concerned frequency:

6> from the moment the UE initiates connection establishment until receiving an RRCConnectionReconfiguration including sl-V2X-ConfigDedicated, or until receiving an RRCConnectionRelease or an RRCConnectionReject; or
6> if the UE is in RRC_IDLE and a result of sensing on the resources configured in v2x-CommTxPoolNormalCommon or v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency in Systeminformationblocktype21 or v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency in Systeminformationblocktype26 is not available in accordance with TS 36.213 [23]; or

6> if the UE is in RRC_IDLE and UE selects to use partial sensing according to 5.10.13.1a and a result of partial sensing on the resources configured in p2x-CommTxPoolNormalCommon or p2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency in Systeminformationblocktype21 or v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency in Systeminformationblocktype26 is not available in accordance with TS 36.213 [23];

7> configure lower layers to transmit the sidelink control information and the corresponding data based on random selection (as defined in TS 36.321 [6]) using the pool of resources indicated in v2x-CommTxPoolExceptional;

2> else:

3> configure lower layers to transmit the sidelink control information and the corresponding data based on sensing (as defined in TS 36.321 [6] and TS 36.213 [23]) using one of the resource pools indicated by v2x-CommTxPoolList in SL-V2X-Preconfiguration in case of non-P2X related V2X sidelink communication, which is selected according to 5.10.13.2, or using one of the resource pools indicated by p2x-CommTxPoolList in SL-V2X-Preconfiguration in case of P2X related V2X sidelink communication, which is selected according to 5.10.13.2, and in accordance with the timing of the selected reference as defined in 5.10.8;

The UE capable of non-P2X related V2X sidelink communication that is configured by upper layers to transmit V2X sidelink communication shall perform sensing on all pools of resources which may be used for transmission of the sidelink control information and the corresponding data. The pools of resources are indicated by SL-V2X-Preconfiguration, v2x-CommTxPoolNormalCommon, v2x-CommTxPoolNormalDedicated in sl-V2X-ConfigDedicated, or v2x-CommTxPoolNormal in v2x-InterFreqInfoList for the concerned frequency, as configured above.

NOTE 1: If there are multiple frequencies for which normal or exceptional pools are configured, it is up to UE implementation which frequency is selected for V2X sidelink communication transmission.

5.10.13.1a Transmission of P2X related V2X sidelink communication

A UE configured to transmit P2X related V2X sidelink communication shall:

1> if partialSensing is included and randomSelection is not included in resourceSelectionConfigP2X of the pool selected; or

1> if both partialSensing and randomSelection are included in resourceSelectionConfigP2X of the pool selected, and the UE selects to use partial sensing:

2> configure lower layers to transmit the sidelink control information and the corresponding data based on partial sensing (as defined in TS 36.321 [6] and TS 36.213 [23]) using the selected resource pool, if the UE supports partial sensing;

1> if partialSensing is not included and randomSelection is included in resourceSelectionConfigP2X of the pool selected.

2> configure lower layers to transmit the sidelink control information and the corresponding data based on random selection (as defined in TS 36.321 [6] and TS 36.213 [23]) using the selected resource pool;

1> if both partialSensing and randomSelection is included in resourceSelectionConfigP2X of the pool selected, and the UE selects to use random selection:

2> configure lower layers to transmit the sidelink control information and the corresponding data based on random selection using the selected resource pool and indicates to lower layers that transmissions of multiple MAC PDUs are allowed (as defined in TS 36.321 [6] and TS 36.213 [23]).

NOTE: If both partialSensing and randomSelection is included in resourceSelectionConfigP2X of the pool selected, the selection between partial sensing and random selection is left to UE implementation.
5.10.13.2 V2X sidelink communication transmission pool selection

For a frequency used for V2X sidelink communication, if zoneConfig is not ignored as specified in 5.10.13.1, the UE configured by upper layers for V2X sidelink communication shall only use the pool which corresponds to geographical coordinates of the UE, if zoneConfig is included in SystemInformationBlockType21 or SystemInformationBlockType26 of the serving cell (RRC_IDLE)/PCell (RRC_CONNECTED) or in RRCConnectionReconfiguration for the concerned frequency, and the UE is configured to use resource pools provided by RRC signalling for the concerned frequency; or if zoneConfig is included in SL-V2X-Preconfiguration for the concerned frequency, and the UE is configured to use resource pools in SL-V2X-Preconfiguration for the frequency, according to 5.10.13.1. The UE shall only use the pool which is associated with the synchronization reference source selected in accordance with 5.10.8.2.

1> if the UE is configured to transmit on p2x-CommTxPoolNormalCommon or on p2x-CommTxPoolNormal in v2x-InterFreqInfoList in SystemInformationBlockType21 or on p2x-CommTxPoolNormal in v2x-InterFreqInfoList in SystemInformationBlockType26 according to 5.10.13.1; or

1> if the UE is configured to transmit on p2x-CommTxPoolList-r14 in SL-V2X-Preconfiguration according to 5.10.13.1; or

1> if zoneConfig is not included in SystemInformationBlockType21 and the UE is configured to transmit on v2x-CommTxPoolNormalCommon or v2x-CommTxPoolNormalDedicated; or

1> if zoneConfig is included in SystemInformationBlockType21 and the UE is configured to transmit on v2x-CommTxPoolNormalDedicated for P2X related V2X sidelink communication and zoneID is not included in v2x-CommTxPoolNormalDedicated; or

1> if zoneConfig is not included in the entry of v2x-InterFreqInfoList for the concerned frequency and the UE is configured to transmit on v2x-CommTxPoolNormal in v2x-InterFreqInfoList or p2x-CommTxPoolNormal in v2x-InterFreqInfoList in RRCConnectionReconfiguration; or

1> if zoneConfig is included in the entry of v2x-InterFreqInfoList for the concerned frequency and the UE is configured to transmit on p2x-CommTxPoolNormal in v2x-InterFreqInfoList in RRCConnectionReconfiguration and zoneID is not included in p2x-CommTxPoolNormal; or

1> if zoneConfig is not included in SL-V2X-Preconfiguration for the concerned frequency and the UE is configured to transmit on v2x-CommTxPoolList in SL-V2X-Preconfiguration for the concerned frequency:

2> select a pool associated with the synchronization reference source selected in accordance with 5.10.8.2;

NOTE 0: If multiple pools are associated with the selected synchronization reference source, it is up to UE implementation which resource pool is selected for V2X sidelink communication transmission.

1> if zoneConfig is included in SystemInformationBlockType21 and the UE is configured to transmit on v2x-CommTxPoolNormalCommon or v2x-CommTxPoolNormalDedicated for non-P2X related V2X sidelink communication; or

1> if zoneConfig is included in SystemInformationBlockType21 and the UE is configured to transmit on v2x-CommTxPoolNormalDedicated for P2X related V2X sidelink communication and zoneID is included in v2x-CommTxPoolNormalDedicated; or

1> if zoneConfig is included in the entry of v2x-InterFreqInfoList for the concerned frequency and if the UE is configured to transmit on v2x-CommTxPoolNormal in v2x-InterFreqInfoList or is configured to transmit on p2x-CommTxPoolNormal in v2x-InterFreqInfoList in RRCConnectionReconfiguration and zoneID is included in p2x-CommTxPoolNormal; or

1> if zoneConfig is included in SL-V2X-Preconfiguration for the concerned frequency and the UE is configured to transmit on v2x-CommTxPoolList in SL-V2X-Preconfiguration for the concerned frequency:

2> select the pool configured with zoneID equal to the zone identity determined below and associated with the synchronization reference source selected in accordance with 5.10.8.2;

The UE shall determine an identity of the zone (i.e. Zone_id) in which it is located using the following formulae, if zoneConfig is included in SystemInformationBlockType21 or SystemInformationBlockType26 or in SL-V2X-Preconfiguration:

\[ x_i = \text{Floor}(x / L) \text{ Mod } N \]
The parameters in the formulae are defined as follows:

\( y_1 = \text{Floor} \left( \frac{y}{W} \right) \text{ Mod } Ny \);  

\[ \text{Zone\_id} = y_1 \times Nx + x_1. \]

\( L \) is the value of zoneLength included in zoneConfig in SystemInformationBlockType21 or SystemInformationBlockType26 or in SL-V2X-Preconfiguration;

\( W \) is the value of zoneWidth included in zoneConfig in SystemInformationBlockType21 or SystemInformationBlockType26 or in SL-V2X-Preconfiguration;

\( Nx \) is the value of zoneIdLongiMod included in zoneConfig in SystemInformationBlockType21 or SystemInformationBlockType26 or in SL-V2X-Preconfiguration;

\( Ny \) is the value of zoneIdLatiMod included in zoneConfig in SystemInformationBlockType21 or SystemInformationBlockType26 or in SL-V2X-Preconfiguration;

\( x \) is the geodesic distance in longitude between UE's current location and geographical coordinates (0, 0) according to WGS84 model [80] and it is expressed in meters;

\( y \) is the geodesic distance in latitude between UE's current location and geographical coordinates (0, 0) according to WGS84 model [80] and it is expressed in meters.

The UE shall select a pool of resources which includes a Zone_id equals to the Zone_id calculated according to above mentioned formulae and indicated by v2x-CommTxPoolNormalDedicated, v2x-CommTxPoolNormalCommon, v2x-CommTxPoolNormal in v2x-InterFreqInfoList or p2x-CommTxPoolNormal in v2x-InterFreqInfoList in RRCConnectionReconfiguration, or v2x-CommTxPoolList according to 5.10.13.1.

NOTE 1: The UE uses its latest geographical coordinates to perform resource pool selection.

NOTE 2: If geographical coordinates are not available and zone specific TX resource pools are configured for the concerned frequency, it is up to UE implementation which resource pool is selected for V2X sidelink communication transmission.

5.10.13.3 V2X sidelink communication transmission reference cell selection

A UE capable of V2X sidelink communication that is configured by upper layers to transmit V2X sidelink communication shall:

1> for each frequency used to transmit V2X sidelink communication, select a cell to be used as reference for synchronisation and DL measurements in accordance with the following:

2> if the frequency concerns the primary frequency:

3> use the PCell (RRC_CONNECTED) or the serving cell (RRC_IDLE) as reference;

2> else if the frequency concerns a secondary frequency:

3> use the concerned SCell as reference;

2> else if the UE is in coverage of the concerned frequency:

3> use the DL frequency paired with the one used to transmit V2X sidelink communication as reference;

2> else (i.e., out of coverage on the concerned frequency):

3> use the PCell (RRC_CONNECTED) or the serving cell (RRC_IDLE) as reference, if needed;

5.10.14 DFN derivation from GNSS

When the UE selects GNSS as the synchronization reference source, the DFN used for V2X sidelink communication is derived from the current UTC time, by the following formulæ:

\[ \text{DFN}= \text{Floor} \left( 0.1 \times (T_{\text{current}} – T_{\text{ref}} – \text{offsetDFN}) \right) \text{ mod } 1024 \]

\[ \text{SubframeNumber}= \text{Floor} \left( T_{\text{current}} – T_{\text{ref}} – \text{offsetDFN} \right) \text{ mod } 10 \]
Where:

$T_{\text{current}}$ is the current UTC time that obtained from GNSS. This value is expressed in milliseconds;

$T_{\text{ref}}$ is the reference UTC time 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Thursday, December 31, 1899 and Friday, January 1, 1900). This value is expressed in milliseconds;

$\text{OffsetDFN}$ is the value $\text{offsetDFN}$ if configured, otherwise it is zero. This value is expressed in milliseconds.

NOTE: In case of leap second change event, how V2X UE obtains the scheduled time of leap second change to adjust $T_{\text{current}}$ correspondingly is left to UE implementation. How V2X UE handles the sudden discontinuity of DFN is left to UE implementation.

6 Protocol data units, formats and parameters (tabular & ASN.1)

6.1 General

The contents of each RRC message is specified in sub-clause 6.2 using ASN.1 to specify the message syntax and using tables when needed to provide further detailed information about the fields specified in the message syntax. The syntax of the information elements that are defined as stand-alone abstract types is further specified in a similar manner in sub-clause 6.3.

The need for fields to be present in a message or an abstract type, i.e., the ASN.1 fields that are specified as OPTIONAL in the abstract notation (ASN.1), is specified by means of comment text tags attached to the OPTIONAL statement in the abstract syntax. All comment text tags are available for use in the downlink direction only. The meaning of each tag is specified in table 6.1-1.

Table 6.1-1: Meaning of abbreviations used to specify the need for fields to be present

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond</td>
<td>Conditionally present</td>
</tr>
<tr>
<td>conditionTag</td>
<td>A field for which the need is specified by means of conditions. For each conditionTag, the need is specified in a tabular form following the ASN.1 segment. In case, according to the conditions, a field is not present, the UE takes no action and where applicable shall continue to use the existing value (and/or the associated functionality) unless explicitly stated otherwise (e.g. in the conditional presence table or in the description of the field itself).</td>
</tr>
<tr>
<td>Need OP</td>
<td>Optionally present</td>
</tr>
<tr>
<td>(Used in downlink only)</td>
<td>A field that is optional to signal. For downlink messages, the UE is not required to take any special action on absence of the field beyond what is specified in the procedural text or the field description table following the ASN.1 segment. The UE behaviour on absence should be captured either in the procedural text or in the field description.</td>
</tr>
<tr>
<td>Need ON</td>
<td>Optionally present, No action</td>
</tr>
<tr>
<td>(Used in downlink only)</td>
<td>A field that is optional to signal. If the message is received by the UE, and in case the field is absent, the UE takes no action and where applicable shall continue to use the existing value (and/or the associated functionality).</td>
</tr>
<tr>
<td>Need OR</td>
<td>Optionally present, Release</td>
</tr>
<tr>
<td>(Used in downlink only)</td>
<td>A field that is optional to signal. If the message is received by the UE, and in case the field is absent, the UE shall discontinue/ stop using/ delete any existing value (and/or the associated functionality).</td>
</tr>
</tbody>
</table>

Any field with Need ON in system information shall be interpreted as Need OR.

Need codes may not be specified for a parent extension field/ extension group, used in downlink, which includes one or more child extension fields. Upon absence of such a parent extension field/ extension group, the UE shall:

- For each individual child extension field, including extensions that are mandatory to include in the optional group, act in accordance with the need code that is defined for the extension;
- Apply this behaviour not only for child extension fields included directly within the optional parent extension field/extension group, but also for extension fields defined at further nesting levels as long as for none of the fields in-between the concerned extension field and the parent extension field a need code is specified;

NOTE 1: The above applies for groups of non critical extensions using double brackets (referred to as extension groups), as well as non-critical extensions at the end of a message or at the end of a structure contained in a BIT STRING or OCTET STRING (referred to as parent extension fields).

Need codes, conditions and ASN.1 defaults specified for a particular (child) field only apply in case the (parent) field including the particular field is present. This rule does not apply for optional parent extension fields/extension groups without need codes,

NOTE 2: The previous rule implies that E-UTRAN has to include such a parent extension field to release a child field that is either:

- Optional with need OR, or
- Conditional while the UE releases the child field when absent.

The handling of need codes as specified in the previous is illustrated by means of an example, as shown in the following ASN.1.

```
-- /example/ ASN1START

RRCMessage-r8-IEs ::= SEQUENCE {
  field1         InformationElement1, OPTIONAL, -- Need ON
  field2         InformationElement2 OPTIONAL, -- Need ON
  nonCriticalExtension     RRCMessage-v8a0-IEs OPTIONAL
}

RRCMessage-v8a0-IEs ::= SEQUENCE {
  field3         InformationElement3 OPTIONAL, -- Need ON
  nonCriticalExtension     RRCMessage-v940-IEs OPTIONAL
}

RRCMessage-v940-IEs ::= SEQUENCE {
  field4         InformationElement4 OPTIONAL, -- Need OR
  nonCriticalExtension     SEQUENCE {} OPTIONAL
}

InformationElement1 ::= SEQUENCE {
  field11        InformationElement11 OPTIONAL, -- Need ON
  field12        InformationElement12 OPTIONAL, -- Need OR
  ...
  [[ field13        InformationElement13 OPTIONAL, -- Need OR
    field14        InformationElement14 OPTIONAL -- Need ON
  ]]
}

InformationElement2 ::= SEQUENCE {
  field21        InformationElement11 OPTIONAL, -- Need OR
  ...
}

-- ASN1STOP

The handling of need codes as specified in the previous implies that:

- if field2 in RRCMessage-r8-IEs is absent, the UE does not modify field21;
- if field2 in RRCMessage-r8-IEs is present but does not include field21, the UE releases field21;
- if the extension group containing field13 is absent, the UE releases field13 and does not modify field14;
- if nonCriticalExtension defined by IE RRCMessage-v8a0-IEs is absent, the UE does not modify field3 and releases field4;

In the ASN.1 of this specification, the first bit of a bit string refers to the leftmost bit, unless stated otherwise.
6.2 RRC messages

NOTE: The messages included in this section reflect the current status of the discussions. Additional messages may be included at a later stage.

6.2.1 General message structure

—  

EUTRA-RRC-Definitions

This ASN.1 segment is the start of the E-UTRA RRC PDU definitions.

```
-- ASN1START
EUTRA-RRC-Definitions DEFINITIONS AUTOMATIC TAGS ::= 
BEGIN
-- ASN1STOP
```

—  

BCCH-BCH-Message

The BCCH-BCH-Message class is the set of RRC messages that may be sent from the E-UTRAN to the UE via BCH on the BCCH logical channel.

```
-- ASN1START
BCCH-BCH-Message ::= SEQUENCE {
   message     BCCH-BCH-MessageType
}
BCCH-BCH-MessageType ::= MasterInformationBlock
-- ASN1STOP
```

—  

BCCH-BCH-Message-MBMS

The BCCH-BCH-Message-MBMS class is the set of RRC messages that may be sent from the E-UTRAN to the UE via BCH on the BCCH logical channel in an MBMS-dedicated cell.

```
-- ASN1START
BCCH-BCH-Message-MBMS ::= SEQUENCE {
   message     BCCH-BCH-MessageType-MBMS-r14
}
BCCH-BCH-MessageType-MBMS-r14 ::= MasterInformationBlock-MBMS-r14
-- ASN1STOP
```

—  

BCCH-DL-SCH-Message

The BCCH-DL-SCH-Message class is the set of RRC messages that may be sent from the E-UTRAN to the UE via DL-SCH on the BCCH logical channel.

```
-- ASN1START
BCCH-DL-SCH-Message ::= SEQUENCE {
   message     BCCH-DL-SCH-MessageType
}
BCCH-DL-SCH-MessageType ::= CHOICE {
   cl      CHOICE {
      systemInformation      SystemInformation,
      systemInformationBlockType1    SystemInformationBlockType1
   },
   messageClassExtension  SEQUENCE {}
}
```
The **BCCH-DL-SCH-Message-BR** class is the set of RRC messages that may be sent from the E-UTRAN to the UE via DL-SCH on the BR-BCCH logical channel.

**BCCH-DL-SCH-Message-BR**

```asn1
BCCH-DL-SCH-Message-BR ::= SEQUENCE {
  message     BCCH-DL-SCH-MessageType-BR-r13
}
BCCH-DL-SCH-MessageType-BR-r13 ::= CHOICE {
  c1    CHOICE {
    systemInformation-BR-r13    SystemInformation-BR-r13,
    systemInformationBlockType1-BR-r13  SystemInformationBlockType1-BR-r13
  },
  messageClassExtension SEQUENCE {}
}
```

The **BCCH-DL-SCH-Message-MBMS** class is the set of RRC messages that may be sent from the E-UTRAN to the UE via DL-SCH on the BCCH logical channel in an MBMS-dedicated cell.

**BCCH-DL-SCH-Message-MBMS**

```asn1
BCCH-DL-SCH-Message-MBMS ::= SEQUENCE {
  message      BCCH-DL-SCH-MessageType-MBMS-r14
}
BCCH-DL-SCH-MessageType-MBMS-r14 ::= CHOICE {
  c1    CHOICE {
    systemInformation-MBMS-r14      SystemInformation-MBMS-r14,
    systemInformationBlockType1-MBMS-r14    SystemInformationBlockType1-MBMS-r14
  },
  messageClassExtension SEQUENCE {}
}
```

The **MCCH-Message** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the MCCH logical channel.

**MCCH-Message**

```asn1
MCCH-Message ::=  SEQUENCE {
  message     MCCH-MessageType
}
MCCH-MessageType ::= CHOICE {
  c1       CHOICE {
    mbsfnAreaConfiguration-r9  MBSFNAreaConfiguration-r9
  },
  later      CHOICE {
    c2        CHOICE{
      mbmsCountingRequest-r10  MBMSCountingRequest-r10
    },
    messageClassExtension SEQUENCE {}
  }
}
```

---
### PCCH-Message

The **PCCH-Message** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the PCCH logical channel.

```asn1
PCCH-Message ::= SEQUENCE {
  message      PCCH-MessageType
}

PCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    paging          Paging
  },
  messageClassExtension  SEQUENCE {}

DCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    csfbParametersResponseCDMA2000  CSFBParametersResponseCDMA2000,
    dlInformationTransfer  DLInformationTransfer,
    handoverFromEUTRAPreparationRequest  HandoverFromEUTRAPreparationRequest,
    mobilityFromEUTRACommand  MobilityFromEUTRACommand,
    rrcConnectionReconfiguration  RRCConnectionReconfiguration,
    rrcConnectionRelease  RRCConnectionRelease,
    securityModeCommand  SecurityModeCommand,
    ueCapabilityEnquiry  UECapabilityEnquiry,
    counterCheck  CounterCheck,
    ueInformationRequest-r9  UEInformationRequest-r9,
    loggedMeasurementConfiguration-r10  LoggedMeasurementConfiguration-r10,
  },
  messageClassExtensionFuture-r15  SEQUENCE {}
}
```

### DL-CCCH-Message

The **DL-CCCH-Message** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink CCCH logical channel.

```asn1
DL-CCCH-Message ::= SEQUENCE {
  message      DL-CCCH-MessageType
}

DL-CCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    rrcConnectionReestablishment  RRCConnectionReestablishment,
    rrcConnectionReestablishmentReject  RRCConnectionReestablishmentReject,
    rrcConnectionReject  RRCConnectionReject,
    rrcConnectionSetup  RRCConnectionSetup
  },
  messageClassExtension  CHOICE {
    c2      CHOICE {
      rrcEarlyDataComplete-r15  RRCEarlyDataComplete-r15,
      spare3  NULL, spare2  NULL, spare1  NULL
    },
    messageClassExtensionFuture-r15  SEQUENCE {}
  }
}
```

### DL-DCCH-Message

The **DL-DCCH-Message** class is the set of RRC messages that may be sent from the E-UTRAN to the UE or from the E-UTRAN to the RN on the downlink DCCH logical channel.
UL-CCCH-Message

The UL-CCCH-Message class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink CCCH logical channel.

-- ASN1START

UL-CCCH-Message ::= SEQUENCE {
  message     UL-CCCH-MessageType
}

UL-CCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    rrcConnectionReestablishmentRequest  RRCConnectionReestablishmentRequest,
    rrcConnectionRequest     RRCConnectionRequest
  },
  messageClassExtension CHOICE {
    c2      CHOICE {
      rrcConnectionResumeRequest-r13   RRCConnectionResumeRequest-r13
    },
    messageClassExtensionFuture-r13 CHOICE {
      c3      CHOICE {
        rrcEarlyDataRequest-r15   RRCEarlyDataRequest-r15,
        spare3 NULL, spare2 NULL, spare1 NULL
      },
      messageClassExtensionFuture-r15  SEQUENCE {}
    }
  }
}

-- ASN1STOP

UL-DCCH-Message

The UL-DCCH-Message class is the set of RRC messages that may be sent from the UE to the E-UTRAN or from the RN to the E-UTRAN on the uplink DCCH logical channel.

-- ASN1START

UL-DCCH-Message ::= SEQUENCE {
  message   UL-DCCH-MessageType
}

UL-DCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    csfbParametersRequestCDMA2000    CSFBParametersRequestCDMA2000,
    measurementReport    MeasurementReport,
    rrcConnectionReconfigurationComplete  RRCConnectionReconfigurationComplete,
    rrcConnectionSetupComplete    RRCConnectionSetupComplete,
    securityModeComplete      SecurityModeComplete,
    securityModeFailure      SecurityModeFailure,
    ueCapabilityInformation     UECapabilityInformation,
    ulHandoverPreparationTransfer    ULHandoverPreparationTransfer,
    ulInformationTransfer    ULInformationTransfer,
    counterCheckResponse    CounterCheckResponse,
    ueInformationResponse-r9     UEInformationResponse-r9,
    proximityIndication-r9     ProximityIndication-r9,
    rnReconfigurationComplete-r10    RNReconfigurationComplete-r10,
    mbmsCountingResponse-r10     MBMSCountingResponse-r10,
    interFreqRSTDMeasurementIndication-r10 InterFreqRSTDMeasurementIndication-r10
  },
  messageClassExtension CHOICE {
    c2      CHOICE {
      ueAssistanceInformation-r11    UEAssistanceInformation-r11,
    }
  }
}

-- ASN1STOP
The **SC-MCCH-Message** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the SC-MCCH logical channel.

```asciidoc
-- ASN1START
SC-MCCH-Message-r13 ::= SEQUENCE {
  message     SC-MCCH-MessageType-r13
}
SC-MCCH-MessageType-r13 ::= CHOICE {
  c1      CHOICE {
    scptmConfiguration-r13      SCPTMConfiguration-r13
  },
  messageClassExtension CHOICE {
    c2       CHOICE {
      scptmConfiguration-BR-r14    SCPTMConfiguration-BR-r14,
      spare         NULL
    },
    messageClassExtensionFuture-r14 SEQUENCE {}
  }
}
-- ASN1STOP
```

### 6.2.2 Message definitions

#### CounterCheck

The **CounterCheck** message is used by the E-UTRAN to indicate the current COUNT MSB values associated to each DRB and to request the UE to compare these to its COUNT MSB values and to report the comparison results to E-UTRAN.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**CounterCheck message**

```asciidoc
-- ASN1START
CounterCheck ::=   SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      counterCheck-r8      CounterCheck-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    }
  }
}
-- ASN1STOP
```
CounterCheck-r8-IEs ::= SEQUENCE {
  drb-CountInfoList   DRB-CountInfoList, OPTIONAL
  nonCriticalExtension CounterCheck-v8a0-IEs OPTIONAL
}

CounterCheck-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension CounterCheck-v1530-IEs OPTIONAL
}

CounterCheck-v1530-IEs ::= SEQUENCE {
  drb-CountInfoListExt-r15 DRB-CountInfoListExt-r15 OPTIONAL, -- Need ON
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

DRB-CountInfoList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-CountInfo

DRB-CountInfoListExt-r15 ::= SEQUENCE (SIZE (1..maxDRBExt-r15)) OF DRB-CountInfo

CounterCheckResponse ::=   SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    counterCheckResponse-r8    CounterCheckResponse-r8-IEs,
    criticalExtensionsFuture   SEQUENCE {}   OPTIONAL
  }
}

CounterCheckResponse-r8-IEs ::= SEQUENCE {
  drb-CountInfoList   DRB-CountInfoList, OPTIONAL
  nonCriticalExtension CounterCheckResponse-v8a0-IEs OPTIONAL
}

CounterCheckResponse-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension CounterCheckResponse-v1530-IEs OPTIONAL
}

---

**CounterCheck field descriptions**

- **count-MSB-Downlink**
  Indicates the value of 25 MSBs from downlink COUNT associated to this DRB.

- **count-MSB-Uplink**
  Indicates the value of 25 MSBs from uplink COUNT associated to this DRB.

- **drb-CountMSB-InfoList**
  Indicates the MSBs of the COUNT values of the DRBs.

---

**CounterCheckResponse**

The **CounterCheckResponse** message is used by the UE to respond to a **CounterCheck** message.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

---

**CounterCheckResponse message**

---

---
CounterCheckResponse field descriptions

`count-Downlink`
Indicates the value of downlink COUNT associated to this DRB.

`count-Uplink`
Indicates the value of uplink COUNT associated to this DRB.

`drb-CountInfoList`
Indicates the COUNT values of the DRBs.

---

**CSFBParametersRequestCDMA2000**

The `CSFBParametersRequestCDMA2000` message is used by the UE to obtain the CDMA2000 1xRTT Parameters from the network. The UE needs these parameters to generate the CDMA2000 1xRTT Registration message used to register with the CDMA2000 1xRTT Network which is required to support CSFB to CDMA2000 1xRTT.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**CSFBParametersRequestCDMA2000 message**

```
CSFBParametersRequestCDMA2000 ::= SEQUENCE {
  criticalExtensions                 CHOICE {
    csfbParametersRequestCDMA2000-r8   CSFBParametersRequestCDMA2000-r8-IEs,
    criticalExtensionsFuture   SEQUENCE { }
  }
}

CSFBParametersRequestCDMA2000-r8-IEs ::= SEQUENCE {
  nonCriticalExtension   CSFBParametersRequestCDMA2000-r8-IEs OPTIONAL
}

CSFBParametersRequestCDMA2000-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING   OPTIONAL,
  nonCriticalExtension   SEQUENCE { }
}
```

```
-- ASN1STOP

---

**CSFBParametersResponseCDMA2000**

The `CSFBParametersResponseCDMA2000` message is used to provide the CDMA2000 1xRTT Parameters to the UE so the UE can register with the CDMA2000 1xRTT Network to support CSFB to CDMA2000 1xRTT.
Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

---

**DLInformationTransfer**

The *DLInformationTransfer* message is used for the downlink transfer of NAS, non-3GPP dedicated information or time reference information.

Signalling radio bearer: SRB2 or SRB1. If only *timeReferenceInfo* is included in the message, SRB1 is used. Otherwise, SRB1 is used only if SRB2 not established yet, and if SRB2 is suspended, E-UTRAN does not send this message until SRB2 is resumed.

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

---

**DLInformationTransfer message**
lateNonCriticalExtension OCTET STRING OPTIONAL, 
nonCriticalExtension SEQUENCE {} OPTIONAL 
}

DLInformationTransfer-r15-IEs ::= SEQUENCE { 
dedicatedInfoType-r15 CHOICE { 
dedicatedInfoNAS-r15 DedicatedInfoNAS, 
dedicatedInfoCDMA2000-1XRTT-r15 DedicatedInfoCDMA2000, 
dedicatedInfoCDMA2000-HRPD-r15 DedicatedInfoCDMA2000 
} OPTIONAL, -- Need ON 
timeReferenceInfo-r15 TimeReferenceInfo-r15 OPTIONAL, -- Need ON 
nonCriticalExtension DLInformationTransfer-v8a0-IEs OPTIONAL 
}

FailureInformation

The FailureInformation message is used to provide information regarding failures detected by the UE, e.g. radio link failure for one of the RLC entities configured with PDCP duplication.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

FailureInformation message

--- ASN1START

FailureInformation-r15 ::=  SEQUENCE { 
  failedLogicalChannelInfo-r15 FailedLogicalChannelInfo-r15   OPTIONAL, 
  nonCriticalExtension   SEQUENCE {} 
}

FailedLogicalChannelInfo-r15 ::= SEQUENCE { 
  failedLogicalChannelIdentity-r15 SEQUENCE { 
    cellGroupIndication-r15 ENUMERATED {mn, sn}, 
    logicalChannelIdentity-r15 INTEGER (1..10) OPTIONAL, 
    logicalChannelIdentityExt-r15 INTEGER (32..38) OPTIONAL 
  }, 
  failureType ENUMERATED {duplication, spare3, spare2, spare1} 
}

--- ASN1STOP

FailureInformation field descriptions

cellGroupIndication
This field indicates the cell group (MCG, SCG) of the RLC entity for which the PDCP duplication failure occurred.

failedLogicalChannelId, failedLogicalChannelIExt
This field indicates the logical channel identity of the RLC entity for which the PDCP duplication failure occurred.

failureType
This field indicates the type of failure reported. Value duplication indicates that a radio link failure for one of the RLC entities configured with PDCP duplication has been detected.

--- HandoverFromEUTRAPreparationRequest (CDMA2000)

The HandoverFromEUTRAPreparationRequest message is used to trigger the handover preparation procedure with a CDMA2000 RAT. This message is also used to trigger a tunneled preparation procedure with a CDMA2000 1xRTT RAT to obtain traffic channel resources for the enhanced CS fallback to CDMA2000 1xRTT, which may also involve a concurrent preparation for handover to CDMA2000 HRPD. Also, this message is used to trigger the dual Rx/Tx redirection procedure with a CDMA2000 1xRTT RAT.
Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**HandoverFromEUTRA** PreparationRequest message

```asn1
HandoverFromEUTRApreparationRequest ::= SEQUENCE {
  rrc-TransactionIdentifier  RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1  CHOICE {
      handoverFromEUTRApreparationRequest-r8
        HandoverFromEUTRApreparationRequest-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

HandoverFromEUTRApreparationRequest-r8-IEs ::= SEQUENCE {
  cdma2000-Type     CDMA2000-Type,
  rand       RAND-CDMA2000    OPTIONAL, -- Cond cdma2000-Type
  mobilityParameters    MobilityParametersCDMA2000 OPTIONAL, -- Cond cdma2000-Type
  nonCriticalExtension   HandoverFromEUTRApreparationRequest-v890-IEs OPTIONAL
}

HandoverFromEUTRApreparationRequest-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension  OCTET STRING    OPTIONAL,
  nonCriticalExtension   HandoverFromEUTRApreparationRequest-v920-IEs OPTIONAL
}

HandoverFromEUTRApreparationRequest-v920-IEs ::= SEQUENCE {
  concurrPrepCDMA2000-HRPD-r9  BOOLEAN     OPTIONAL, -- Cond cdma2000-Type
  nonCriticalExtension   HandoverFromEUTRApreparationRequest-v1020-IEs OPTIONAL
}

HandoverFromEUTRApreparationRequest-v1020-IEs ::= SEQUENCE {
  dualRxTxRedirectIndicator-r10  ENUMERATED {true}  OPTIONAL, -- Cond cdma2000-1XRTT
  redirectCarrierCDMA2000-1XRTT-r10 CarrierFreqCDMA2000  OPTIONAL, -- Cond dualRxTxRedirect
  nonCriticalExtension    SEQUENCE {}    OPTIONAL
}
```

**HandoverFromEUTRA** PreparationRequest field descriptions

**concurrPrepCDMA2000-HRPD**
Value TRUE indicates that upper layers should initiate concurrent preparation for handover to CDMA2000 HRPD in addition to preparation for enhanced CS fallback to CDMA2000 1xRTT.

**dualRxTxRedirectIndicator**
Value TRUE indicates that the second radio of the dual Rx/Tx UE is being redirected to CDMA2000 1xRTT [51].

**redirectCarrierCDMA2000-1XRTT**
Used to indicate the CDMA2000 1xRTT carrier frequency where the UE is being redirected to.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>cdma2000-1XRTT</td>
<td>The field is optionally present, need ON, if the cdma2000-Type = type1XRTT; otherwise it is not present.</td>
</tr>
<tr>
<td>cdma2000-Type</td>
<td>The field is mandatory present if the cdma2000-Type = type1XRTT; otherwise it is not present.</td>
</tr>
<tr>
<td>dualRxTxRedirect</td>
<td>The field is optionally present, need ON, if dualRxTxRedirectIndicator is present; otherwise it is not present.</td>
</tr>
</tbody>
</table>
The `InDeviceCoexIndication` message is used to inform E-UTRAN about IDC problems which can not be solved by the UE itself, as well as to provide information that may assist E-UTRAN when resolving these problems.

**Signalling radio bearer:** SRB1  
**RLC-SAP:** AM  
**Logical channel:** DCCH  
**Direction:** UE to E-UTRAN

### InDeviceCoexIndication message

```asn1
-- ASN1START

InDeviceCoexIndication-r11 ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1 CHOICE {
      inDeviceCoexIndication-r11 InDeviceCoexIndication-r11-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE {}
  }
}

InDeviceCoexIndication-r11-IEs ::= SEQUENCE {
  affectedCarrierFreqList-r11 AffectedCarrierFreqList-r11 OPTIONAL,
  tdm-AssistanceInfo-r11 TDM-AssistanceInfo-r11 OPTIONAL,
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension InDeviceCoexIndication-v11d0-IEs OPTIONAL
}

InDeviceCoexIndication-v11d0-IEs ::= SEQUENCE {
  ul-CA-AssistanceInfo-r11 SEQUENCE {
    affectedCarrierFreqCombList-r11 AffectedCarrierFreqCombList-r11 OPTIONAL,
    victimSystemType-r11 VictimSystemType-r11
  } OPTIONAL,
  nonCriticalExtension InDeviceCoexIndication-v1310-IEs OPTIONAL
}

InDeviceCoexIndication-v1310-IEs ::= SEQUENCE {
  affectedCarrierFreqList-v1310 AffectedCarrierFreqList-v1310 OPTIONAL,
  affectedCarrierFreqCombList-r13 AffectedCarrierFreqCombList-r13 OPTIONAL,
  nonCriticalExtension InDeviceCoexIndication-v1360-IEs OPTIONAL
}

InDeviceCoexIndication-v1360-IEs ::= SEQUENCE {
  hardwareSharingProblem-r13 ENUMERATED {true} OPTIONAL,
  nonCriticalExtension InDeviceCoexIndication-v1530-IEs OPTIONAL
}

InDeviceCoexIndication-v1530-IEs ::= SEQUENCE {
  mrdc-AssistanceInfo-r15 MRDC-AssistanceInfo-r15 OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

AffectedCarrierFreqList-r11 ::= SEQUENCE (SIZE (1..maxFreqIDC-r11)) OF AffectedCarrierFreq-r11

AffectedCarrierFreqList-v1310 ::= SEQUENCE (SIZE (1..maxFreqIDC-r11)) OF AffectedCarrierFreq-v1310

AffectedCarrierFreq-r11 ::= SEQUENCE {
  carrierFreq-r11 MeasObjectId,
  interferenceDirection-r11 ENUMERATED {eutra, other, both, spare}
}

AffectedCarrierFreq-v1310 ::= SEQUENCE {
  carrierFreq-v1310 MeasObjectId-v1310 OPTIONAL
}

AffectedCarrierFreqCombList-r11 ::= SEQUENCE (SIZE (1..maxCombIDC-r11)) OF AffectedCarrierFreqComb-r11

-- ASN1END
```
AffectedCarrierFreqCombList-r13 ::= SEQUENCE (SIZE (1..maxCombIDC-r11)) OF AffectedCarrierFreqComb-r13

AffectedCarrierFreqComb-r11 ::= SEQUENCE (SIZE (2..maxServCell-r10)) OF MeasObjectId

AffectedCarrierFreqComb-r13 ::= SEQUENCE (SIZE (2..maxServCell-r13)) OF MeasObjectId-r13

TDM-AssistanceInfo-r11 ::= CHOICE {
  drx-AssistanceInfo-r11    SEQUENCE {
    drx-CycleLength-r11     ENUMERATED {sf40, sf64, sf80, sf128, sf160,
                                    sf256, spare2, spare1},
    drx-Offset-r11      INTEGER (0..255) OPTIONAL,
    drx-ActiveTime-r11     ENUMERATED {sf20, sf30, sf40, sf60, sf80,
                                       sf100, spare2, spare1}
  },
  idc-SubframePatternList-r11 IDC-SubframePatternList-r11,
  ...
}

IDC-SubframePatternList-r11 ::= SEQUENCE (SIZE (1..maxSubframePatternIDC-r11)) OF IDC-SubframePattern-r11

IDC-SubframePattern-r11 ::= CHOICE {
  subframePatternFDD-r11    BIT STRING (SIZE (4)),
  subframePatternTDD-r11    CHOICE {
    subframeConfig0-r11     BIT STRING (SIZE (70)),
    subframeConfig1-5-r11    BIT STRING (SIZE (10)),
    subframeConfig6-r11     BIT STRING (SIZE (60))
  },
  ...
}

VictimSystemType-r11 ::= SEQUENCE {
  gps-r11       ENUMERATED {true}    OPTIONAL,
  glonass-r11      ENUMERATED {true}    OPTIONAL,
  bds-r11       ENUMERATED {true}    OPTIONAL,
  galileo-r11      ENUMERATED {true}    OPTIONAL,
  wlan-r11      ENUMERATED {true}    OPTIONAL,
  bluetooth-r11     ENUMERATED {true}    OPTIONAL
}

MRDC-AssistanceInfo-r15 ::= SEQUENCE {
  affectedCarrierFreqCombInfoListMRDC-r15  SEQUENCE (SIZE (1..maxCombIDC-r11)) OF AffectedCarrierFreqCombInfoMRDC-r15,
  ...
}

AffectedCarrierFreqCombInfoMRDC-r15 ::= SEQUENCE {
  victimSystemType-r15, VictimSystemType-r11,
  interferenceDirectionMRDC-r15     ENUMERATED {eutra-nr, nr, other, eutra-nr-other,
                                            nr-other, spare3, spare2, spare1},
  affectedCarrierFreqCombMRDC-r15  SEQUENCE {
    affectedCarrierFreqCombEUTRA-r15  AffectedCarrierFreqComb-r15 OPTIONAL,
    affectedCarrierFreqCombNR-r15    AffectedCarrierFreqComb-r15 OPTIONAL
  }
}

AffectedCarrierFreqComb-r15 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasObjectId-r13

AffectedCarrierFreqCombNR-r15 ::= SEQUENCE (SIZE (1..maxServCellNR-r15)) OF ARFCN-ValueNR-r15

-- ASN1STOP
InDeviceCoexIndication field descriptions

**AffectedCarrierFreq**
If carrierFreq-v1310 is included, carrierFreq-r11 is ignored by eNB.

**affectedCarrierFreqCombList**
Indicates a list of E-UTRA carrier frequencies that are affected by IDC problems due to Inter-Modulation Distortion and harmonics from E-UTRA when configured with UL CA. affectedCarrierFreqCombList-r13 is used when more than 5 serving cells are configured or affected combinations contain MeasObjectId larger than 32. If affectedCarrierFreqCombList-r13 is included, affectedCarrierFreqCombList-r11 shall not be included.

**affectedCarrierFreqCombMRDC**
Indicates a set of at least one NR carrier frequency and optionally one or more E-UTRA carrier frequency that is affected by IDC problems due to Inter-Modulation Distortion and harmonics when configured with MR-DC.

**affectedCarrierFreqList**
List of E-UTRA carrier frequencies affected by IDC problems. If E-UTRAN includes affectedCarrierFreqList-v1310 it includes the same number of entries, and listed in the same order, as in affectedCarrierFreqList-r11.

**drx-ActiveTime**
Indicates the desired active time that the E-UTRAN is recommended to configure. Value in number of subframes. Value sf20 corresponds to 20 subframes, sf30 corresponds to 30 subframes and so on.

**drx-CycleLength**
Indicates the desired DRX cycle length that the E-UTRAN is recommended to configure. Value in number of subframes. Value sf40 corresponds to 40 subframes, sf64 corresponds to 64 subframes and so on.

**drx-Offset**
Indicates the desired DRX starting offset that the E-UTRAN is recommended to configure. The UE shall set the value of drx-Offset smaller than the value of drx-CycleLength. The starting frame and subframe satisfy the relation: \( \left( \text{SFN} \cdot 10 + \text{subframe number} \right) \mod (\text{drx-CycleLength}) = \text{drx-Offset} \).

**hardwareSharingProblem**
Indicates whether the UE has hardware sharing problems that the UE cannot solve by itself. The field is present (i.e. value true), if the UE has such hardware sharing problems. Otherwise the field is absent.

**idc-SubframePatternList**
A list of one or more subframe patterns indicating which HARQ process E-UTRAN is requested to abstain from using. Value 0 indicates that E-UTRAN is requested to abstain from using the subframe. For FDD, the radio frame in which the pattern starts (i.e. the radio frame in which the first/leftmost bit of the subframePatternFDD corresponds to subframe #0) occurs when SFN mod 2 = 0. For TDD, the first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod x = 0, where x is the size of the bit string divided by 10. The UE shall indicate a subframe pattern that follows HARQ time line, as specified in TS 36.213 [23], i.e, if a subframe is set to 1 in the subframe pattern, also the corresponding subframes carrying the potential UL grant [23, 8.0], the UL HARQ retransmission [23, 8.0] and the DL/UL HARQ feedback [23, 7.3, 8.3 and 9.1.2] shall be set to 1.

**interferenceDirection**
Indicates the direction of IDC interference. Value eutra indicates that only E-UTRA is victim of IDC interference, value other indicates that only another radio is victim of IDC interference and value both indicates that both E-UTRA and another radio are victims of IDC interference. The other radio refers to either the ISM radio or GNSS (see 3GPP TR 36.816 [63]).

**interferenceDirectionMRDC**
Indicates the direction of IDC interference. Value eutra-nr indicates E-UTRA and NR is victim, value nr indicates NR, value other indicates other radio system and so on. The other radio refers to either the ISM radio or GNSS (see 3GPP TR 36.816 [63]).

**victimSystemType**
Indicate the list of victim system types to which IDC interference is caused from E-UTRA when configured with UL CA or from E-UTRA and NR when configured with MR-DC. Value gps, glonass, bds and galileo indicates the type of GNSS. Value wlan indicates WLAN and value bluetooth indicates Bluetooth.

---

**InterFreqRSTDMeasurementIndication**
The InterFreqRSTDMeasurementIndication message is used to indicate that the UE is going to either start or stop OTDOA inter-frequency RSTD measurement which requires measurement gaps as specified in TS 36.133 [16, 8.1.2.6]. The InterFreqRSTDMeasurementIndication message is also used to indicate to the network that the UE is going to start/stop OTDOA intra-frequency RSTD measurements which require measurement gaps. The InterFreqRSTDMeasurementIndication message is also used to indicate to the network the measurement gap that the category M1 or M2 UE prefers to perform RSTD measurements with dense PRS configuration, as specified in TS 36.133 [16], Table 8.1.2.1-3.
Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

InterFreqRSTDMeasurementIndication message

```asn1
-- ASN1START

InterFreqRSTDMeasurementIndication-r10 ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1 CHOICE {
      InterFreqRSTDMeasurementIndication-r10-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE {}
  }
}

InterFreqRSTDMeasurementIndication-r10-IEs ::= SEQUENCE {
  rstd-InterFreqIndication-r10 CHOICE {
    start SEQUENCE {
      RSTD-InterFreqInfoList-r10
    },
    stop NULL
  },
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

RSTD-InterFreqInfoList-r10 ::= SEQUENCE (SIZE(1..maxRSTD-Freq-r10)) OF RSTD-InterFreqInfo-r10

RSTD-InterFreqInfo-r10 ::= SEQUENCE {
  carrierFreq-r10 ARFCN-ValueEUTRA,
  measPRS-Offset-r10 INTEGER (0..39),
  [[ carrierFreq-v1090 ARFCN-ValueEUTRA-v9e0 OPTIONAL ]],
  [[ measPRS-Offset-r15 CHOICE {
    rstd0-r15 INTEGER (0..79),
    rstd1-r15 INTEGER (0..159),
    rstd2-r15 INTEGER (0..319),
    rstd3-r15 INTEGER (0..639),
    rstd4-r15 INTEGER (0..1279),
    rstd5-r15 INTEGER (0..159),
    rstd6-r15 INTEGER (0..319),
    rstd7-r15 INTEGER (0..639),
    rstd8-r15 INTEGER (0..1279),
    rstd9-r15 INTEGER (0..319),
    rstd10-r15 INTEGER (0..639),
    rstd11-r15 INTEGER (0..1279),
    rstd12-r15 INTEGER (0..319),
    rstd13-r15 INTEGER (0..639),
    rstd14-r15 INTEGER (0..1279),
    rstd15-r15 INTEGER (0..639),
    rstd16-r15 INTEGER (0..1279),
    rstd17-r15 INTEGER (0..639),
    rstd18-r15 INTEGER (0..1279),
    rstd19-r15 INTEGER (0..639),
    rstd20-r15 INTEGER (0..1279)
  }]]
}

-- ASN1STOP
```
### InterFreqRSTDMeasurementIndication field descriptions

**carrierFreq**
The EARFCN value of the carrier received from upper layers for which the UE needs to perform the inter-frequency RSTD measurements. If the UE includes `carrierFreq-v1090`, it shall set `carrierFreq-r10` to `maxEARFCN`. In case the UE starts intra-frequency RSTD measurements the `carrierFreq` indicates the carrier frequency of the serving cell.

**densePRS-GapPreference**
The measurement gap that the category M1 or M2 UE prefers to perform RSTD measurements with densePRS configuration, as specified in TS 36.133 [16], Table 8.1.2.1-3. Value 0 corresponds to Gap Pattern Id rstd0, value 1 corresponds to Gap Pattern Id rstd1 and so on.

**measPRS-Offset**
Indicates the requested gap offset for performing inter-frequency or intra-frequency RSTD measurements. It is the smallest subframe offset from the beginning of subframe 0 of SFN=0 of the serving cell of the requested gap for measuring PRS positioning occasions in the carrier frequency `carrierFreq` for which the UE needs to perform the inter-frequency or intra-frequency RSTD measurements. The PRS positioning occasion information is received from upper layers. The value of `measPRS-Offset-r10` is obtained by mapping the starting subframe of the PRS positioning occasion in the measured cell onto the corresponding subframe in the serving cell and is calculated as the serving cell’s number of subframes from SFN=0 mod 40.

If `measPRS-Offset-r15` is included, the field further indicates the requested gap pattern that the category M1 or M2 UE prefers to perform RSTD measurements with dense PRS configuration, as specified in TS 36.133 [16], Table 8.1.2.1-3, where value rstd0 corresponds to Gap Pattern Id rstd0, value rstd1 corresponds to Gap Pattern Id rstd1 and so on. The value of `measPRS-Offset-r15` is obtained by mapping the starting subframe of the PRS positioning occasion in the measured cell onto the corresponding subframe in the serving cell and is calculated as the serving cell’s number of subframes from SFN=0 mod MGRP corresponding to the requested Gap pattern Id. If `measPRS-Offset-r15` is included, `measPRS-Offset-r10` is ignored.

The UE shall take into account any additional time required by the UE to start PRS measurements on the other carrier when it does this mapping for determining the `measPRS-Offset` field.

NOTE: Figure 6.2.2-1 illustrates the `measPRS-Offset` field.

**rstd-InterFreqIndication**
Indicates the inter-frequency or intra-frequency RSTD measurement action, i.e. the UE is going to start or stop inter-frequency or intra-frequency RSTD measurement.

![Exemplary calculation of measPRS-Offset field.](image)

---

### LoggedMeasurementConfiguration

The `LoggedMeasurementConfiguration` message is used by E-UTRAN to configure the UE to perform logging of measurement results while in RRC_IDLE or to perform logging of measurement results for MBSFN while in both RRC_IDLE and RRC_CONNECTED. It is used to transfer the logged measurement configuration for network performance optimisation, see TS 37.320 [60].

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH
LoggedMeasurementConfiguration message

```asn1
-- ASN1START
LoggedMeasurementConfiguration-r10 ::= SEQUENCE {
criticalExtensions CHOICE {
c1 CHOICE {
  loggedMeasurementConfiguration-r10 LoggedMeasurementConfiguration-r10-IEs,
  spare3 NULL, spare2 NULL, spare1 NULL
},
criticalExtensionsFuture SEQUENCE ()
}
}

LoggedMeasurementConfiguration-r10-IEs ::= SEQUENCE {
  traceReference-r10 TraceReference-r10,
  traceRecordingSessionRef-r10 OCTET STRING (SIZE (2)),
  tce-Id-r10 OCTET STRING (SIZE (1)),
  absoluteTimeInfo-r10 AbsoluteTimeInfo-r10,
  areaConfiguration-r10 AreaConfiguration-r10 OPTIONAL, -- Need OR
  loggingDuration-r10 LoggingDuration-r10,
  loggingInterval-r10 LoggingInterval-r10,
  nonCriticalExtension LoggedMeasurementConfiguration-v1080-IEs OPTIONAL
}

LoggedMeasurementConfiguration-v1080-IEs ::= SEQUENCE {
  lateNonCriticalExtension-r10 OCTET STRING OPTIONAL,
  nonCriticalExtension LoggedMeasurementConfiguration-v1130-IEs OPTIONAL
}

LoggedMeasurementConfiguration-v1130-IEs ::= SEQUENCE {
  plmn-IdentityList-r11 PLMN-IdentityList3-r11 OPTIONAL, -- Need OR
  areaConfiguration-v1130 AreaConfiguration-v1130 OPTIONAL, -- Need OR
  nonCriticalExtension LoggedMeasurementConfiguration-v1250-IEs OPTIONAL
}

LoggedMeasurementConfiguration-v1250-IEs ::= SEQUENCE {
  targetMBSFN-AreaList-r12 TargetMBSFN-AreaList-r12 OPTIONAL, -- Need OR
  nonCriticalExtension LoggedMeasurementConfiguration-v1530-IEs OPTIONAL
}

LoggedMeasurementConfiguration-v1530-IEs ::= SEQUENCE {
  bt-NameList-r15 BT-NameList-r15 OPTIONAL, -- Need OR
  wlan-NameList-r15 WLAN-NameList-r15 OPTIONAL, -- Need OR
  nonCriticalExtension SEQUENCE () OPTIONAL
}

TargetMBSFN-AreaList-r12 ::= SEQUENCE (SIZE (0..maxMBSFN-Area)) OF TargetMBSFN-Area-r12

TargetMBSFN-Area-r12 ::= SEQUENCE {
mbsfn-AreaId-r12 MBSFN-AreaId-r12 OPTIONAL, -- Need OR
carrierFreq-r12 ARFCN-ValueEUTRA-r9, ...
}

-- ASN1STOP
```
**LoggedMeasurementConfiguration** field descriptions

**absoluteTimeInfo**
Indicates the absolute time in the current cell.

**areaConfiguration**
Used to restrict the area in which the UE performs measurement logging to cells broadcasting either one of the included cell identities or one of the included tracking area codes/identities.

**plmn-IdentityList**
Indicates a set of PLMNs defining when the UE performs measurement logging as well as the associated status indication and information retrieval i.e. the UE performs these actions when the RPLMN is part of this set of PLMNs.

**targetMBSFN-AreaList**
Used to indicate logging of MBSFN measurements and further restrict the area and frequencies for which the UE performs measurement logging for MBSFN. If both MBSFN area id and carrier frequency are present, a specific MBSFN area is indicated. If only carrier frequency is present, all MBSFN areas on that carrier frequency are indicated. If there is no entry in the list, any MBSFN area is indicated.

**tce-id**
Parameter Trace Collection Entity Id: See TS 32.422 [58].

**traceRecordingSessionRef**
Parameter Trace Recording Session Reference: See TS 32.422 [58]

---

**MasterInformationBlock**

The **MasterInformationBlock** includes the system information transmitted on BCH.

- Signalling radio bearer: N/A
- RLC-SAP: TM
- Logical channel: BCCH
- Direction: E-UTRAN to UE

---

```asn1
MasterInformationBlock ::= SEQUENCE {
  dl-Bandwidth      ENUMERATED {
    n6, n15, n25, n50, n75, n100},
  phich-Config      PHICH-Config,
  systemFrameNumber     BIT STRING (SIZE (8)),
  schedulingInfoSIB1-BR-r13   INTEGER (0..31),
  systemInfoUnchanged-BR-r15   BOOLEAN,
  spare        BIT STRING (SIZE (4))
}
```

---

**MasterInformationBlock** field descriptions

**dl-Bandwidth**
Parameter: transmission bandwidth configuration, NRB in downlink, see TS 36.101 [42, table 5.6-1]. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.

**phich-Config**
Specifies the PHICH configuration. If the UE is a BL UE or UE in CE, it shall ignore this field.

**schedulingInfoSIB1-BR**
Indicates the index to the tables that define SystemInformationBlockType1-BR scheduling information. The tables are specified in TS 36.213 [23, Table 7.1.6-1 and Table 7.1.7.2.7-1]. Value 0 means that SystemInformationBlockType1-BR is not scheduled.

**systemFrameNumber**
Defines the 8 most significant bits of the SFN. As indicated in TS 36.211 [21, 6.6.1], the 2 least significant bits of the SFN are acquired implicitly in the P-BCH decoding, i.e. timing of 40ms P-BCH TTI indicates 2 least significant bits (within 40ms P-BCH TTI, the first radio frame: 00, the second radio frame: 01, the third radio frame: 10, the last radio frame: 11). One value applies for all serving cells of a Cell Group (i.e. MCG or SCG). The associated functionality is common (i.e. not performed independently for each cell).

**systemInfoUnchanged-BR**
Value TRUE indicates that no change has occurred in the SIB1-BR and SI messages at least over the SI validity time.
**MasterInformationBlock-MBMS**

The *MasterInformationBlock-MBMS* includes the system information transmitted on BCH.

- Signalling radio bearer: N/A
- RLC-SAP: TM
- Logical channel: BCCH
- Direction: E-UTRAN to UE

**MasterInformationBlock-MBMS field descriptions**

- `additionalNonMBSFNSubframes`
  Configures additional non-MBSFN subframes where *SystemInformationBlockType1-MBMS* and *SystemInformation-MBMS* may be transmitted. Value 0, 1, 2, 3 mean zero, one, two, three additional non-MBSFN subframes are configured after each subframe which has PBCH.

- `dl-Bandwidth-MBMS`
  Parameter: transmission bandwidth configuration, NRB in downlink, see TS 36.101 [42, table 5.6-1]. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.

- `systemFrameNumber`
  Defines the 6 most significant bits of the SFN of the MBMS-dedicated cell. As indicated in TS 36.211 [21, 6.6.1], the 4 least significant bits of the SFN are acquired implicitly in the P-BCH decoding, i.e. timing of 160ms P-BCH TTI indicates 4 least significant bits (within 40ms P-BCH TTI, the first radio frame: 00, the fourth radio frame: 01, the eighth radio frame: 10, the last radio frame: 11).

**MBMSCountingRequest**

The *MBMSCountingRequest* message is used by E-UTRAN to count the UEs that are receiving or interested to receive specific MBMS services.

- Signalling radio bearer: N/A
- RLC-SAP: UM
- Logical channel: MCCH
- Direction: E-UTRAN to UE

**MBMSCountingRequest message**
The **MBMSCountingResponse** message is used by the UE to respond to an **MBMSCountingRequest** message.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

---

### MBMSCountingResponse message

```asn1
MBMSCountingResponse-r10 ::= SEQUENCE {
    criticalExtensions     CHOICE {
        c1         CHOICE {
            countingResponse-r10    MBMSCountingResponse-r10-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {} 
    }
}

MBMSCountingResponse-r10-IEs ::= SEQUENCE {
    mbsfn-AreaIndex-r10    INTEGER (0..maxMBSFN-Area-1)      OPTIONAL,
    countingResponseList-r10  CountingResponseList-r10   OPTIONAL,
    lateNonCriticalExtension  OCTET STRING      OPTIONAL,
    nonCriticalExtension   SEQUENCE {}       OPTIONAL
}

CountingResponseList-r10 ::=  SEQUENCE (SIZE (1..maxServiceCount)) OF CountingResponseInfo-r10

CountingResponseInfo-r10 ::=  SEQUENCE {
    countingResponseService-r10 INTEGER (0..maxServiceCount-1),
    ... 
}
```

---

### MBMSCountingResponse field descriptions

**countingResponseList**

List of MBMS services which the UE is receiving or interested to receive. Value 0 for field **countingResponseService** corresponds to the first entry in **countingRequestList** within **MBMSCountingRequest**, value 1 corresponds to the second entry in this list and so on.

**mbsfn-AreaIndex**

Index of the entry in field **mbsfn-AreaInfoList** within **SystemInformationBlockType13**. Value 0 corresponds to the first entry in **mbsfn-AreaInfoList** within **SystemInformationBlockType13**, value 1 corresponds to the second entry in this list and so on.
### MBMSInterestIndication

The **MBMSInterestIndication** message is used to inform E-UTRAN that the UE is receiving/interested to receive or no longer receiving/interested to receive MBMS via an MRB or SC-MRB.

- **Signalling radio bearer:** SRB1
- **RLC-SAP:** AM
- **Logical channel:** DCCH
- **Direction:** UE to E-UTRAN

#### MBMSInterestIndication message

```
MBMSInterestIndication-r11 ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE {
      interestIndication-r11    MBMSInterestIndication-r11-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {} }
}

MBMSInterestIndication-r11-IEs ::= SEQUENCE {
  mbms-FreqList-r11   CarrierFreqListMBMS-r11   OPTIONAL,
  mbms-Priority-r11   ENUMERATED {true}     OPTIONAL,
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension   MBMSInterestIndication-v1310-IEs OPTIONAL
}

MBMSInterestIndication-v1310-IEs ::= SEQUENCE {
  mbms-Services-r13     MBMS-ServiceList-r13  OPTIONAL,
  nonCriticalExtension   SEQUENCE {}       OPTIONAL
}
```

#### MBMSInterestIndication field descriptions

- **mbms-FreqList**
  - List of MBMS frequencies on which the UE is receiving or interested to receive MBMS via an MRB or SC-MRB.
- **mbms-Priority**
  - Indicates whether the UE prioritises MBMS reception above unicast reception. The field is present (i.e. value **true**), if the UE prioritises reception of all listed MBMS frequencies above reception of any of the unicast bearers. Otherwise the field is absent.

### MBSFNAreaConfiguration

The **MBSFNAreaConfiguration** message contains the MBMS control information applicable for an MBSFN area. For each MBSFN area included in **SystemInformationBlockType13** E-UTRAN configures an MCCH (i.e. the MCCH identifies the MBSFN area) and signals the **MBSFNAreaConfiguration** message.

- **Signalling radio bearer:** N/A
- **RLC-SAP:** UM
- **Logical channel:** MCCH
- **Direction:** E-UTRAN to UE

#### MBSFNAreaConfiguration message

```
MBSFNAreaConfiguration-r9 ::= SEQUENCE {
  commonSF-Alloc-r9     CommonSF-AllocPatternList-r9,  
  commonSF-AllocPeriod-r9 ENUMERATED { 
```
MBSFNAreaConfiguration field descriptions

**commonSF-Alloc**
Indicates the subframes allocated to the MBSFN area. E-UTRAN always sets this field to cover at least the subframes configured by SystemInformationBlockType13 for this MCCH, regardless of whether any MBMS sessions are ongoing.

**commonSF-AllocPeriod**
Indicates the period during which resources corresponding with field commonSF-Alloc are divided between the (P)MCH that are configured for this MBSFN area. The subframe allocation patterns, as defined by commonSF-Alloc, repeat continuously during this period. Value rf4 corresponds to 4 radio frames, rf8 corresponds to 8 radio frames and so on. The commonSF-AllocPeriod starts in the radio frames for which: SFN mod commonSF-AllocPeriod = 0.

**pmch-InfoList**
EUTRAN may include pmch-InfoListExt even if pmch-InfoList does not include maxPMCH-PerMBSFN entries. EUTRAN configures at most maxPMCH-PerMBSFN entries i.e. across pmch-InfoList and pmch-InfoListExt.

---

**MeasReportAppLayer**

The *MeasReportAppLayer* message is used for sending application layer measurement report.

Signalling radio bearer: SRB4

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**MeasReportAppLayer message**

---

```
MeasReportAppLayer-r15 ::= SEQUENCE {
  criticalExtensions  CHOICE {
   _measReportAppLayer-r15  MeasReportAppLayer-r15-IEs,
    criticalExtensionsFuture  SEQUENCE {}  
  }
}
MeasReportAppLayer-r15-IEs ::= SEQUENCE {
  measReportAppLayerContainer-r15  OCTET STRING (SIZE(1..8000)) OPTIONAL,
  serviceType  ENUMERATED {qoe, qoemtsi, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL,
  nonCriticalExtension  SEQUENCE {} OPTIONAL
}
```

---
**MeasReportAppLayer field descriptions**

*measReportAppLayerContainer*
The field contains container of application layer measurements, see Annex L (normative) in TS 26.247 [90].

*serviceType*
Indicates the type of application layer measurement. Value qoe indicates Quality of Experience Measurement Collection for streaming services, value qoemtsi indicates Quality of Experience Measurement Collection for MTSI.

---

**MeasurementReport**
The *MeasurementReport* message is used for the indication of measurement results.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**MeasurementReport message**

```asn1
MeasurementReport ::= SEQUENCE {
    criticalExtensions     CHOICE {
        c1         CHOICE{
            measurementReport-r8    MeasurementReport-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}

MeasurementReport-r8-IEs ::= SEQUENCE {
    measResults       MeasResults,
    nonCriticalExtension    MeasurementReport-v8a0-IEs   OPTIONAL
}

MeasurementReport-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL,
    nonCriticalExtension    SEQUENCE {}       OPTIONAL
}
```

---

**MobilityFromEUTRACCommand**
The *MobilityFromEUTRACCommand* message is used to command handover or a cell change from E-UTRA to another RAT (3GPP or non-3GPP), or enhanced CS fallback to CDMA2000 1xRTT.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**MobilityFromEUTRACCommand message**

```asn1
MobilityFromEUTRACCommand ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        c1         CHOICE{
            MeasurementReport-r8-IEs,
            MeasurementReport-v8a0-IEs
        }
    }
}
```
MobilityFromEUTRACommand-r8-IEs ::= SEQUENCE {
    cs-FallbackIndicator BOOLEAN,
    purpose CHOICE{
        handover Handover,
        cellChangeOrder CellChangeOrder,
    },
    nonCriticalExtension MobilityFromEUTRACommand-v8a0-IEs OPTIONAL
}

MobilityFromEUTRACommand-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension MobilityFromEUTRACommand-v8d0-IEs OPTIONAL
}

MobilityFromEUTRACommand-v8d0-IEs ::= SEQUENCE {
    bandIndicator BandIndicatorGERAN OPTIONAL, -- Cond GERAN
    nonCriticalExtension SEQUENCE () OPTIONAL
}

MobilityFromEUTRACommand-r9-IEs ::= SEQUENCE {
    cs-FallbackIndicator BOOLEAN,
    purpose CHOICE{
        handover Handover,
        cellChangeOrder CellChangeOrder,
        e-CSFB-r9 E-CSFB-r9,
        ...,
    },
    nonCriticalExtension MobilityFromEUTRACommand-v930-IEs OPTIONAL
}

MobilityFromEUTRACommand-v930-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension MobilityFromEUTRACommand-v960-IEs OPTIONAL
}

MobilityFromEUTRACommand-v960-IEs ::= SEQUENCE {
    bandIndicator BandIndicatorGERAN OPTIONAL, -- Cond GERAN
    nonCriticalExtension MobilityFromEUTRACommand-v1530-IEs OPTIONAL
}

MobilityFromEUTRACommand-v1530-IEs ::= SEQUENCE {
    smtc-r15 MTC-SSB-NR-r15 OPTIONAL, -- Need OP
    nonCriticalExtension SEQUENCE () OPTIONAL
}

Handover ::= SEQUENCE {
    targetRAT-Type ENUMERATED {
        utra, geran, cdma2000-1XRTT, cdma2000-HRPD,
        nr, eutra, spare2, spare1, ...},
    targetRAT-MessageContainer OCTET STRING,
    nas-SecurityParamFromEUTRA OCTET STRING (SIZE (1)) OPTIONAL, -- Cond UTRAGERANEPC
    systemInformation SI-OrPSI-GERAN OPTIONAL -- Cond PSHO
}

CellChangeOrder ::= SEQUENCE {
    t304 ENUMERATED {
        ms100, ms200, ms500, ms1000,
        ms2000, ms4000, ms8000, ms10000-v1310},
    targetRAT-Type CHOICE {
        geran SEQUENCE {
            physCellId PhysCellIdGERAN,
            carrierFreq CarrierFreqGERAN,
            networkControlOrder BIT STRING (SIZE (2)) OPTIONAL, -- Need OP
            systemInformation SI-OrPSI-GERAN OPTIONAL -- Need OP
        },
        ...,
    }
}

SI-OrPSI-GERAN ::= CHOICE {

}
MobilityFromEUTRACommand field descriptions

**bandIndicator**
Indicates how to interpret the ARFCN of the BCCH carrier.

**carrierFreq**
contains the carrier frequency of the target GERAN cell.

**cs-FallbackIndicator**
Value *true* indicates that the CS fallback procedure to UTRAN or GERAN is triggered.

**messageContCDMA2000-1XRTT**
This field contains a message specified in CDMA2000 1xRTT standard that either tells the UE to move to specific 1xRTT target cell(s) or indicates a failure to allocate resources for the enhanced CS fallback to CDMA2000 1xRTT.

**messageContCDMA2000-HRPD**
This field contains a message specified in CDMA2000 HRPD standard that either tells the UE to move to specific HRPD target cell(s) or indicates a failure to allocate resources for the handover to CDMA2000 HRPD.

**mobilityCDMA2000-HRPD**
This field indicates whether or not mobility to CDMA2000 HRPD is to be performed by the UE and it also indicates the type of mobility to CDMA2000 HRPD that is to be performed; If this field is not present the UE shall perform only the enhanced CS fallback to CDMA2000 1xRTT.

**nas-SecurityParamFromEUTRA**
If the *targetRAT-Type* is set to "eutra" and the source CN is 5GC, this field is used to deliver the key synchronisation and key freshness for the 5GS to EPS handovers as specified in TS 33.501 [86] and the content of the parameter is defined in TS 24.501 [95]. Otherwise, this field is used to deliver the key synchronisation and Key freshness for the E-UTRAN to UTRAN handovers as specified in TS 33.401 [32] and the content of the parameter is defined in TS24.301 [35].

**networkControlOrder**
Parameter NETWORK_CONTROL_ORDER in TS 44.060 [36].

**purpose**
Indicates which type of mobility procedure the UE is requested to perform. EUTRAN always applies value *e-CSFB* in case of enhanced CS fallback to CDMA2000 (e.g. also when that procedure results in handover to CDMA2000 1XRTT only, in handover to CDMA2000 HRPD only or in redirection to CDMA2000 HRPD only).

**redirectCarrierCDMA2000-HRPD**
The redirectCarrierCDMA2000-HRPD indicates a CDMA2000 carrier frequency and is used to redirect the UE to a HRPD carrier frequency.

**smtc**
The SSB periodicity/offset/duration configuration of target cell for inter-RAT handover to NR. It is based on timing reference of EUTRAN PCell. If the field is absent, the UE uses the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing.

**SystemInfoListGERAN**
If *purpose* = CellChangeOrder and if the field is not present, the UE has to acquire SI/PSI from the GERAN cell.

**t304**
Timer T304 as described in section 7.3. Value ms100 corresponds with 100 ms, ms200 corresponds with 200 ms and so on. EUTRAN includes extended value *ms10000-v1310* only when UE supports CE.

**targetRAT-Type**
Indicates the target RAT type.

**targetRAT-MessageContainer**
The field contains a message specified in another standard, as indicated by the *targetRAT-Type*, and carries information about the target cell identifier(s) and radio parameters relevant for the target radio access technology. NOTE 1.

A complete message is included, as specified in the other standard.
<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>concHO</td>
<td>The field is mandatory present if the <code>mobilityCDMA2000-HRPD</code> is set to &quot;handover&quot;; otherwise the field is optional present, need ON.</td>
</tr>
<tr>
<td>concRedir</td>
<td>The field is mandatory present if the <code>mobilityCDMA2000-HRPD</code> is set to &quot;redirection&quot;; otherwise the field is not present.</td>
</tr>
<tr>
<td>GERAN</td>
<td>The field should be present if the <code>purpose</code> is set to &quot;handover&quot; and the <code>targetRAT-Type</code> is set to &quot;geran&quot;; otherwise the field is not present.</td>
</tr>
<tr>
<td>PSHO</td>
<td>The field is mandatory present in case of PS handover toward GERAN; otherwise the field is optionally present, but not used by the UE.</td>
</tr>
<tr>
<td>UTRAGERANEPC</td>
<td>The field is mandatory present if the <code>targetRAT-Type</code> is set to &quot;utra&quot; or &quot;geran&quot; or if the <code>targetRAT-Type</code> is set to &quot;eutra&quot; and the source CN is 5GC; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

Note 1: The correspondence between the value of the `targetRAT-Type`, the standard to apply and the message contained within the `targetRAT-MessageContainer` is shown in the table below:

<table>
<thead>
<tr>
<th>targetRAT-Type</th>
<th>Standard to apply</th>
<th>targetRAT-MessageContainer</th>
</tr>
</thead>
<tbody>
<tr>
<td>cdma2000-1XRTT</td>
<td>C.S0001 or later, C.S0007 or later, C.S0008 or later</td>
<td></td>
</tr>
<tr>
<td>cdma2000-HRPD</td>
<td>C.S0024 or later</td>
<td></td>
</tr>
<tr>
<td>eutra</td>
<td>3GPP TS 36.331 (clause 5.4.2)</td>
<td>RRCConnectionReconfiguration</td>
</tr>
<tr>
<td>geran</td>
<td>GSM TS 04.18, version 8.5.0 or later, or 3GPP TS 44.018 (clause 9.1.15)</td>
<td>HANOVER COMMAND</td>
</tr>
<tr>
<td></td>
<td>3GPP TS 44.060, version 6.13.0 or later (clause 11.2.43)</td>
<td>PS HANOVER COMMAND</td>
</tr>
<tr>
<td></td>
<td>3GPP TS 44.060, version 7.6.0 or later (clause 11.2.46)</td>
<td>DTM HANOVER COMMAND</td>
</tr>
<tr>
<td>nr</td>
<td>3GPP TS 38.331 (clause 6.2.2)</td>
<td>RRCReconfiguration</td>
</tr>
<tr>
<td>utra</td>
<td>3GPP TS 25.331 (clause 10.2.16a)</td>
<td>HANOVER TO UTRAN COMMAND</td>
</tr>
</tbody>
</table>

---

**Paging**

The **Paging** message is used for the notification of one or more UEs.

- Signalling radio bearer: N/A
- RLC-SAP: TM
- Logical channel: PCCH
- Direction: E-UTRAN to UE

**Paging message**

```asn1
-- ASN1START
Paging ::= SEQUENCE {
    pagingRecordList    PagingRecordList OPTIONAL, -- Need ON
    systemInfoModification ENUMERATED {true} OPTIONAL, -- Need ON
    etws-Indication     ENUMERATED {true} OPTIONAL, -- Need ON
    nonCriticalExtension Paging-v890-IEs OPTIONAL
}
Paging-v890-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension Paging-v920-IEs OPTIONAL
}
Paging-v920-IEs ::= SEQUENCE {
    cmas-Indication-r9 ENUMERATED {true} OPTIONAL, -- Need ON
    nonCriticalExtension Paging-v1130-IEs OPTIONAL
}
Paging-v1130-IEs ::= SEQUENCE {
    eab-ParamModification-r11 ENUMERATED {true} OPTIONAL, -- Need ON
    nonCriticalExtension Paging-v1310-IEs OPTIONAL
}
-- ASN1END
```
Paging-v1310-IEs ::= SEQUENCE {
  redistributionIndication-r13 ENUMERATED {true} OPTIONAL, -- Need ON
  systemInfoModification-eDRX-r13 ENUMERATED {true} OPTIONAL, -- Need ON
  nonCriticalExtension Paging-v1310-IEs OPTIONAL
}

Paging-v1530-IEs ::= SEQUENCE {
  accessType ENUMERATED {non3GPP} OPTIONAL, -- Need ON
  nonCriticalExtension SEQUENCE () OPTIONAL
}

PagingRecordList ::= SEQUENCE {SIZE (1..maxPageRec)} OF PagingRecord

PagingRecord ::= SEQUENCE {
  ue-Identity PagingUE-Identity,
  cn-Domain ENUMERATED {ps, cs},
  ...
}

PagingUE-Identity ::= CHOICE {
  s-TMSI S-TMSI,
  imsi IMSI,
  ...
  ng-5G-S-TMSI-r15 NG-5G-S-TMSI-r15,
  i-RNTI-r15 I-RNTI-r15
}

IMSI ::= SEQUENCE {SIZE (6..21)} OF IMSI-Digit

IMSI-Digit ::= INTEGER (0..9)

--- ASN1STOP

**Paging field descriptions**

- **cmas-Indication**
  If present: indication of a CMAS notification.

- **cn-Domain**
  Indicates the origin of paging.

- **eab-ParamModification**
  If present: indication of an EAB parameters (SIB14) modification.

- **etws-Indication**
  If present: indication of an ETWS primary notification and/ or ETWS secondary notification.

- **imsi**
  The International Mobile Subscriber Identity, a globally unique permanent subscriber identity, see TS 23.003 [27]. The first element contains the first IMSI digit, the second element contains the second IMSI digit and so on.

- **redistributionIndication**
  If present: indication to trigger E-UTRAN inter-frequency redistribution procedure as specified in TS 36.304 [4], clause 5.2.4.10.

- **systemInfoModification**
  If present: indication of a BCCH modification other than SIB10, SIB11, SIB12 and SIB14. This indication does not apply to UEs using eDRX cycle longer than the BCCH modification period.

- **systemInfoModification-eDRX**
  If present: indication of a BCCH modification other than SIB10, SIB11, SIB12 and SIB14. This indication applies only to UEs using eDRX cycle longer than the BCCH modification period.

- **ue-Identity**
  Provides the NAS identity of the UE that is being paged. The IMSI is not applicable for E-UTRA connected to 5GC.

---

**ProximityIndication**

The **ProximityIndication** message is used to indicate that the UE is entering or leaving the proximity of one or more CSG member cell(s).
ProximityIndication message

--- ASN1START

ProximityIndication-r9 ::= SEQUENCE {
  criticalExtensions  CHOICE {
    c1  CHOICE {
      proximityIndication-r9    ProximityIndication-r9-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture  SEQUENCE {}
  }
}

ProximityIndication-r9-IEs ::= SEQUENCE {
  type-r9        ENUMERATED {entering, leaving},
  carrierFreq-r9      CHOICE {
    eutra-r9       ARFCN-ValueEUTRA,
    utra-r9        ARFCN-ValueUTRA,
    ...,
    eutra2-v9e0     ARFCN-ValueEUTRA-v9e0
  },
  nonCriticalExtension  ProximityIndication-v930-IEs
}

ProximityIndication-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension  OCTET STRING,  OPTIONAL,
  nonCriticalExtension  SEQUENCE [],  OPTIONAL
}

--- ASN1STOP

ProximityIndication field descriptions

carrierFreq
Indicates the RAT and frequency of the CSG member cell(s), for which the proximity indication is sent. For E-UTRA
and UTRA frequencies, the UE shall set the ARFCN according to a band it previously considered suitable for
accessing (one of) the CSG member cell(s), for which the proximity indication is sent.

type
Used to indicate whether the UE is entering or leaving the proximity of CSG member cell(s).

-- RNReconfiguration

The RNReconfiguration is a command to modify the RN subframe configuration and/or to convey changed system
information.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to RN

RNReconfiguration message

--- ASN1START

RNReconfiguration-r10 ::= SEQUENCE {
  rrc-TransactionIdentifier  RRC-TransactionIdentifier,  
  criticalExtensions  CHOICE {
    c1  CHOICE {
      rnReconfiguration-r10    RNReconfiguration-r10-IEs,
    }
  }
}

--- ASN1STOP
spare3 NULL, spare2 NULL, sparse1 NULL
},
criticalExtensionsFuture SEQUENCE {}
}

RNReconfiguration-r10-IEs ::= SEQUENCE {
  rn-SystemInfo-r10 RN-SystemInfo-r10 OPTIONAL, -- Need ON
  rn-SubframeConfig-r10 RN-SubframeConfig-r10 OPTIONAL, -- Need ON
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

RN-SystemInfo-r10 ::= SEQUENCE {
  systemInformationBlockType1-r10 OCTET STRING (CONTAINING SystemInformationBlockType1) OPTIONAL, -- Need ON
  systemInformationBlockType2-r10 SystemInformationBlockType2 OPTIONAL, -- Need ON
  ...
} -- ASN1STOP

– RNReconfigurationComplete

The RNReconfigurationComplete message is used to confirm the successful completion of an RN reconfiguration.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: RN to E-UTRAN

**RNReconfigurationComplete message**

-- ASN1START

RNReconfigurationComplete-r10 ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
    c1 CHOICE {
      rnReconfigurationComplete-r10 RNReconfigurationComplete-r10-IEs,
      spare3 NULL, spare2 NULL, sparse1 NULL
    },
    criticalExtensionsFuture SEQUENCE {}
  }
}
	nonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- ASN1STOP

– RRCConnectionReconfiguration

The RRCConnectionReconfiguration message is the command to modify an RRC connection. It may convey information for measurement configuration, mobility control, radio resource configuration (including RBs, MAC main configuration and physical channel configuration) including any associated dedicated NAS information and security configuration.
Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to UE

**RRCConnectionReconfiguration message**

```asn1
RRCConnectionReconfiguration ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier, -- Need ON,
  criticalExtensions     CHOICE {
    c1   CHOICE{
      rrcConnectionReconfiguration-r8  RRCConnectionReconfiguration-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {} 
  }
}

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
  measConfig       MeasConfig      OPTIONAL, -- Need ON
  mobilityControlInfo     MobilityControlInfo    OPTIONAL, -- Cond HO
  dedicatedInfoNASList    SEQUENCE (SIZE(1..maxDRB)) OF
    DedicatedInfoNAS   OPTIONAL, -- Cond nonHO
  radioResourceConfigDedicated  RadioResourceConfigDedicated OPTIONAL, -- Cond HO-toEUTRA
  securityConfigHO     SecurityConfigHO    OPTIONAL, -- Cond HO-toEPC
  nonCriticalExtension    RRCConnectionReconfiguration-v890-IEs OPTIONAL
}

RRCConnectionReconfiguration-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING (CONTAINING RRCConnectionReconfiguration-v8m0-IEs) OPTIONAL,
  nonCriticalExtension    RRCConnectionReconfiguration-v920-IEs OPTIONAL
}

-- Late non-critical extensions:
RRCConnectionReconfiguration-v8m0-IEs ::= SEQUENCE {
  -- Following field is only for pre REL-10 late non-critical extensions
  lateNonCriticalExtension   OCTET STRING OPTIONAL,
  nonCriticalExtension    RRCConnectionReconfiguration-v10i0-IEs OPTIONAL
}

RRCConnectionReconfiguration-v10i0-IEs ::= SEQUENCE {
  mobilityControlInfo-v10l0   MobilityControlInfo-v10l0   OPTIONAL,
  sCellToAddModList-v10l0   SCellToAddModList-v10l0   OPTIONAL, -- Need ON
  -- Following field is only for late non-critical extensions from REL-10 to REL-11
  lateNonCriticalExtension   OCTET STRING OPTIONAL,
  nonCriticalExtension     RRCConnectionReconfiguration-v12f0-IEs OPTIONAL
}

RRCConnectionReconfiguration-v12f0-IEs ::= SEQUENCE {
  scg-Configuration-v12f0   SCG-Configuration-v12f0   OPTIONAL, -- Cond nonFullConfig
  -- Following field is only for late non-critical extensions from REL-12
  lateNonCriticalExtension   OCTET STRING OPTIONAL,
  nonCriticalExtension     SEQUENCE {} OPTIONAL
}

RRCConnectionReconfiguration-v1370-IEs ::= SEQUENCE {
  radioResourceConfigDedicated-v1370 RadioResourceConfigDedicated-v1370 OPTIONAL, -- Need ON
  sCellToAddModListExt-v1370 SCellToAddModListExt-v1370 OPTIONAL, -- Need ON
  -- Following field is only for late non-critical extensions from REL-13 onwards
  nonCriticalExtension     SEQUENCE {} OPTIONAL
}

-- Regular non-critical extensions:
RRCConnectionReconfiguration-v920-IEs ::= SEQUENCE {
```
otherConfig-r9
fullConfig-r9
nonCriticalExtension

RRConnectionReconfiguration-v1020-IEs ::= SEQUENCE {
  sCellToReleaseList-r10  SCellToReleaseList-r10  OPTIONAL, -- Need ON
  sCellToAddModList-r10  SCellToAddModList-r10  OPTIONAL, -- Need ON
  nonCriticalExtension
}

RRConnectionReconfiguration-v110-IEs ::= SEQUENCE {
  systemInformationBlockType1Dedicated-r11  OCTET STRING (CONTAINING SystemInformationBlockType1)
}

RRConnectionReconfiguration-v1250-IEs ::= SEQUENCE {
  wlan-OffloadInfo-r12  CHOICE {
    release  NULL,
    setup    SEQUENCE {
      wlan-OffloadConfigDedicated-r12  WLAN-OffloadConfig-r12,
      t350-r12  ENUMERATED {min5, min10, min20, min30, min60,
                                min120, min180, spare1} OPTIONAL -- Need OR
    }
  }
  scg-Configuration-r12  SCG-Configuration-r12  OPTIONAL, -- Cond nonFullConfig
  sl-SyncTxControl-r12  SL-SyncTxControl-r12  OPTIONAL, -- Need ON
  sl-DiscConfig-r12    SL-DiscConfig-r12    OPTIONAL, -- Need ON
  sl-CommConfig-r12     SL-CommConfig-r12     OPTIONAL, -- Need ON
  nonCriticalExtension
}

RRConnectionReconfiguration-v1310-IEs ::= SEQUENCE {
  sCellToReleaseListExt-r13  SCellToReleaseListExt-r13  OPTIONAL, -- Need ON
  sCellToAddModListExt-r13  SCellToAddModListExt-r13  OPTIONAL, -- Need ON
  lwa-Configuration-r13    LWA-Configuration-r13    OPTIONAL, -- Need ON
  lwip-Configuration-r13    LWIP-Configuration-r13    OPTIONAL, -- Need ON
  rclwi-Configuration-r13    RCLWI-Configuration-r13    OPTIONAL, -- Need ON
  nonCriticalExtension
}

RRConnectionReconfiguration-v1430-IEs ::= SEQUENCE {
  sl-V2X-ConfigDedicated-r14  SL-V2X-ConfigDedicated-r14  OPTIONAL, -- Need ON
  sCellToAddModListExt-v1430  SCellToAddModListExt-v1430  OPTIONAL, -- Need ON
  perCC-GapIndicationRequest-r14  ENUMERATED{true} OPTIONAL -- Need ON
  systemInformationBlockType2Dedicated-r14  OCTET STRING (CONTAINING SystemInformationBlockType2)
}

RRConnectionReconfiguration-v1510-IEs ::= SEQUENCE {
  nr-Config-r15    CHOICE {
    release  NULL,
    setup    SEQUENCE {
      endc-ReleaseAndAdd-r15  BOOLEAN,
      nr-SecondaryCellGroupConfig-r15  OCTET STRING
        OPTIONAL, -- Need ON
      p-MaxEUTRA-r15  P-Max
        OPTIONAL -- Need ON
    }
  }
  sk-Counter-r15    INTEGER (0.. 65535)
    OPTIONAL, -- Need ON
  nr-RadioBearerConfig1-r15  OCTET STRING
    OPTIONAL, -- Need ON
  nr-RadioBearerConfig2-r15  OCTET STRING
    OPTIONAL, -- Need ON
  tdm-PatternConfig-r15    CHOICE {
    release  NULL,
    setup    SEQUENCE {
      subframeAssignment-r15  SubframeAssignment-r15,
      harq-Offset-r15  INTEGER (0.. 9)
    }
  }
  nonCriticalExtension
}

RRConnectionReconfiguration-v1530-IEs ::= SEQUENCE {
  NR-Config-r15  CHOICE {
    release  NULL,
    setup    SEQUENCE {
      endc-ReleaseAndAdd-r15  BOOLEAN,
      nr-SecondaryCellGroupConfig-r15  OCTET STRING
        OPTIONAL, -- Need ON
      p-MaxEUTRA-r15  P-Max
        OPTIONAL -- Need ON
    }
  }
  sk-Counter-r15    INTEGER (0.. 65535)
    OPTIONAL, -- Need ON
  nr-RadioBearerConfig1-r15  OCTET STRING
    OPTIONAL, -- Need ON
  nr-RadioBearerConfig2-r15  OCTET STRING
    OPTIONAL, -- Need ON
  tdm-PatternConfig-r15    CHOICE {
    release  NULL,
    setup    SEQUENCE {
      subframeAssignment-r15  SubframeAssignment-r15,
      harq-Offset-r15  INTEGER (0.. 9)
    }
  }
  nonCriticalExtension
}
securityConfigHO-v1530 | SecurityConfigHO-v1530 | OPTIONAL, -- Cond HO-5GC
sCellGroupToReleaseList-r15 | SCellGroupToReleaseList-r15 | OPTIONAL, -- Need ON
sCellGroupToAddModList-r15 | SCellGroupToAddModList-r15 | OPTIONAL, -- Need ON
dedicatedInfoNASList-r15 | SEQUENCE (SIZE(1..maxDRB-r15)) OF DedicatedInfoNAS | OPTIONAL, -- Cond nonHO
p-MaxUE-FR1-r15 | P-Max | OPTIONAL, -- Need OR
smtc-r15 | MTC-SSB-NR-r15 | OPTIONAL, -- Need OP
nonCriticalExtension | SEQUENCE () | OPTIONAL

SL-SyncTxControl-r12 ::= SEQUENCE {
  networkControlledSyncTx-r12 ENUMERATED [on, off] OPTIONAL -- Need Op
}

PCellToAddMod-r12 ::= SEQUENCE {
  sCellIndex-r12 SCellIndex-r10,
  cellIdentification-r12 SEQUENCE {
    physCellId-r12 PhysCellId,
    dl-CarrierFreq-r12 ARFCN-ValueEUTRA-r9
  } OPTIONAL, -- Cond SCelAdd
  radioResourceConfigCommonPCell-r12 RadioResourceConfigCommonPCell-r12 OPTIONAL, -- Cond SCelAdd2
  ...
  [[[ antennaInfoDedicatedPCell-v1280 AntennaInfoDedicated-v1010 OPTIONAL -- Need ON ]],
  [[[ sCellIndex-r13 SCellIndex-r13 OPTIONAL -- Need ON ]],
  [[[ radioResourceConfigDedicatedPCell-v1370 RadioResourceConfigDedicatedPCell-v1370 OPTIONAL -- Need ON ]]]
}

PCellToAddMod-v12f0 ::= SEQUENCE {
  radioResourceConfigCommonPCell-r12 RadioResourceConfigCommonPCell-v12f0 OPTIONAL
}

PCellToAddMod-v1440 ::= SEQUENCE {
  radioResourceConfigCommonPCell-r14 RadioResourceConfigCommonPCell-v1440 OPTIONAL
}

PowerCoordinationInfo-r12 ::= SEQUENCE {
  p-MeNB-r12 INTEGER (1..16),
  p-SeNB-r12 INTEGER (1..16),
  powerControlMode-r12 INTEGER (1..2)
}

SCellToAddModList-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-r10
SCellToAddModList-v1010 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-v1010
SCellToAddModListExt-r13 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddModExt-r13
SCellToAddModListExt-v1370 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddModExt-v1370
SCellToAddModListExt-v1430 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellToAddModExt-v1430
SCellGroupToAddModList-r15 ::= SEQUENCE (SIZE (1..maxSCellGroups-r15)) OF SCellGroupToAddModList-r15
SCellToAddMod-r10 ::= SEQUENCE {
  sCellIndex-r10 SCellIndex-r10,
  cellIdentification-r10 SEQUENCE {
    physCellId-r10 PhysCellId,
    dl-CarrierFreq-r10 ARFCN-ValueEUTRA
  } OPTIONAL, -- Cond SCelAdd
  radioResourceConfigCommonSCell-r10 RadioResourceConfigCommonSCell-r10 OPTIONAL, -- Cond SCelAdd2
  ...
  [[[ antennaInfoDedicatedSCell-v1090 AntennaInfoDedicated-v9e0 OPTIONAL -- Cond EARFCN-max ]],
  [[[ srs-SwitchFromServCellIndex-r14 INTEGER (0..31) OPTIONAL -- Need ON ]],
  [[[ sCellState-r15 ENUMERATED {activated, dormant} OPTIONAL -- Need ON ]]]
}
SCellToAddMod-v1010 ::= SEQUENCE {
  radioResourceConfigCommonSCell-v1010  RadioResourceConfigCommonSCell-v1010  OPTIONAL
}

SCellToAddModExt-r13 ::= SEQUENCE {
  sCellIndex-r13          SCellIndex-r13,
  cellIdentification-r13  SEQUENCE {
    physCellId-r13         PhysCellId,
    dl-CarrierFreq-r13     ARFCN-ValueEUTRA-r9  OPTIONAL,  -- Cond SCellAdd
  }
  SCellAdd
  radioResourceConfigDedicatedSCell-r13 RadioResourceConfigDedicatedSCell-r10  OPTIONAL,  -- Cond
  SCellAdd2
  antennaInfoDedicatedSCell-r13    AntennaInfoDedicated-v1010  OPTIONAL  -- Need ON
}

SCellToAddModExt-v1370 ::= SEQUENCE {
  radioResourceConfigCommonSCell-v1370  RadioResourceConfigCommonSCell-v1010  OPTIONAL
}

SCellToAddModExt-v1430 ::= SEQUENCE {
  srs-SwitchFromServCellIndex-r14   INTEGER (0.. 31)  OPTIONAL,  -- Need ON
  ...
  sCellState-r15          ENUMERATED {activated, dormant}  OPTIONAL  -- Need ON
}

SCellGroupToAddMod-r15 ::= SEQUENCE {
  sCellGroupIndex-r15   SCellGroupIndex-r15,
  sCellConfigCommon-r15  SCellConfigCommon-r15  OPTIONAL,  -- Need ON
  sCellToReleaseList-r15  SCellToReleaseListExt-r13  OPTIONAL,  -- Need ON
  sCellToAddModList-r15  SCellToAddModListExt-r13  OPTIONAL  -- Need ON
}

SCellToReleaseList-r10 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellIndex-r10

SCellToReleaseListExt-r13 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF SCellIndex-r13

SCellGroupToReleaseList-r15 ::= SEQUENCE (SIZE (1..maxSCellGroups-r15)) OF SCellGroupIndex-r15

SCellGroupIndex-r15 ::= INTEGER (1..maxSCellGroups-r15)

SCellConfigCommon-r15 ::= SEQUENCE {
  radioResourceConfigCommonSCell-r15  RadioResourceConfigCommonSCell-r10  OPTIONAL,  -- Need ON
  radioResourceConfigDedicatedSCell-r15 RadioResourceConfigDedicatedSCell-r10  OPTIONAL,  -- Need ON
  antennaInfoDedicatedSCell-r15    AntennaInfoDedicated-v1010  OPTIONAL  -- Need ON
}

SCG-Configuration-r12 ::= CHOICE {
  release        NULL,
  setup          SEQUENCE {
    scg-ConfigPartMCG-r12  SEQUENCE {
      scg-Counter-r12         INTEGER (0.. 65535)  OPTIONAL,  -- Need ON
      powerCoordinationInfo-r12  PowerCoordinationInfo-r12  OPTIONAL,  -- Need ON
      ...
    }  OPTIONAL,  -- Need ON
    scg-ConfigPartSCG-r12  SCG-ConfigPartSCG-r12  OPTIONAL  -- Need ON
  }
}

SCG-Configuration-v12f0 ::= CHOICE {
  release        NULL,
  setup          SEQUENCE {
    scg-ConfigPartSCG-v12f0  SCG-ConfigPartSCG-v12f0  OPTIONAL  -- Need ON
  }
}

SCG-ConfigPartSCG-r12 ::= SEQUENCE {
  radioResourceConfigDedicatedSCG-r12 RadioResourceConfigDedicatedSCG-r12  OPTIONAL,  -- Need ON
  sCellToAddListSCG-r12  SCellToAddListSCG-r12  OPTIONAL,  -- Need ON
  pCellToAddMod-r12      PCellToAddMod-r12  OPTIONAL  -- Need ON
}
sCellToAddModListSCG-r12  SCellToAddModList-r10  OPTIONAL, -- Need ON
mobilityControlInfoSCG-r12  MobilityControlInfoSCG-r12  OPTIONAL, -- Need ON
...
[[
  sCellToReleaseListSCG-Ext-r12  SCellToReleaseListExt-r13  OPTIONAL, -- Need ON
  sCellToAddModListSCG-Ext-r13  SCellToAddModListExt-r13  OPTIONAL -- Need ON
]],
[[
sCellToAddModListSCG-Ext-v1370  SCellToAddModListExt-v1370  OPTIONAL -- Need ON
]],
[[
pCellToAddMod-v1440  PCellToAddMod-v1440  OPTIONAL -- Need ON
]],
[[
  sCellGroupToReleaseListSCG-r15  SCellGroupToReleaseList-r15  OPTIONAL, -- Need ON
  sCellGroupToAddModListSCG-r15  SCellGroupToAddModList-r15  OPTIONAL -- Need ON
]]
}

SCG-ConfigPartSCG-v12f0 ::= SEQUENCE {
pCellToAddMod-v12f0  PCellToAddMod-v12f0  OPTIONAL, -- Need ON
  sCellToAddModListSCG-v12f0  SCellToAddModList-v10l0  OPTIONAL -- Need ON
}

SecurityConfigHO ::= SEQUENCE {
  handoverType
    CHOICE {
      intraLTE
        SEQUENCE {
          securityAlgorithmConfig  SecurityAlgorithmConfig  OPTIONAL, -- Cond
          keyChangeIndicator     BOOLEAN,
          nextHopChainingCount    NextHopChainingCount
        },
      interRAT
        SEQUENCE {
          securityAlgorithmConfig  SecurityAlgorithmConfig,
          nas-SecurityParamToEUTRA  OCTET STRING (SIZE(6))
        }
    },
  ...
}

SecurityConfigHO-v1530 ::= SEQUENCE {
  handoverType-v1530
    CHOICE {
      intra5GC-r15
        SEQUENCE {
          securityAlgorithmConfig-r15  SecurityAlgorithmConfig  OPTIONAL, -- Cond
          keyChangeIndicator-r15     BOOLEAN,
          nextHopChainingCount-r15    NextHopChainingCount,
          nas-Container-r15    OCTET STRING OPTIONAL -- Need ON
        },
      ngc-ToEPC-r15
        SEQUENCE {
          securityAlgorithmConfig-r15  SecurityAlgorithmConfig,
          nextHopChainingCount-r15    NextHopChainingCount
        },
      epc-ToNGC-r15
        SEQUENCE {
          securityAlgorithmConfig-r15  SecurityAlgorithmConfig,
          nas-Container-r15    OCTET STRING
        }
    },
  ...
}

-- ASN1STOP
<table>
<thead>
<tr>
<th><strong>Field Description</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3GPP TS 36.331 version 15.3.0 Release 15</strong></td>
<td><strong>ETSI TS 136 331 V15.3.0 (2018-10)</strong></td>
</tr>
<tr>
<td><strong>dedicatedInfoNASList</strong></td>
<td>This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for each PDU in the list. If <strong>dedicatedInfoNASList-r15</strong> is present, UE shall ignore the <strong>dedicatedInfoNASList</strong> (without suffix).</td>
</tr>
<tr>
<td><strong>endc-ReleaseAndAdd</strong></td>
<td>A one-shot field indicating whether the UE simultaneously releases and adds all the NR SCG related configuration within <strong>nr-Config</strong>, i.e. the configuration set by the NR <strong>RRCReconfiguration</strong> message (e.g. secondaryCellGroup, SRB3 and measConfig).</td>
</tr>
<tr>
<td><strong>fullConfig</strong></td>
<td>Indicates the full configuration option is applicable for the RRC Connection Reconfiguration message.</td>
</tr>
<tr>
<td><strong>harq-Offset</strong></td>
<td>Indicates a HARQ subframe offset that is applied to the subframes designated as UL in the associated subframe assignment, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>keyChangeIndicator</strong></td>
<td>If UE is connected to EPC, true is used only in an intra-cell handover when a K_{NB} key is derived from a K_{ASME} key taken into use through the latest successful NAS SMC procedure, as described in TS 33.401 [32] for K_{NB} re-keying. False is used in an intra-LTE handover when the new K_{NB} key is obtained from the current K_{NB} key or from the NH as described in TS 33.401 [32]. If UE is connected to 5GC, with keyChangeIndicator-r15, true is used in an intra-cell handover when a K_{NB} key is derived from a K_{AMF} key taken into use through the latest successful NAS SMC procedure, as described in TS 33.501 [86] for K_{NB} re-keying. False is used for intra-system handover when the new K_{AMF} key is obtained from the current K_{AMF} key or from the NH as described in TS 33.501 [86]. True is also used in NG based handover procedure with K_{AMF} change, when a K_{NB} key is derived from the new K_{AMF} key as described in TS 33.501 [86].</td>
</tr>
<tr>
<td><strong>lwa-Configuration</strong></td>
<td>This field is used to provide parameters for LWA configuration. E-UTRAN does not simultaneously configure LWA with DC, LWIP or RCLWI for a UE.</td>
</tr>
<tr>
<td><strong>lwip-Configuration</strong></td>
<td>This field is used to provide parameters for LWIP configuration. E-UTRAN does not simultaneously configure LWIP with DC, LWA or RCLWI for a UE.</td>
</tr>
<tr>
<td><strong>nas-Container</strong></td>
<td>This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although, if included, it affects activation of AS- security after handover within LTE/5GC. The content is defined in TS 24.501 [95]. In case of NG based handover, the content of nas-Container is the Intra N1 mode NAS transparent container IE. In case of inter-system handover to from 5GS to EPS, the content of NAS-Container is the S1 mode to N1 mode NAS transparent container IE.</td>
</tr>
<tr>
<td><strong>nas-securityParamToEUTRA</strong></td>
<td>This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this field, although, if included, it affects activation of AS- security after inter-RAT handover to E-UTRA connected to EPC or inter-system handover to LTE/EPC. The content is defined in TS 24.301 [35]. This field is not used for handover from 5GC.</td>
</tr>
<tr>
<td><strong>networkControlledSyncTx</strong></td>
<td>This field indicates whether the UE shall transmit synchronisation information (i.e. become synchronisation source). Value <strong>On</strong> indicates the UE to transmit synchronisation information while value <strong>Off</strong> indicates the UE to not transmit such information.</td>
</tr>
<tr>
<td><strong>nextHopChainingCount</strong></td>
<td>Parameter NCC: See TS 33.401 [32] if UE is connected to EPC, else see 33.501 [86] if UE is connected to 5GC.</td>
</tr>
<tr>
<td><strong>nr-Config</strong></td>
<td>Includes the NR <strong>RadioBearerConfig</strong> IE as specified in TS 38.331 [82]. The field includes the configuration of RBs configured with NR PDCP.</td>
</tr>
<tr>
<td><strong>nr-SecondaryCellGroupConfig</strong></td>
<td>Includes the NR <strong>RRCReconfiguration</strong> message as specified in TS 38.331 [82]. In this version of the specification, the NR RRC message only includes fields <strong>secondaryCellGroup</strong> and/or <strong>measConfig</strong>. If <strong>nr-SecondaryCellGroupConfig</strong> is configured, the network always includes this field upon MN handover to initiate an NR SCG reconfiguration with sync and key change.</td>
</tr>
<tr>
<td><strong>perCC-GapIndicationRequest</strong></td>
<td>Indicates that UE shall include perCC-GapIndicationList and numFreqEffective in the RRCConnectionReconfigurationComplete message. numFreqEffectiveReduced may also be included if frequencies are configured for reduced measurement performance.</td>
</tr>
<tr>
<td><strong>p-MaxEUTRA</strong></td>
<td>Indicates the maximum power available for LTE.</td>
</tr>
</tbody>
</table>
**RRCConnectionReconfiguration field descriptions**

### p-MaxUE-FR1
The maximum total transmit power to be used by the UE across all serving cells in frequency range 1 (FR1) across all cell groups. The maximum transmit power that the UE may use may be additionally limited on cell- or cell-group level. The field is optionally present, if EN-DC (nr-Config-r15) has been configured. It is absent otherwise.

### p-MeNB
Indicates the guaranteed power for the MeNB, as specified in TS 36.213 [23]. The value N corresponds to N-1 in TS 36.213 [23].

### powerControlMode
Indicates the power control mode used in DC. Value 1 corresponds to DC power control mode 1 and value 2 indicates DC power control mode 2, as specified in TS 36.213 [23].

### p-SeNB
Indicates the guaranteed power for the SeNB as specified in TS 36.213 [23, Table 5.1.4.2-1]. The value N corresponds to N-1 in TS 36.213 [23].

### rclwi-Configuration
WLAN traffic steering command as specified in 5.6.16.2. E-UTRAN does not simultaneously configure RCLWI with DC, LA or LWIP for a UE.

### sCellConfigCommon
Indicates the common configuration for the SCell group.

### sCellGroupIndex
Indicates the identity of SCell groups for which a common configuration is provided.

### sCellIndex
In case of DC, the SCellIndex is unique within the scope of the UE i.e. an SCG cell can not use the same value as used for an MCG cell. For sCellToAddMod, if sCellIndex-r13 is present the UE shall ignore sCellIndex-r12.

### sCellGroupToAddModList, sCellGroupToAddModListSCG
Indicates the SCell group to be added or modified. E-UTRAN only configures at most 4 SCell groups per UE over all cell groups.

### sCellGroupToReleaseList
Indicates the SCell group to be released.

### sCellState
A one-shot field that indicates whether the SCell shall be considered to be in activated or dormant state upon SCell configuration.

### sCellToAddModList, sCellToAddModListExt
Indicates the SCell to be added or modified. Field sCellToAddModList is used to add the first 4 SCells for a UE with sCellIndex-r10 while sCellToAddModListExt is used to add the rest. If E-UTRAN includes sCellToAddModListExt-v1430 it includes the same number of entries, and listed in the same order, as in sCellToAddModListExt-r13. If E-UTRAN includes sCellToAddModList-v1370 it includes the same number of entries, and listed in the same order, as in sCellToAddModList-r10. If E-UTRAN includes sCellToAddModListExt-v1370 it includes the same number of entries, and listed in the same order, as in sCellToAddModListExt-r13.

### sCellToAddModListSCG, sCellToAddModListSCG-Ext
Indicates the SCG cell to be added or modified. The field is used for SCG cells other than the PSCell (which is added/modified by field pSCellToAddMod). Field sCellToAddModListSCG is used to add the first 4 SCells for a UE with sCellIndex-r10 while sCellToAddModListSCG-Ext is used to add the rest. If E-UTRAN includes sCellToAddModListSCG-v1010 it includes the same number of entries, and listed in the same order, as in sCellToAddModList-r13. If E-UTRAN includes sCellToAddModListSCG-Ext-v1370 it includes the same number of entries, and listed in the same order, as in sCellToAddModListSCG-Ext-r13.

### sCellToReleaseListSCG, sCellToReleaseListSCG-Ext
Indicates the SCG cell to be released. The field is also used to release the PSCell e.g. upon change of PSCell, upon system information change for the PSCell.

### scg-Counter
A counter used upon initial configuration of SCG security as well as upon refresh of S-K_{nab}. E-UTRAN includes the field upon SCG change when one or more SCG DRBs are configured. Otherwise E-UTRAN does not include the field.

### securityConfigHO
This field contains the parameters required to update the security keys at handover. If E-UTRAN includes the securityConfigHO (i.e., without suffix), the choice intraLTE is used for handover within LTE/EPC while the choice interRAT is used for handover from GERAN or UTRAN to LTE/EPC. If E-UTRAN includes the securityConfigHO-v1530 (i.e., with suffix), the choice intraNGC is used for handover from NR or LTE/5GC to LTE/5GC while the choice ngc-ToEPC is used for inter-system handover from NR or LTE/5GC to LTE/EPC and the choice epc-ToNGC is used for inter-system handover from LTE/EPC to LTE/5GC.

### sk-Counter
A one-shot counter used upon initial configuration of security for EN-DC as well as upon refresh of S-K_{nab}. E-UTRAN provides this field upon configuring EN-DC to facilitate configuration of SRB3.

### sl-V2X-ConfigDedicated
Indicates sidelink configuration for non-P2X related V2X sidelink communication as well as P2X related V2X sidelink communication.
### RRCConnectionReconfiguration field descriptions

**smtc**
The SSB periodicity/offset/duration configuration of target cell for NR PSCell addition and SN change. It is based on timing reference of EUTRAN PCell. If the field is absent, the UE uses the SMTC configured in the_measObjectNR having the same SSB frequency and subcarrier spacing.

**srs-SwitchFromServCellIndex**
Indicates the serving cell whose UL transmission may be interrupted during SRS transmission on a PUSCH-less cell. During SRS transmission on a PUSCH-less cell, the UE may temporarily suspend the UL transmission on a serving cell with PUSCH in the same CG to allow the PUSCH-less cell to transmit SRS. The PUSCH-less cell is always a TDD cell but the serving cell with PUSCH may be either a FDD or TDD cell.

**subframeAssignment**
Indicates DL/UL subframe configuration where sa0 points to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2-2].

**systemInformationBlockType1Dedicated**
This field is used to transfer SystemInformationBlockType1 or SystemInformationBlockType1-BR to the UE.

**systemInformationBlockType2Dedicated**
This field is used to transfer BR version of SystemInformationBlockType2 to BL UEs or UEs in CE or SystemInformationBlockType2 to non-BL UEs.

**t350**
Timer T350 as described in section 7.3. Value minN corresponds to N minutes.

**tdm-PatternConfig**
UL/DL reference configuration indicating the time during which a UE configured with EN-DC is allowed to transmit. This field is used when power control or IMD issues require single UL transmission as specified in TS38.101-3 [85] and TS 38.213 [86].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EARFCN-max</td>
<td>The field is mandatory present if dl-CarrierFreq-r10 is included and set to maxEARFCN. Otherwise the field is not present.</td>
</tr>
<tr>
<td>FDD-PCell</td>
<td>This field is optionally present, need ON, for a FDD PCell if there is no SCell with configured uplink. Otherwise, the field is not present.</td>
</tr>
<tr>
<td>fullConfig</td>
<td>This field is mandatory present for handover within E-UTRA when the fullConfig is included; otherwise it is optionally present, Need OP.</td>
</tr>
<tr>
<td>HO</td>
<td>The field is mandatory present in case of handover within E-UTRA or to E-UTRA; otherwise the field is not present.</td>
</tr>
<tr>
<td>HO-Reestab</td>
<td>The field is mandatory present in case of inter-system handover within E-UTRA or handover from NR to LTE/EPC; it is optionally present, need ON, in case of intra-system handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment; or for intra-system handover from NR to E-UTRA, otherwise the field is not present.</td>
</tr>
<tr>
<td>HO-5GC</td>
<td>The field is mandatory present in case of handover within LTE/5GC, handover to LTE/5GC, handover from NR to LTE/EPC, or handover from LTE/5GC to LTE/EPC, otherwise the field is not present.</td>
</tr>
<tr>
<td>HO-toEPC</td>
<td>The field is mandatory present in case of handover within LTE/EPC or to LTE/EPC, except handover from NR or LTE/5GC, otherwise the field is not present.</td>
</tr>
<tr>
<td>HO-toEUTRA</td>
<td>The field is mandatory present in case of handover to E-UTRA or for reconfigurations when fullConfig is included; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>nonFullConfig</td>
<td>The field is not present when the fullConfig is included or in case of handover to E-UTRA; otherwise it is optional present, need ON.</td>
</tr>
<tr>
<td>nonHO</td>
<td>The field is not present in case of handover within E-UTRA or to E-UTRA; otherwise it is optional present, need ON.</td>
</tr>
<tr>
<td>SCellAdd</td>
<td>The field is mandatory present upon SCell addition; otherwise it is not present.</td>
</tr>
<tr>
<td>SCellAdd2</td>
<td>The field is mandatory present upon SCell addition; otherwise it is optionally present, need ON.</td>
</tr>
</tbody>
</table>

**NOTE:** Fields sk-Counter and nr-RadioBearerConfig1/2 are placed outside nr-Config, as these may be configured while the UE is not configured with EN-DC.

### RRCConnectionReconfigurationComplete

The RRCConnectionReconfigurationComplete message is used to confirm the successful completion of an RRC connection reconfiguration.
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Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

**RRCConnectionReconfigurationComplete message**

```asn1
-- ASN1START
RRCConnectionReconfigurationComplete ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        rrcConnectionReconfigurationComplete-r8-
            RRCConnectionReconfigurationComplete-r8-IEs,
        criticalExtensionsFuture   SEQUENCE {
        }
    }
}

RRCConnectionReconfigurationComplete-r8-IEs ::= SEQUENCE {
    nonCriticalExtension   RRCConnectionReconfigurationComplete-v8a0-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension    OCTET STRING      OPTIONAL,
    nonCriticalExtension    RRCConnectionReconfigurationComplete-v1020-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v1020-IEs ::= SEQUENCE {
    rlf-InfoAvailable-r10    ENUMERATED {true}    OPTIONAL,
    logMeasAvailable-r10    ENUMERATED {true}    OPTIONAL,
    nonCriticalExtension   RRCConnectionReconfigurationComplete-v1130-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v1130-IEs ::= SEQUENCE {
    connEstFailInfoAvailable-r11  ENUMERATED {true}    OPTIONAL,
    nonCriticalExtension    RRCConnectionReconfigurationComplete-v1250-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v1250-IEs ::= SEQUENCE {
    logMeasAvailableMBSFN-r12   ENUMERATED {true}    OPTIONAL,
    nonCriticalExtension    RRCConnectionReconfigurationComplete-v1430-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v1430-IEs ::= SEQUENCE {
    perCC-GapIndicationList-r14   PerCC-GapIndicationList-r14  OPTIONAL,
    numFreqEffective-r14    INTEGER (1..12)     OPTIONAL,
    numFreqEffectiveReduced-r14   INTEGER (1..12)     OPTIONAL,
    nonCriticalExtension    RRCConnectionReconfigurationComplete-v1510-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v1510-IEs ::= SEQUENCE {
    scg-ConfigResponseNR-r15   OCTET STRING     OPTIONAL,
    nonCriticalExtension    RRCConnectionReconfigurationComplete-v1530-IEs OPTIONAL
}

RRCConnectionReconfigurationComplete-v1530-IEs ::= SEQUENCE {
    logMeasAvailableBT-r15    ENUMERATED {true}    OPTIONAL,
    logMeasAvailableWLAN-r15    ENUMERATED {true}    OPTIONAL,
    flightPathInfoAvailable-r15   ENUMERATED {true}    OPTIONAL,
    nonCriticalExtension    SEQUENCE {}      OPTIONAL
}

-- ASN1STOP
```
**numFreqEffective**
This field is used to indicate the number of effective frequencies that a UE measures in series according to TS 36.133 [16]. Simultaneous measurement in parallel on multiple frequencies can be equivalent to a single effective frequency. The frequencies configured for reduced measurement performance should not be included.

**numFreqEffectiveReduced**
This field is used to indicate the number of effective frequencies that a UE measures in series according to TS 36.133 [16] for frequencies configured for reduced measurement performance. Simultaneous measurement in parallel on multiple frequencies can be equivalent to a single effective frequency.

**perCC-GapIndicationList**
This field is used to indicate per CC measurement gap preference by the UE.

**scg-ConfigResponseNR**
Includes the NR RRCReconfigurationComplete message as defined in TS 38.331 [82].

---

**RRCConnectionReestablishment**

The **RRCConnectionReestablishment** message is used to re-establish SRB1.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: E-UTRAN to UE

**RRCConnectionReestablishment message**

```asn1
RRCConnectionReestablishment ::= SEQUENCE {
    rrc-TransactionIdentifier RRC-TransactionIdentifier,
    criticalExtensions CHOICE {
        c1 CHOICE {
            rrcConnectionReestablishment-r8 RRCConnectionReestablishment-r8-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture SEQUENCE {}
    }
}

RRCConnectionReestablishment-r8-IEs ::= SEQUENCE {
    radioResourceConfigDedicated RadioResourceConfigDedicated,
    nextHopChainingCount NextHopChainingCount,
    nonCriticalExtension RRCConnectionReestablishment-v8a0-IEs OPTIONAL
}

RRCConnectionReestablishment-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension SEQUENCE () OPTIONAL
}
```

---

**RRCConnectionReestablishmentComplete**

The **RRCConnectionReestablishmentComplete** message is used to confirm the successful completion of an RRC connection re-establishment.
Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

**RRCConnectionReestablishmentComplete message**

```
-- ASN1START

RRCConnectionReestablishmentComplete ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    rrcConnectionReestablishmentComplete-r8-IEs,
    criticalExtensionsFuture   SEQUENCE {} } }

RRCConnectionReestablishmentComplete-r8-IEs ::= SEQUENCE {
  nonCriticalExtension    RRCConnectionReestablishmentComplete-v920-IEs OPTIONAL }

RRCConnectionReestablishmentComplete-v920-IEs ::= SEQUENCE {
  rlf-InfoAvailable-r9    ENUMERATED {true} OPTIONAL, 
  nonCriticalExtension    RRCConnectionReestablishmentComplete-v8a0-IEs OPTIONAL }

RRCConnectionReestablishmentComplete-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL, 
  nonCriticalExtension    RRCConnectionReestablishmentComplete-v1020-IEs OPTIONAL }

RRCConnectionReestablishmentComplete-v1020-IEs ::= SEQUENCE {
  logMeasAvailable-r10    ENUMERATED {true} OPTIONAL, 
  nonCriticalExtension    RRCConnectionReestablishmentComplete-v1130-IEs OPTIONAL }

RRCConnectionReestablishmentComplete-v1130-IEs ::= SEQUENCE {
  connEstFailInfoAvailable-r11 ENUMERATED {true} OPTIONAL, 
  nonCriticalExtension    RRCConnectionReestablishmentComplete-v1250-IEs OPTIONAL }

RRCConnectionReestablishmentComplete-v1250-IEs ::= SEQUENCE {
  logMeasAvailableMBSFN-r12 ENUMERATED {true} OPTIONAL, 
  nonCriticalExtension    RRCConnectionReestablishmentComplete-v1530-IEs OPTIONAL }

RRCConnectionReestablishmentComplete-v1530-IEs ::= SEQUENCE {
  logMeasAvailableBT-r15    ENUMERATED {true} OPTIONAL, 
  logMeasAvailableWLAN-r15 ENUMERATED {true} OPTIONAL, 
  flightPathInfoAvailable-r15 ENUMERATED {true} OPTIONAL, 
  nonCriticalExtension    SEQUENCE {} OPTIONAL }

-- ASN1STOP
```

**RRCConnectionReestablishmentComplete field descriptions**

*rlf-InfoAvailable*
This field is used to indicate the availability of radio link failure or handover failure related measurements

---

**RRCConnectionReestablishmentReject**

The **RRCConnectionReestablishmentReject** message is used to indicate the rejection of an RRC connection re-establishment request.
**Signalling radio bearer: SRB0**

**RLC-SAP: TM**

**Logical channel: CCCH**

**Direction: E-UTRAN to UE**

---

**RRCConnectionReestablishmentReject message**

```asn1
RRCConnectionReestablishmentReject ::= SEQUENCE {
criticalExtensions     CHOICE {
  rrcConnectionReestablishmentReject-r8
    RRCConnectionReestablishmentReject-r8-IEs,
  criticalExtensionsFuture   SEQUENCE {} }
}
RRCConnectionReestablishmentReject-r8-IEs ::= SEQUENCE {
  nonCriticalExtension    RRCConnectionReestablishmentReject-v8a0-IEs OPTIONAL }
RRCConnectionReestablishmentReject-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL }

-- ASN1STOP
```

---

**RRCConnectionReestablishmentRequest**

The **RRCConnectionReestablishmentRequest** message is used to request the reestablishment of an RRC connection.

**Signalling radio bearer: SRB0**

**RLC-SAP: TM**

**Logical channel: CCCH**

**Direction: UE to E-UTRAN**

---

**RRCConnectionReestablishmentRequest message**

```asn1
RRCConnectionReestablishmentRequest ::= SEQUENCE {
criticalExtensions     CHOICE {
  rrcConnectionReestablishmentRequest-r8
    RRCConnectionReestablishmentRequest-r8-IEs,
  criticalExtensionsFuture   SEQUENCE {} }
}
RRCConnectionReestablishmentRequest-r8-IEs ::= SEQUENCE {
  ue-Identity       ReestabUE-Identity,
  reestablishmentCause    ReestablishmentCause,
  spare        BIT STRING (SIZE (2))
}
ReestabUE-Identity ::=    SEQUENCE {
c-RNTI        C-RNTI,
physCellId       PhysCellId,
shortMAC-I       ShortMAC-I }
ReestablishmentCause ::=   ENUMERATED {
reconfigurationFailure, handoverFailure, otherFailure, spare1}

-- ASN1STOP
```
**RRConnectionReestablishmentRequest field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>physCellId</td>
<td>The Physical Cell Identity of the PCell the UE was connected to prior to the failure.</td>
</tr>
<tr>
<td>reestablishmentCause</td>
<td>Indicates the failure cause that triggered the re-establishment procedure. eNB is not expected to reject a RRConnectionReestablishmentRequest due to unknown cause value being used by the UE.</td>
</tr>
<tr>
<td>ue-Identity</td>
<td>UE identity included to retrieve UE context and to facilitate contention resolution by lower layers.</td>
</tr>
</tbody>
</table>

---

**RRConnectionReject**

The RRConnectionReject message is used to reject the RRC connection establishment.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

**RRConnectionReject message**

--- ASN1START

```asn1
RRConnectionReject ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1     CHOICE {
      rrcConnectionReject-r8    RRCConnectionReject-r8-IEs,
    spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
RRConnectionReject-r8-IEs ::=  SEQUENCE {
  waitTime       INTEGER (1..16),
  nonCriticalExtension    RRCConnectionReject-v8a0-IEs  OPTIONAL
}
RRConnectionReject-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    RRCConnectionReject-v1020-IEs  OPTIONAL
}
RRConnectionReject-v1020-IEs ::= SEQUENCE {
  extendedWaitTime-r10    INTEGER (1..1800)     OPTIONAL, -- Need ON
  nonCriticalExtension    RRCConnectionReject-v1130-IEs  OPTIONAL
}
RRConnectionReject-v1130-IEs ::= SEQUENCE {
  rrc-SuspendIndication-r13    ENUMERATED {true}    OPTIONAL, -- Need ON
  nonCriticalExtension     SEQUENCE {}      OPTIONAL
}
-- ASN1STOP
```

---
### RRCConnectionReject field descriptions

**deprioritisationReg**
Indicates whether the current frequency or RAT is to be de-prioritised. The UE shall be able to store a deprioritisation request for up to 8 frequencies (applicable when receiving another frequency specific deprioritisation request before T325 expiry).

**deprioritisationTimer**
Indicates the period for which either the current carrier frequency or E-UTRA is deprioritised. Value $minN$ corresponds to $N$ minutes.

**extendedWaitTime**
Value in seconds for the wait time for Delay Tolerant access requests.

**rrc-SuspendIndication**
If present, this field indicates that the UE should remain suspended and not release its stored context.

**waitTime**
Wait time value in seconds.

---

### RRCConnectionRelease

The **RRCConnectionRelease** message is used to command the release of an RRC connection, or to complete an UP-EDT procedure.

*Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: E-UTRAN to UE*

#### RRCConnectionRelease message

```
-- ASN1START
RRCConnectionRelease ::=   SEQUENCE {  
   rrc-TransactionIdentifier   RRC-TransactionIdentifier,  
   criticalExtensions     CHOICE {  
      c1         CHOICE {  
         rrcConnectionRelease-r8    RRCConnectionRelease-r8-IEs,  
         spare3 NULL, spare2 NULL, spare1 NULL  
      },  
      criticalExtensionsFuture   SEQUENCE {}  
   }  
}  
RRCConnectionRelease-r8-IEs ::=  SEQUENCE {  
   releaseCause      ReleaseCause,  
   redirectedCarrierInfo   RedirectedCarrierInfo OPTIONAL, -- Need ON  
   idleModeMobilityControlInfo   IdleModeMobilityControlInfo OPTIONAL, -- Need OP  
   nonCriticalExtension    RRCConnectionRelease-v890-IEs OPTIONAL  
}  
RRCConnectionRelease-v890-IEs ::= SEQUENCE {  
   lateNonCriticalExtension   OCTET STRING (CONTAINING RRCConnectionRelease-v9e0-IEs) OPTIONAL,  
   nonCriticalExtension    RRCConnectionRelease-v920-IEs OPTIONAL  
}  
-- Late non critical extensions
RRCConnectionRelease-v9e0-IEs ::= SEQUENCE {  
   redirectedCarrierInfo-v9e0   RedirectedCarrierInfo-v9e0 OPTIONAL, -- Cond  
   NoRedirect-r8            IdleModeMobilityControlInfo-v9e0 OPTIONAL, -- Cond  
   nonCriticalExtension    SEQUENCE {} OPTIONAL  
}  
-- Regular non critical extensions
RRCConnectionRelease-v920-IEs ::= SEQUENCE {  
   cellInfoList-r9   CHOICE {  
      geran-r9   CellInfoListGERAN-r9,  
      utra-FDD-r9   CellInfoListUTRA-FDD-r9,  
      utra-TDD-r9   CellInfoListUTRA-TDD-r9,  
   }  
}  
-- ASN1END
```
cellInfoListUTRA-TDD-r10

RRCConnectionRelease-v1020-IEs ::= SEQUENCE {
  extendedWaitTime-r10 INTEGER (1..1800) OPTIONAL, -- Need ON
  nonCriticalExtension RRCConnectionRelease-v1120-IEs OPTIONAL
}

RRCConnectionRelease-v1320-IEs ::= SEQUENCE {
  resumeIdentity-r13 ResumeIdentity-r13 OPTIONAL, -- Need OR
  nonCriticalExtension RRCConnectionRelease-v1530-IEs OPTIONAL
}

RRCConnectionRelease-v1530-IEs ::= SEQUENCE {
  drb-ContinueROHC-r15 ENUMERATED {true} OPTIONAL, -- Cond UP-EDT
  nextHopChainingCount-r15 NextHopChainingCount OPTIONAL, -- Cond UP-EDT
  measIdleConfig-r15 MeasIdleConfigDedicated-r15 OPTIONAL, -- Need ON
  rrc-InactiveConfig-r15 RRC-InactiveConfig-r15 OPTIONAL, -- Need OR
  cn-Type-r15 ENUMERATED {epc,fivegc} OPTIONAL, -- Need OR
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

ReleaseCause ::= ENUMERATED {loadBalancingTAUrequired,
  other, cs-FallbackHighPriority-v1020, rrc-Suspend-v1320}

RedirectedCarrierInfo ::= CHOICE {
  eutra ARFCN-ValueEUTRA,
  geran CarrierFreqsGERAN,
  utra-FDD ARFCN-ValueUTRA,
  utra-TDD ARFCN-ValueUTRA,
  cdma2000-HRPD CarrierFreqCDMA2000,
  cdma2000-1xRTT CarrierFreqCDMA2000,
  ..., utra-TDD-r10 CarrierFreqListUTRA-TDD-r10,
  nr-r15 CarrierInfoNR-r15
}

RedirectedCarrierInfo-v9e0 ::= SEQUENCE {
  eutra-v9e0 ARFCN-ValueEUTRA-v9e0
}

RRC-InactiveConfig-r15 ::= SEQUENCE {
  full-I-RNTI-r15 I-RNTI-r15,
  short-I-RNTI-r15 ShortI-RNTI-r15,
  ran-PagingCycle-r15 ENUMERATED {rf32, rf64, rf128, rf256} OPTIONAL, -- Need OR
  ran-NotificationAreaInfo-r15 RAN-NotificationAreaInfo-r15 OPTIONAL, -- Need ON
  periodic-RNAU-timer-r15 ENUMERATED {min5, min10, min20, min30, min60,
    min120, min360, min720} OPTIONAL, -- Need OR
  nextHopChainingCount-r15 NextHopChainingCount OPTIONAL, -- Need ON
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

RAN-NotificationAreaInfo-r15 ::= CHOICE {
  cellList-r15 PLMN-RAN-AreaCellList-r15,
  areaConfigList-r15 PLMN-RAN-AreaConfigList-r15
}

PLMN-RAN-AreaCellList-r15 ::= SEQUENCE (SIZE (1..maxPLMN-r15)) OF PLMN-RAN-AreaCell-r15
-- Total number of cells from all PLMNs does not exceed 32

PLMN-RAN-AreaCell-r15 ::= SEQUENCE {
  plmn-Identity-r15 PLMN-Identity OPTIONAL,
  areaCells-r15 SEQUENCE (SIZE (1..32)) OF CellIdentity
}

PLMN-RAN-AreaConfigList-r15 ::= SEQUENCE (SIZE (1..maxPLMN-r15)) OF PLMN-RAN-AreaConfig-r15

PLMN-RAN-AreaConfig-r15 ::= SEQUENCE {
  plmn-Identity-r15 PLMN-Identity OPTIONAL,
  area-r15 SEQUENCE (SIZE (1..16)) OF RAN-AreaConfig-r15
}
-- Total number of TACs from all PLMNs does not exceed 16
-- Total number of RAN-AreaCodes from all PLMNs does not exceed 32
RAN-AreaConfig-r15 ::= SEQUENCE {
    trackingAreaCode-5GC-r15 TrackingAreaCode-5GC-r15,
    ran-AreaCodeList-r15  SEQUENCE (SIZE (1..32)) OF RAN-AreaCode-r15 OPTIONAL  -- Need OR
}

CarrierFreqListUTRA-TDD-r10 ::=  SEQUENCE (SIZE (1..maxFreqUTRA-TDD-r10)) OF ARFCN-ValueUTRA

IdleModeMobilityControlInfo ::=  SEQUENCE {
    freqPriorityListEUTRA FreqPriorityListEUTRA OPTIONAL,  -- Need ON
    freqPriorityListGERAN FreqPriorityListGERAN OPTIONAL,  -- Need ON
    freqPriorityListUTRA-FDD FreqPriorityListUTRA-FDD OPTIONAL,  -- Need ON
    freqPriorityListUTRA-TDD FreqPriorityListUTRA-TDD OPTIONAL,  -- Need ON
    bandClassPriorityListHRPD BandClassPriorityListHRPD OPTIONAL,  -- Need ON
    bandClassPriorityList1XRTT BandClassPriorityList1XRTT OPTIONAL,  -- Need ON
    t320 ENUMERATED {
        min5, min10, min20, min30, min60, min120, min180,
        spare1} OPTIONAL,  -- Need OR
    ...,
    [[ freqPriorityListExtEUTRA-r12 FreqPriorityListExtEUTRA-r12 OPTIONAL -- Need ON
    ],
    [[ freqPriorityListEUTRA-v1310 FreqPriorityListEUTRA-v1310 OPTIONAL,  -- Need ON
    freqPriorityListExtEUTRA-v1310 FreqPriorityListExtEUTRA-v1310 OPTIONAL  -- Need ON
    ],
    [[ freqPriorityListNR-r15 FreqPriorityListNR-r15 OPTIONAL -- Need ON
    ]]
}

IdleModeMobilityControlInfo-v9e0 ::=  SEQUENCE {
    freqPriorityListEUTRA-v9e0 SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA-v9e0
}

FreqPriorityListEUTRA ::=  SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA

FreqPriorityListEUTRA-v9e0 ::=  SEQUENCE {
    carrierFreq-v9e0 ARFCN-ValueEUTRA-v9e0 OPTIONAL -- Cond EARFCN-max
}

FreqPriorityEUTRA ::=  SEQUENCE {
    carrierFreq ARFCN-ValueEUTRA,
    cellReselectionPriority CellReselectionPriority
}

FreqPriorityListExtEUTRA-r12 ::=  SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA-r12

FreqPriorityListEUTRA-r12 ::=  SEQUENCE {
    carrierFreq-r12 ARFCN-ValueEUTRA-r9,
    cellReselectionPriority-r12 CellReselectionPriority
}

FreqPriorityListEUTRA-v1310 ::=  SEQUENCE {
    carrierFreq-r15 ARFCN-ValueNR-r15,
    cellReselectionPriority-r15 CellReselectionPriority,
    cellReselectionSubPriority-r13 CellReselectionSubPriority-r13 OPTIONAL  -- Need OR
}

FreqPriorityListNR-r15 ::=  SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityNR-r15

FreqPriorityNR-r15 ::=  SEQUENCE {
    carrierFreq-r15 ARFCN-ValueNR-r15,
    cellReselectionPriority-r15 CellReselectionPriority,
    cellReselectionSubPriority-r13 CellReselectionSubPriority-r13 OPTIONAL  -- Need OR
}

FreqPriorityListGERAN ::=  SEQUENCE (SIZE (1..maxGNFG)) OF FreqPriorityGERAN

FreqPriorityGERAN ::=  SEQUENCE {
    carrierFreq CarrierFreqGERAN,
    cellReselectionPriority CellReselectionPriority
}

FreqPriorityListUTRA-FDD ::=  SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF FreqPriorityUTRA-FDD
FreqPriorityUTRA-FDD ::= SEQUENCE {
    carrierFreq       ARFCN-ValueUTRA,
    cellReselectionPriority    CellReselectionPriority
}

FreqPriorityListUTRA-TDD ::= SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF FreqPriorityUTRA-TDD

FreqPriorityUTRA-TDD ::= SEQUENCE {
    carrierFreq       ARFCN-ValueUTRA,
    cellReselectionPriority    CellReselectionPriority
}

BandClassPriorityListHRPD ::=  SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassPriorityHRPD

BandClassPriorityHRPD ::=   SEQUENCE {
    bandClass       BandclassCDMA2000,
    cellReselectionPriority    CellReselectionPriority
}

BandClassPriorityList1XRTT ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassPriority1XRTT

BandClassPriority1XRTT ::=   SEQUENCE {
    bandClass       BandclassCDMA2000,
    cellReselectionPriority    CellReselectionPriority
}

CellInfoListGERAN-r9 ::=  SEQUENCE (SIZE (1..maxCellInfoGERAN-r9)) OF CellInfoGERAN-r9

CellInfoGERAN-r9 ::=   SEQUENCE {
    physCellId-r9      PhysCellIdGERAN,
    carrierFreq-r9      CarrierFreqGERAN,
    systemInformation-r9    SystemInfoListGERAN
}

CarrierInfoNR-r15 ::= SEQUENCE {
    carrierFreq-r15     ARFCN-ValueNR-r15,
    subcarrierSpacingSSB-r15   ENUMERATED {kHz15, kHz30, kHz120, kHz240},
    smtc-r15       MTC-SSB-NR-r15    OPTIONAL  -- Need OP
}

CellInfoListUTRA-FDD-r9 ::=  SEQUENCE (SIZE (1..maxCellInfoUTRA-r9)) OF CellInfoUTRA-FDD-r9

CellInfoUTRA-FDD-r9 ::=   SEQUENCE {
    physCellId-r9      PhysCellIdUTRA-FDD,
    utra-BCCH-Container-r9    OCTET STRING
}

CellInfoListUTRA-TDD-r9 ::=  SEQUENCE (SIZE (1..maxCellInfoUTRA-r9)) OF CellInfoUTRA-TDD-r9

CellInfoUTRA-TDD-r9 ::=   SEQUENCE {
    physCellId-r9      PhysCellIdUTRA-TDD,
    utra-BCCH-Container-r9    OCTET STRING
}

CellInfoListUTRA-TDD-r10 ::=  SEQUENCE (SIZE (1..maxCellInfoUTRA-r9)) OF CellInfoUTRA-TDD-r10

CellInfoUTRA-TDD-r10 ::=   SEQUENCE {
    physCellId-r10     PhysCellIdUTRA-TDD,
    carrierFreq-r10      ARFCN-ValueUTRA,
    utra-BCCH-Container-r10    OCTET STRING
}

-- ASN1STOP
**RRConnectionRelease field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>carrierFreq or bandClass</td>
<td>The carrier frequency (UTRA and E-UTRA) and band class (HRPD and 1xRTT) for which the associated cellReselectionPriority is applied.</td>
</tr>
<tr>
<td>carrierFreqs</td>
<td>The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.</td>
</tr>
<tr>
<td>cellInfoList</td>
<td>Used to provide system information of one or more cells on the redirected inter-RAT carrier frequency. The system information can be used if, upon redirection, the UE selects an inter-RAT cell indicated by the physCellId and carrierFreq (GERAN and UTRA TDD) or by the physCellId (other RATs). The choice shall match the redirectedCarrierInfo. In particular, E-UTRAN only applies value utra-TDD-r10 in case redirectedCarrierInfo is set to utra-TDD-r10.</td>
</tr>
<tr>
<td>cellList</td>
<td>Indicates a list of cells configured as RAN area. For each element, in the absence of plmn-Identity the UE considers the registered PLMN.</td>
</tr>
<tr>
<td>cn-Type</td>
<td>The cn-Type is used to indicate that the UE is redirected from 5GC to EPC or 5GC when redirectedCarrierInfo indicates E-UTRA frequency.</td>
</tr>
<tr>
<td>drb-ContinueROHC</td>
<td>This field indicates whether to continue or reset the header compression protocol context for the DRBs configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues when UE initiates UP-EDT in the same cell, while absence indicates that the header compression protocol context is reset.</td>
</tr>
<tr>
<td>extendedWaitTime</td>
<td>Value in seconds for the wait time for Delay Tolerant access requests.</td>
</tr>
<tr>
<td>freqPriorityListX</td>
<td>Provides a cell reselection priority for each frequency, by means of separate lists for each RAT (including E-UTRA). The UE shall be able to store at least 3 occurrences of FreqsPriorityGERAN. If E-UTRAN includes freqPriorityListEUTRA-v9e0 and/or freqPriorityListEUTRA-v1310 it includes the same number of entries, and listed in the same order, as in freqPriorityListEUTRA (i.e. without suffix). Field freqPriorityListExt includes additional neighbouring inter-frequencies, i.e. extending the size of the inter-frequency carrier list using the general principles specified in 5.1.2. EUTRAN only includes freqPriorityListExtEUTRA if freqPriorityListEUTRA (i.e without suffix) includes maxFreq entries. If E-UTRAN includes freqPriorityListExtEUTRA-v1310 it includes the same number of entries, and listed in the same order, as in freqPriorityListExtEUTRA-r12.</td>
</tr>
<tr>
<td>idleModeMobilityControlInfo</td>
<td>Provides dedicated cell reselection priorities. Used for cell reselection as specified in TS 36.304 [4]. For E-UTRA and UTRA frequencies, a UE that supports multi-band cells for the concerned RAT considers the dedicated priorities to be common for all overlapping bands (i.e. regardless of the ARFCN that is used).</td>
</tr>
<tr>
<td>measIdleConfig</td>
<td>Indicates measurement configuration to be used by the UE in RRC_IDLE.</td>
</tr>
<tr>
<td>periodic-RNAU-timer</td>
<td>Refers to the timer that triggers the periodic RNAU procedure in UE. Value min5 corresponds to 5 minutes, value min10 corresponds to 10 minutes and so on.</td>
</tr>
<tr>
<td>ran-Area</td>
<td>Indicates whether TA code(s) or RAN area code(s) are used for the RAN notification area. The network uses only TA code(s) or RAN area code(s) to configure a UE.</td>
</tr>
<tr>
<td>ranAreaConfigList</td>
<td>Indicates a list of RAN area codes or RA code(s) as RAN area. For each element, in the absence of plmn-Identity the UE considers the registered PLMN.</td>
</tr>
<tr>
<td>ran-pagingCycle</td>
<td>Refers to the UE specific cycle for RAN-initiated paging. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on.</td>
</tr>
<tr>
<td>redirectedCarrierInfo</td>
<td>The redirectedCarrierInfo indicates a carrier frequency (downlink for FDD) and is used to redirect the UE to an E-UTRA or an inter-RAT carrier frequency, by means of the cell selection upon leaving RRC_CONNECTED as specified in TS 36.304 [4]. The value geran can only be included after successful security activation when UE is connected to 5GC.</td>
</tr>
<tr>
<td>releaseCause</td>
<td>The releaseCause is used to indicate the reason for releasing the RRC Connection. The cause value cs-FallbackHighPriority is only applicable when redirectedCarrierInfo is present with the value set to utra-FDD, utra-TDD or utra-TDD-r10. E-UTRAN should not set the releaseCause to loadBalancingTAURequired or to cs-FallbackHighPriority if the extendedWaitTime is present. The network should not set the releaseCause to loadBalancingTAURequired if the UE is connected to 5GC.</td>
</tr>
<tr>
<td>smtc</td>
<td>The SSB periodicity/offset/duration configuration of the redirected target NR frequency. It is based on the timing reference of EUTRAN PCell. If the field is absent, the UE uses the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing.</td>
</tr>
</tbody>
</table>
The **RRCConnectionRequest** message is used to request the establishment of an RRC connection.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: UE to E-UTRAN

### RRCConnectionRequest message

```asn1
RRCConnectionRequest ::= SEQUENCE {
  criticalExtensions     CHOICE {
    rrcConnectionRequest-r8  RRCConnectionRequest-r8-IEs,
    criticalExtensionsFuture SEQUENCE {}   }
}

RRCConnectionRequest-r8-IEs ::= SEQUENCE {
  ue-Identity       InitialUE-Identity,
  establishmentCause EstablishmentCause,
  spare             BIT STRING (SIZE (1))
}

InitialUE-Identity ::= CHOICE {
  s-TMSI        S-TMSI,
  randomValue       BIT STRING (SIZE (40))
}

EstablishmentCause ::= ENUMERATED {
  emergency, highPriorityAccess, mt-Access, mo-Signalling, 
  mo-Data, delayTolerantAccess-v1020, mo-VoiceCall-v1280, 
  spare1}  
```
**RRCConnectionRequest field descriptions**

**establishmentCause**
Provides the establishment cause for the RRC connection request as provided by the upper layers. W.r.t. the cause value names: highPriorityAccess concerns AC11..AC15, 'mt' stands for 'Mobile Terminating' and 'mo' for 'Mobile Originating. eNB is not expected to reject a RRCConnectionRequest due to unknown cause value being used by the UE.

**randomValue**
Integer value in the range 0 to $2^{46} - 1$.

**ue-Identity**
UE identity included to facilitate contention resolution by lower layers. The s-TMSI is selected and set to the rightmost of 40 bits with the value received from upper layers if upper layers provide a 5G-S-TMSI.

---

**RRCConnectionResume**

The **RRCConnectionResume** message is used to resume the suspended RRC connection.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

**RRCConnectionResume message**

```
-- ASN1START

RRCConnectionResume-r13 ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      rrcConnectionResume-r13    RRCConnectionResume-r13-IEs,
      spare3        NULL,
      spare2        NULL,
      spare1        NULL
    },
    criticalExtensionsFuture   SEQUENCE {}  
  }
}

RRCConnectionResume-r13-IEs ::=  SEQUENCE {
  radioResourceConfigDedicated-r13  RadioResourceConfigDedicated OPTIONAL, -- Need ON
  nextHopChainingCount-r13    NextHopChainingCount,
  measConfig-r13       MeasConfig OPTIONAL, -- Need ON
  antennaInfoDedicatedPCell-r13   AntennaInfoDedicated-v10i0 OPTIONAL,  -- Need ON
  drb-ContinueROHC-r13     ENUMERATED {true} OPTIONAL, -- Need OP
  lateNonCriticalExtension    OCTET STRING OPTIONAL,
  rrcConnectionResume-v1430-IEs   RRCConnectionResume-v1430-IEs OPTIONAL
}

RRCConnectionResume-v1430-IEs ::= SEQUENCE {
  otherConfig-r14      OtherConfig-v9 OPTIONAL, -- Need ON
  rrcConnectionResume-v1510-IEs   RRCConnectionResume-v1510-IEs OPTIONAL
}

RRCConnectionResume-v1510-IEs ::= SEQUENCE {
  sk-Counter-r15      INTEGER (0.. 65535) OPTIONAL, -- Need ON
  nr-RadioBearerConfig1-r15   OCTET STRING OPTIONAL, -- Need ON
  nr-RadioBearerConfig2-r15   OCTET STRING OPTIONAL, -- Need ON
  nonCriticalExtension     RRCConnectionResume-v1530-IEs OPTIONAL
}

RRCConnectionResume-v1530-IEs ::= SEQUENCE {
  fullConfig-r15      ENUMERATED {true} OPTIONAL, -- Need ON
  nonCriticalExtension     SEQUENCE {} OPTIONAL
}

-- ASN1STOP
```
**RRCConnectionResume field descriptions**

**drb-ContinueROHC**
This field indicates whether to continue or reset the header compression protocol context for the DRBs configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues while absence indicates that the header compression protocol context is reset.

**fullConfig**
Indicates that the full configuration option is applicable for the RRCResume message.

**nr-RadioBearerConfig1**, **nr-RadioBearerConfig2**
Includes the NR RadioBearerConfig IE as specified in TS 38.331 [82]. The field includes the configuration of RBs configured with NR PDCP.

**sk-Counter**
A one-shot counter used upon initial configuration of security for EN-DC as well as upon refresh of S-KgNB. E-UTRAN provides this field upon establishment of first SN-terminated bearer using S-KgNB.

---

**RRCConnectionResumeComplete**

The RRCConnectionResumeComplete message is used to confirm the successful completion of an RRC connection resumption.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

**RRCConnectionResumeComplete message**

```asn1
RRCConnectionResumeComplete-r13 ::= SEQUENCE {
    rrc-TransactionIdentifier    RRC-TransactionIdentifier,
    criticalExtensions       CHOICE {
        rrcConnectionResumeComplete-r13    RRCConnectionResumeComplete-r13-IEs,
        criticalExtensionsFuture     SEQUENCE {}  
    }
}

RRCConnectionResumeComplete-r13-IEs ::= SEQUENCE {
    selectedPLMN-Identity-r13   INTEGER (1..maxPLMN-r11)    OPTIONAL,
    dedicatedInfoNAS-r13      DedicatedInfoNAS      OPTIONAL,
    rlf-InfoAvailable-r13     ENUMERATED {true}      OPTIONAL,
    logMeasAvailable-r13      ENUMERATED {true}      OPTIONAL,
    connEstFailInfoAvailable-r13 ENUMERATED {true}      OPTIONAL,
    mobilityState-r13       ENUMERATED {normal, medium, high, spare} OPTIONAL,
    mobilityHistoryAvail-r13 ENUMERATED {true}      OPTIONAL,
    logMeasAvailableMBSFN-r13 ENUMERATED {true}      OPTIONAL,
    lateNonCriticalExtension OCTET STRING     OPTIONAL,
    nonCriticalExtension    RRCConnectionResumeComplete-v1530-IEs OPTIONAL
}

RRCConnectionResumeComplete-v1530-IEs ::= SEQUENCE {
    logMeasAvailableET-r15     ENUMERATED {true}      OPTIONAL,
    logMeasAvailableWLAN-r15   ENUMERATED {true}      OPTIONAL,
    idleMeasAvailable-r15     ENUMERATED {true}      OPTIONAL,
    flightPathInfoAvailable-r15 ENUMERATED {true}      OPTIONAL,
    nonCriticalExtension    SEQUENCE {}      OPTIONAL
}
```

---
**RRCConnectionResumeComplete** field descriptions

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>idleMeasAvailable</td>
<td>Indication that the UE has idle mode measurement report available.</td>
</tr>
<tr>
<td>selectedPLMN-Identity</td>
<td>Index of the PLMN selected by the UE from the plmn-IdentityList fields included in SIB1. 1 if the 1st PLMN is selected from the 1st plmn-IdentityList included in SIB1, 2 if the 2nd PLMN is selected from the same plmn-IdentityList, or when no more PLMN are present within the same plmn-IdentityList, then the PLMN listed 1st in the subsequent plmn-IdentityList within the same SIB1 and so on. The selectedPLMN-Identity is referred to the PLMN list for 5GC if the UE is in RRC_INACTIVE state.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionResumeRequest**

The **RRCConnectionResumeRequest** message is used to request the resumption of a suspended RRC connection or to perform UP-EDT.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E-UTRAN

**RRCConnectionResumeRequest message**

```asn1
RRCConnectionResumeRequest-r13 ::= SEQUENCE {
criticalExtensions CHOICE {
  rrcConnectionResumeRequest-r13 RRCConnectionResumeRequest-r13-IEs,
  rrcConnectionResumeRequest-r15 RRCConnectionResumeRequest-5GC-r15-IEs
}
}
RRCConnectionResumeRequest-r13-IEs ::=  SEQUENCE {
  resumeIdentity-r13 CHOICE {
    resumeID-r13 ResumeIdentity-r13,
    truncatedResumeID-r13 BIT STRING (SIZE (24))
  },
  shortResumeMAC-I-r13 BIT STRING (SIZE (16)),
  resumeCause-r13 ResumeCause,
  spare BIT STRING (SIZE (1))
}
RRCConnectionResumeRequest-5GC-r15-IEs ::=  SEQUENCE {
  resumeIdentity-r15 CHOICE {
    fullI-RNTI-r15 I-RNTI-r15,
    shortI-RNTI-r15 ShortI-RNTI-r15
  },
  shortResumeMAC-I-r15 BIT STRING (SIZE (16)),
  resumeCause-r15 ResumeCause-r15,
  spare BIT STRING (SIZE (1))
}
ResumeCause ::= ENUMERATED {
  emergency, highPriorityAccess, mt-Access, mo-Signalling,
  mo-Data, delayTolerantAccess-v1020, mo-VoiceCall-v1280,
  spare1}
ResumeCause-r15 ::= ENUMERATED {
  emergency, highPriorityAccess, mt-Access, mo-Signalling,
  mo-Data, rna-Update, mo-VoiceCall, spare1
}
```
**RRCConnectionResumeRequest field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>resumeCause</td>
<td>Provides the resume cause for the RRC connection resume request as provided by the upper layers. The network is not expected to reject a RRCConnectionResumeRequest due to unknown cause value being used by the UE.</td>
</tr>
<tr>
<td>resumeIdentity</td>
<td>UE identity to facilitate UE context retrieval at eNB</td>
</tr>
<tr>
<td>shortResumeMAC-I</td>
<td>Authentication token to facilitate UE authentication at eNB</td>
</tr>
</tbody>
</table>

--

**RRCConnectionSetup**

The RRCConnectionSetup message is used to establish SRB1.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: E-UTRAN to UE

**RRCConnectionSetup message**

```asn1
RRCConnectionSetup ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
    c1 CHOICE {
    rrcConnectionSetup-r8 RRCConnectionSetup-r8-IEs,
    spare7 NULL,
    spare6 NULL, spare5 NULL, spare4 NULL,
    spare3 NULL, spare2 NULL, spare1 NULL
  },
  criticalExtensionsFuture SEQUENCE {}})
}
RRCConnectionSetup-r8-IEs ::= SEQUENCE {
  radioResourceConfigDedicated RadioResourceConfigDedicated,
  nonCriticalExtension RRCConnectionSetup-v8a0-IEs OPTIONAL
}
RRCConnectionSetup-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}
-- ASN1STOP
```

--

**RRCConnectionSetupComplete**

The RRCConnectionSetupComplete message is used to confirm the successful completion of an RRC connection establishment.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**RRCConnectionSetupComplete message**

```asn1
RRCConnectionSetupComplete ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
  ...
```

-- ASN1STOP


c1 CHOICE{
  rrcConnectionSetupComplete-r8  RRCConnectionSetupComplete-r8-IEs,
  spare3 NULL, spare2 NULL, spare1 NULL
},
criticalExtensionsFuture  SEQUENCE {} }
plmn-Identity PEML-Identity OPTIONAL,
mmegi BIT STRING (SIZE (16)),
mmec MMEC
}

RegisteredAMF-r15 ::= SEQUENCE {
  plmn-Identity-r15     PLMN-Identity OPTIONAL,
  amf-Identifier-r15     AMF-Identifier-r15
}

-- ASN1STOP

**RRCConnectionSetupComplete field descriptions**

**attachWithoutPDN-Connectivity**
This field is used to indicate that the UE performs an Attach without PDN connectivity procedure, as indicated by the upper layers and specified in TS 24.301 [35].

**cp-CIoT-EPS-Optimisation**
This field is included when the UE supports the Control plane CIoT EPS Optimisation, as indicated by the upper layers, see TS 24.301 [35].

**ce-ModeB**
Indicates whether the UE supports operation in CE mode B, as specified in TS 36.306 [5].

**connectTo5GC**
This field is included if the upper layers indicate the selected core network type as 5GC, see TS 24.501 [95]. If this field is present, the selectedPLMN-Identity refers to the PLMN list for 5GC.

**dcn-ID**
The Dedicated Core Network Identity, see TS 23.401 [41].

**gummei-Type**
This field is used to indicate whether the GUMMEI included is native (assigned by EPC) or mapped (from 2G/3G identifiers).

**idleMeasAvailable**
Indication that the UE has idle mode measurement report available.

**mobilityState**
This field indicates the UE mobility state (as defined in TS 36.304 [4, 5.2.4.3]) just prior to UE going into RRC_CONNECTED state. The UE indicates the value of medium and high when being in Medium-mobility and High-mobility states respectively. Otherwise the UE indicates the value normal.

**ng-5G-S-TMSI-Part2**
The leftmost 8 bits of 5G-S-TMSI.

**registeredMME**
This field is used to transfer the GUMMEI of the MME where the UE is registered, as provided by upper layers.

**rn-SubframeConfigReq**
If present, this field indicates that the connection establishment is for an RN and whether a subframe configuration is requested or not.

**selectedPLMN-Identity**
Index of the PLMN selected by the UE from the plmn-IdentityList fields included in SIB1. 1 if the 1st PLMN is selected from the 1st plmn-IdentityList included in SIB1, 2 if the 2nd PLMN is selected from the same plmn-IdentityList, or when no more PLMN are present within the same plmn-IdentityList, then the PLMN listed 1st in the subsequent plmn-IdentityList within the same SIB1 and so on.

**s-NSSAI-List**
This field is a list of S-NSSAI as indicated by the upper layers. The UE can report up to eight S-NSSAI per NSSAI, see TS 23.003 [27].

**ue-CE-NeedULGaps**
Indicates whether the UE needs uplink gaps during continuous uplink transmission in FDD as specified in TS 36.211 [21] and TS 36.306 [5].

**up-CIoT-EPS-Optimisation**
This field is included when the UE supports the User plane CIoT EPS Optimisation, as indicated by the upper layers, see TS 24.301 [35].

---

**RRCEarlyDataComplete**

The **RRCEarlyDataComplete** message is used to confirm the successful completion of the CP-EDT procedure.
Signalling radio bearer: SRB0
RLC-SAP: TM
Logical channel: CCCH
Direction: E-UTRAN to UE

**RRCEarlyDataComplete message**

```plaintext
RRCEarlyDataComplete-r15 ::= SEQUENCE {
  criticalExtensions     CHOICE {
    rrcEarlyDataComplete-r15 rrcEarlyDataComplete-r15-IEs,
    criticalExtensionsFuture SEQUENCE {},
  }
}
RRCEarlyDataComplete-r15-IEs ::= SEQUENCE {
  dedicatedInfoNAS-r15 DedicatedInfoNAS OPTIONAL, -- Need ON
  extendedWaitTime-r15 INTEGER (1..1800) OPTIONAL, -- Need ON
  idleModeMobilityControlInfo-r15 IdleModeMobilityControlInfo OPTIONAL, -- Need ON
  idleModeMobilityControlInfoExt-r15 IdleModeMobilityControlInfo-v9e0 OPTIONAL, -- Cond
  IdleInfoEUTRA RedirectedCarrierInfo-r15 RedcatedCarrierInfo-r15-IEs OPTIONAL, -- Need ON
  nonCriticalExtension SEQUENCE {} OPTIONAL
}
RedirectedCarrierInfo-r15-IEs ::= CHOICE {
  eutra-r15 ARFCN-ValueEUTRA-r9,
  geran-r15 CarrierFreqsGERAN,
  utra-FDD-r15 ARFCN-ValueUTRA,
  cdma2000-HRPD-r15 CarrierFreqCDMA2000,
  cdma2000-1xRTT-r15 CarrierFreqCDMA2000,
  utra-TDD-r15 CarrierFreqListUTRA-TDD-r10
}
```

---

**RRCEarlyDataComplete field descriptions**

**extendedWaitTime**
Value in seconds for the wait time for Delay Tolerant access requests.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IdleInfoEUTRA</td>
<td>The field is optionally present, Need ON, if the IdleModeMobilityControlInfo-r15 is included and includes freqPriorityListEUTRA; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**RRCEarlyDataRequest**

The **RRCEarlyDataRequest** message is used to initiate CP-EDT.

Signalling radio bearer: SRB0
RLC-SAP: TM
Logical channel: CCCH
Direction: UE to E-UTRAN

**RRCEarlyDataRequest message**

```plaintext
RRCEarlyDataRequest-r15 ::= SEQUENCE {
  criticalExtensions CHOICE {
    rrcEarlyDataRequest-r15 RRCrlEarlyDataRequest-r15-IEs,
    criticalExtensionsFuture SEQUENCE {},
  }
}
```
SCGFailureInformation

The SCGFailureInformation message is used to provide information regarding E-UTRA SCG failures detected by the UE.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

-- ASN1START

SCGFailureInformation-r12 ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1 CHOICE {
      scgFailureInformation-r12 SCGFailureInformation-r12-IEs,
    },
    criticalExtensionsFuture SEQUENCE {} OPTIONAL
  },
}

SCGFailureInformation-r12-IEs ::= SEQUENCE {
  failureReportSCG-r12 FailureReportSCG-r12 OPTIONAL,
  nonCriticalExtension SCGFailureInformation-v1310-IEs OPTIONAL
}

SCGFailureInformation-v1310-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING (CONTAINING SCGFailureInformation-v12d0-IEs) OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- Late non-critical extensions:

SCGFailureInformation-v12d0-IEs ::= SEQUENCE {
  failureReportSCG-v12d0 FailureReportSCG-v12d0 OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- Regular non-critical extensions:

FailureReportSCG-r12 ::= SEQUENCE {
  failureType-r12 ENUMERATED {t313-Expiry, randomAccessProblem, rlc-MaxNumRetx, scg-ChangeFailure },
  measResultServFreqList-r12 MeasResultServFreqList-r10 OPTIONAL,
  measResultNeighCells-r12 MeasResultList2EUTRA-r9 OPTIONAL,
  ...,
  [[ failureType-v1290 ENUMERATED {maxUL-TimingDiff-v1290} OPTIONAL ]],
  [[ measResultServFreqListExt-r13 MeasResultServFreqListExt-r13 OPTIONAL ]]
}

-- ASN1STOP

RRCEarlyDataRequest-r15-IEs ::= SEQUENCE {
  s-TMSI-r15 S-TMSI, 
  establishmentCause-r15 ENUMERATED { mo-Data-r15, delayTolerantAccess-r15},
  dedicatedInfoNAS-r15 DedicatedInfoNAS,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- ASN1STOP

**RRCEarlyDataRequest field descriptions**

**establishmentCause**

Provides the establishment cause for the RRC Early Data Request as provided by the upper layers. W.r.t. the cause value names: ‘mo’ stands for ‘Mobile Originating’. eNB is not expected to reject a RRCEarlyDataRequest due to unknown cause value being used by the UE.
SCGFailureInformationNR

The **SCGFailureInformationNR** message is used to provide information regarding NR SCG failures detected by the UE.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

### SCGFailureInformationNR field descriptions

<table>
<thead>
<tr>
<th><strong>measResultFreqListNR</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The field contains available results of measurements on NR frequencies the UE is configured to measure by <code>measConfig</code>.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>measResultSCG</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes the NR <code>MeasResultSCG-Failure</code> IE as specified in TS 38.331 [82]. The field contains available results of measurements on NR frequencies the UE is configured to measure by the NR RRCConfiguration message.</td>
</tr>
</tbody>
</table>

---

**SCPTMConfiguration**

The **SCPTMConfiguration** message contains the control information applicable for MBMS services transmitted via SC-MRB.
Signalling radio bearer: N/A
RLC-SAP: UM
Logical channel: SC-MCCH
Direction: E-UTRAN to UE

**SCPTMConfiguration message**

```asn1
-- ASN1START
SCPTMConfiguration-r13 ::= SEQUENCE {
  sc-mtch-InfoList-r13   SC-MTCH-InfoList-r13,
  scptm-NeighbourCellList-r13  SCPTM-NeighbourCellList-r13   OPTIONAL, -- Need OP
  lateNonCriticalExtension OCTET STRING      OPTIONAL,
  nonCriticalExtension   SCPTMConfiguration-v1340       OPTIONAL
}
SCPTMConfiguration-v1340 ::= SEQUENCE {
  p-b-r13        INTEGER (0..3)   OPTIONAL, -- Need ON
  nonCriticalExtension    SEQUENCE {}    OPTIONAL
}
-- ASN1STOP
```

**SCPTMConfiguration field descriptions**

- **sc-mtch-InfoList**
  Provides the configuration of each SC-MTCH in the current cell.

- **scptm-NeighbourCellList**
  List of neighbour cells providing MBMS services via SC-MRB. When absent, the UE shall assume that MBMS services listed in the **SCPTMConfiguration** message are not provided via SC-MRB in any neighbour cell.

- **p-b**
  Parameter: $P_B$ for the PDSCH scrambled by G-RNTI, see TS 36.213 [23, Table 5.2-1].

---

**SCPTMConfiguration-BR**

The **SCPTMConfiguration-BR** message contains the control information applicable for MBMS services transmitted via SC-MRB for BL UEs or UEs in CE.

Signalling radio bearer: N/A
RLC-SAP: UM
Logical channel: SC-MCCH
Direction: E-UTRAN to UE

```asn1
-- ASN1START
SCPTMConfiguration-BR-r14 ::= SEQUENCE {
  sc-mtch-InfoList-BR-r14   SC-MTCH-InfoList-BR-r14,
  scptm-NeighbourCellList-r14  SCPTM-NeighbourCellList-r13   OPTIONAL, -- Need OP
  p-b-r14       INTEGER (0..3)      OPTIONAL, -- Need OR
  lateNonCriticalExtension OCTET STRING      OPTIONAL,
  nonCriticalExtension   SEQUENCE {}       OPTIONAL
}
-- ASN1STOP
```
SCPTMConfiguration-BR field descriptions

- **p-b**
  Parameter: \( P_b \) for the PDSCH scrambled by G-RNTI, see TS 36.213 [23, Table 5.2-1].

- **sc-mtch-InfoList**
  Provides the configuration of each SC-MTCH in the current cell for BL UEs or UEs in CE.

- **scptm-NeighbourCellList**
  List of neighbour cells providing MBMS services via SC-MRB. When absent, the BL UE or UE in CE shall assume that MBMS services listed in the SCPTMConfiguration-BR message are not provided via SC-MRB in any neighbour cell.

---

**SecurityModeCommand**

The *SecurityModeCommand* message is used to command the activation of AS security.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

### SecurityModeCommand message

```asn1
SecurityModeCommand ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1   CHOICE{
      securityModeCommand-r8    SecurityModeCommand-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

SecurityModeCommand-r8-IEs ::= SEQUENCE {
  securityConfigSMC     SecurityConfigSMC,
  nonCriticalExtension    SecurityModeCommand-v8a0-IEs  OPTIONAL
}

SecurityModeCommand-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING  OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

SecurityConfigSMC ::=     SEQUENCE {
  securityAlgorithmConfig     SecurityAlgorithmConfig,
  ...
}
```

---

**SecurityModeComplete**

The *SecurityModeComplete* message is used to confirm the successful completion of a security mode command.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

### SecurityModeComplete message

```asn1
SecurityModeComplete ::=   SEQUENCE {
  ...}
```

---
SecurityModeFailure

The SecurityModeFailure message is used to indicate an unsuccessful completion of a security mode command.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

SidelinkUEInformation

The SidelinkUEInformation message is used for the indication of sidelink information to the eNB.

Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN
criticalExtensions CHOICE {
  c1 CHOICE {
    sidelinkUEInformation-r12 SidelinkUEInformation-r12-IEs,
    spare3 NULL, spare2 NULL, spare1 NULL
  },
  criticalExtensionsFuture SEQUENCE ()
}

SidelinkUEInformation-r12-IEs ::= SEQUENCE {
  commRxInterestedFreq-r12 ARFCN-ValueEUTRA-r9 OPTIONAL,
  commTxResourceReq-r12 SL-CommTxResourceReq-r12 OPTIONAL,
  discRxInterested-r12 ENUMERATED {true} OPTIONAL,
  discTxResourceReq-r12 INTEGER (1..63) OPTIONAL,
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SidelinkUEInformation-v1310-IEs OPTIONAL
}

SidelinkUEInformation-v1310-IEs ::= SEQUENCE {
  commTxResourceReqUC-r13 SL-CommTxResourceReq-r12 OPTIONAL,
  commTxResourceInfoReqRelay-r13 SEQUENCE {
    commTxResourceReqRelay-r13 SL-CommTxResourceReq-r12 OPTIONAL,
    commTxResourceReqRelayUC-r13 SL-CommTxResourceReq-r12 OPTIONAL,
    ue-Type-r13 ENUMERATED {relayUE, remoteUE} OPTIONAL,
  } OPTIONAL,
  discTxResourceReq-v1310 SEQUENCE {
    carrierFreqDiscTx-r13 INTEGER (1..maxFreq) OPTIONAL,
    discTxResourceReqAddFreq-r13 SL-DiscTxResourceReqPerFreqList-r13 OPTIONAL
  } OPTIONAL,
  discTxResourceReqPS-r13 SL-DiscTxResourceReq-r13 OPTIONAL,
  discRxGapReq-r13 SL-GapRequest-r13 OPTIONAL,
  discSysInfoReportFreqList-r13 SL-DiscSysInfoReportFreqList-r13 OPTIONAL,
  nonCriticalExtension SidelinkUEInformation-v1430-IEs OPTIONAL
}

SidelinkUEInformation-v1430-IEs ::= SEQUENCE {
  v2x-CommRxInterestedFreqList-r14 SL-V2X-CommFreqList-r14 OPTIONAL,
  p2x-CommTxType-r14 ENUMERATED {true} OPTIONAL,
  v2x-CommTxResourceReq-r14 SL-V2X-CommTxFreqList-r14 OPTIONAL,
  nonCriticalExtension SidelinkUEInformation-v1530-IEs OPTIONAL
}

SidelinkUEInformation-v1530-IEs ::= SEQUENCE {
  reliabilityInfoListSL-r15 SL-ReliabilityList-r15 OPTIONAL,
  nonCriticalExtension SEQUENCE () OPTIONAL
}

SL-CommTxResourceReq-r12 ::= SEQUENCE {
  carrierFreq-r12 ARFCN-ValueEUTRA-r9 OPTIONAL,
  destinationInfoList-r12 SL-DestinationInfoList-r12 OPTIONAL
}

SL-DiscTxResourceReqPerFreqList-r13 ::= SEQUENCE (SIZE (1..maxFreq)) OF SL-DiscTxResourceReq-r13

SL-DiscTxResourceReq-r13 ::= SEQUENCE {
  carrierFreqDiscTx-r13 INTEGER (1..maxFreq) OPTIONAL,
  discTxResourceReq-r13 INTEGER (1..63) OPTIONAL
}

SL-DestinationInfoList-r12 ::= SEQUENCE (SIZE (1..maxSL-Dest-r12)) OF SL-DestinationIdentity-r12

SL-DestinationIdentity-r12 ::= BIT STRING (SIZE (24))


SL-V2X-CommFreqList-r14 ::= SEQUENCE (SIZE (1..maxFreqV2X-r14)) OF INTEGER (0..maxFreqV2X-1-r14)

SL-V2X-CommTxFreqList-r14 ::= SEQUENCE (SIZE (1..maxFreqV2X-r14)) OF SL-V2X-CommTxResourceReq-r14

SL-V2X-CommTxResourceReq-r14 ::= SEQUENCE {
  carrierFreqCommTx-r14 INTEGER (0..maxFreqV2X-1-r14) OPTIONAL,
  v2x-TypeTxSync-r14 SL-TypeTxSync-r14 OPTIONAL,
  v2x-DestinationInfoList-r14 SL-DestinationInfoList-r12 OPTIONAL
}
**SidetlinkUEInformation field descriptions**

**carrierFreqCommTx**
Indicates the index of the frequency on which the UE is interested to transmit V2X sidetlink communication. The value 1 corresponds to the frequency of first entry in v2x-InterFreqInfoList broadcast in SIB21, the value 2 corresponds to the frequency of second entry in v2x-InterFreqInfoList broadcast in SIB21 and so on. The value 0 corresponds the PCell's frequency.

**carrierFreqDiscTx**
Indicates the frequency by the index of the entry in field discInterFreqList within SystemInformationBlockType19. Value 1 corresponds to the first entry in discInterFreqList within SystemInformationBlockType19, value 2 corresponds to the second entry in this list and so on.

**commRxInterestedFreq**
Indicates the frequency on which the UE is interested to receive sidetlink communication.

**commTxResourceReq**
Indicates the frequency on which the UE is interested to transmit non-relay related sidetlink communication as well as the one-to-many sidetlink communication transmission destination(s) for which the UE requests E-UTRAN to assign dedicated resources. NOTE 1.

**commTxResourceReqRelay**
Indicates the relay related one-to-many sidetlink communication transmission destination(s) for which the sidetlink relay UE requests E-UTRAN to assign dedicated resources.

**commTxResourceReqRelayUC**
Indicates the relay related one-to-one sidetlink communication transmission destination(s) for which the sidetlink relay UE or sidetlink remote UE requests E-UTRAN to assign dedicated resources i.e. either contains the unicast destination identity of the sidetlink relay UE or of the sidetlink remote UE.

**commTxResourceReqUC**
Indicates the frequency on which the UE is interested to transmit non-relay related one-to-one sidetlink communication as well as the sidetlink communication transmission destination(s) for which the UE requests E-UTRAN to assign dedicated resources. NOTE 1.

**destinationInfoList**
Indicates the destination(s) for relay or non-relay related one-to-one or one-to-many sidetlink communication. For one-to-one sidetlink communication the destination is identified by the ProSe UE ID for unicast communication, while for one-to-many the destination it is identified by the ProSe Layer-2 Group ID as specified in TS 23.303 [68].

**discRxInterest**
Indicates that the UE is interested to monitor sidetlink discovery announcements.

**discSysInfoReportFreqList**
Indicates, for one or more frequencies, a list of sidetlink discovery related parameters acquired from system Information of cells on configured inter-frequency carriers.

**discTxResourceReq**
Indicates the number of separate discovery message(s) the UE wants to transmit every discovery period. This field concerns the resources the UE requires every discovery period for transmitting sidetlink discovery announcement(s).

**discTxResourceReqAddFreq**
Indicates, for any frequencies in addition to the one covered by discTxResourceReq, the number of separate discovery message(s) the UE wants to transmit every discovery period. This field concerns the resources the UE requires every discovery period for transmitting sidetlink discovery announcement(s).

**discTxResourceReqPS**
Indicates the number of separate PS related discovery message(s) the UE wants to transmit every discovery period. This field concerns the resources the UE requires every discovery period for transmitting PS related sidetlink discovery announcement(s).

**p2x-CommTxType**
Indicates that the requested transmission resource pool is for P2X related V2X sidetlink communication.

**reliabilityInfoListSL**
Indicates the reliability(ies) (i.e., PPPRs [9]) associated with the reported traffic to be transmitted for V2X sidetlink communication.

**v2x-CommRxInterestedFreqList**
Indicates the index(ies) of the frequency(ies) on which the UE is interested to receive V2X sidetlink communication. The value 1 corresponds to the frequency of first entry in v2x-InterFreqInfoList broadcast in SIB21, the value 2 corresponds to the frequency of second entry in v2x-InterFreqInfoList broadcast in SIB21 and so on. The value 0 corresponds the PCell's frequency.

**v2x-DestinationInfoList**
Indicates the destination(s) for V2X sidetlink communication.

**v2x-TypeTxSync**
Indicates the synchronization reference used by the UE.
NOTE 1: When configuring `commTxResourceReq`, `commTxResourceReqUC`, `commTxResourceReqRelay` and `commTxResourceReqRelayUC`, E-UTRAN configures at most `maxSL-Dest-r12` destinations in total (i.e. as included in the four fields together).

---

**SystemInformation**

The `SystemInformation` message is used to convey one or more System Information Blocks or Positioning System Information Blocks. All the SIBs or posSIBs included are transmitted with the same periodicity. `SystemInformation-BR` and `SystemInformation-MBMS` use the same structure as `SystemInformation`.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channels: BCCH and BR-BCCH

Direction: E-UTRAN to UE

**SystemInformation message**

```asn1
-- ASN.1
SystemInformation-BR-r13 ::= SystemInformation
SystemInformation-MBMS-r14 ::= SystemInformation
SystemInformation ::= SEQUENCE {
  criticalExtensions CHOICE {
    systemInformation-r8 SystemInformation-r8-IEs,
    criticalExtensionsFuture-r15 CHOICE {
      posSystemInformation-r15 PosSystemInformation-r15-IEs,
      criticalExtensionsFuture SEQUENCE {}
    }
  }
}
SystemInformation-r8-IEs ::= SEQUENCE {
  sib-TypeAndInfo SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {
    sib2 SystemInformationBlockType2,
    sib3 SystemInformationBlockType3,
    sib4 SystemInformationBlockType4,
    sib5 SystemInformationBlockType5,
    sib6 SystemInformationBlockType6,
    sib7 SystemInformationBlockType7,
    sib8 SystemInformationBlockType8,
    sib9 SystemInformationBlockType9,
    sib10 SystemInformationBlockType10,
    sib11 SystemInformationBlockType11,
    ...
    sib12-v920 SystemInformationBlockType12-r9,
    sib13-v920 SystemInformationBlockType13-r9,
    sib14-v1130 SystemInformationBlockType14-r11,
    sib15-v1130 SystemInformationBlockType15-r11,
    sib16-v1130 SystemInformationBlockType16-r11,
    sib17-v1250 SystemInformationBlockType17-r12,
    sib18-v1250 SystemInformationBlockType18-r12,
    sib19-v1250 SystemInformationBlockType19-r12,
    sib20-v1310 SystemInformationBlockType20-r13,
    sib21-v1430 SystemInformationBlockType21-r14,
    sib24-v1530 SystemInformationBlockType24-r15,
    sib25-v1530 SystemInformationBlockType25-r15,
    sib26-v1530 SystemInformationBlockType26-r15
  },
  nonCriticalExtension SystemInformation-v8a0-IEs OPTIONAL
}
SystemInformation-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}
PosSystemInformation-r15-IEs ::= SEQUENCE {
  posSIB-TypeAndInfo-r15 SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {
    posSib1-1-r15 SystemInformationBlockPos-r15,
  }

```
### SystemInformationBlockType1

SystemInformationBlockType1 contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information. SystemInformationBlockType1-BR uses the same structure as SystemInformationBlockType1.

**Signalling radio bearer:** N/A  
**RLC-SAP:** TM  
**Logical channels:** BCCH and BR-BCCH  
**Direction:** E-UTRAN to UE

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---

```asn1
-- ASN1START
SystemInformationBlockType1-BR-r13 ::= SystemInformationBlockType1

SystemInformationBlockType1 ::= SEQUENCE {
  cellAccessRelatedInfo SEQUENCE {
    plmn-IdentityList     PLMN-IdentityList,
    trackingAreaCode     TrackingAreaCode,
    cellIdentity      CellIdentity,  
    cellBarred       ENUMERATED {barred, notBarred},
    intraFreqReselection ENUMERATED {allowed, notAllowed},
    csg-Indication      BOOLEAN,  
    csg-Identity      CSG-Identity   OPTIONAL -- Need OR
  },
  cellSelectionInfo SEQUENCE {
    q-RxLevMin       Q-RxLevMin,
    q-RxLevMinOffset     INTEGER (1..8)   OPTIONAL -- Need OP
  },
  p-Max        P-Max      OPTIONAL,   -- Need OP
  freqBandIndicator     FreqBandIndicator,  
  schedulingInfoList     SchedulingInfoList,  
  tdd-Config       TDD-Config     OPTIONAL, -- Cond TDD
  si-WindowLength      ENUMERATED {ms1, ms2, ms5, ms10, ms15, ms20,}
...}

lateNonCriticalExtension OCTET STRING OPTIONAL,  
nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- ASN1STOP
```

---

---
SystemInformationBlockType1-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING (CONTAINING SystemInformationBlockType1-v8h0-IEs) OPTIONAL,
  nonCriticalExtension SystemInformationBlockType1-v920-IEs OPTIONAL
}

-- Late non critical extensions
SystemInformationBlockType1-v8h0-IEs ::= SEQUENCE {
  multiBandInfoList MultiBandInfoList OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType1-v9e0-IEs OPTIONAL
}

SystemInformationBlockType1-v9e0-IEs ::= SEQUENCE {
  freqBandIndicator-v9e0 FreqBandIndicator-v9e0 OPTIONAL, -- Cond FBI-max
  multiBandInfoList-v9e0 MultiBandInfoList-v9e0 OPTIONAL, -- Cond mFBI-max
  nonCriticalExtension SystemInformationBlockType1-v10j0-IEs OPTIONAL
}

SystemInformationBlockType1-v10j0-IEs ::= SEQUENCE {
  freqBandInfo-r10 NS-PmaxList-r10 OPTIONAL, -- Need OR
  multiBandInfoList-v10j0 MultiBandInfoList-v10j0 OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType1-v10l0-IEs OPTIONAL
}

SystemInformationBlockType1-v10l0-IEs ::= SEQUENCE {
  freqBandInfo-v10l0 NS-PmaxList-v10l0 OPTIONAL, -- Need OR
  multiBandInfoList-v10l0 MultiBandInfoList-v10l0 OPTIONAL, -- Need OR
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- Regular non critical extensions
SystemInformationBlockType1-v920-IEs ::= SEQUENCE {
  ims-EmergencySupport-r9 ENUMERATED {true} OPTIONAL, -- Need OR
  cellSelectionInfo-v920 CellSelectionInfo-v920 OPTIONAL, -- Cond RSRQ
  nonCriticalExtension SystemInformationBlockType1-v1130-IEs OPTIONAL
}

SystemInformationBlockType1-v1130-IEs ::= SEQUENCE {
  tdd-Config-v1130 TDD-Config-v1130 OPTIONAL, -- Cond TDD-OR
  cellSelectionInfo-v1130 CellSelectionInfo-v1130 OPTIONAL, -- Cond WB-RSRP
  nonCriticalExtension SystemInformationBlockType1-v1250-IEs OPTIONAL
}

SystemInformationBlockType1-v1250-IEs ::= SEQUENCE {
  category0Allowed-r12 ENUMERATED {true} OPTIONAL, -- Need OP
  cellSelectionInfo-v1250 CellSelectionInfo-v1250 OPTIONAL, -- Cond RSRQ2
  freqBandIndicatorPriority-r12 ENUMERATED {true} OPTIONAL, -- Cond mFBI
  nonCriticalExtension SystemInformationBlockType1-v1310-IEs OPTIONAL
}

SystemInformationBlockType1-v1310-IEs ::= SEQUENCE {
  hyperSFN-r13 BIT STRING (SIZE (10)) OPTIONAL, -- Need OR
  edRX-Allowed-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  cellSelectionInfoCE-r13 CellSelectionInfoCE-r13 OPTIONAL, -- Need OP
  bandwidthReducedAccessRelatedInfo-r13 BandwidthReducedAccessRelatedInfo-r13 OPTIONAL
}

bandwidthReducedAccessRelatedInfo-r13 ::= SEQUENCE {
  si-WindowLength-BR-r13 ENUMERATED {
    ms20, ms40, ms60, ms80, ms120,
    ms160, ms200, spare},
  si-RepetitionPattern-r13 ENUMERATED {everyRF, every2ndRF, every4thRF,
    every8thRF},
  schedulingInfoList-BR-r13 SchedulingInfoList-BR-r13 OPTIONAL, -- Cond SI-BR
  fdd-DownlinkOrTddSubframeBitmapBR-r13 CHOICE {
    subframePattern10-r13 BIT STRING (SIZE (10)),
    subframePattern40-r13 BIT STRING (SIZE (40))},
  fdd-UplinkSubframeBitmapBR-r13 BIT STRING (SIZE (10)) OPTIONAL, -- Need OP
  startSymbolBR-r13 INTEGER (1..4),
  si-HoppingConfigCommon-r13 ENUMERATED {on,off},
  si-ValidityTime-r13 ENUMERATED {true} OPTIONAL, -- Need OP
systemInfoValueTagList-r13 SystemInfoValueTagList-r13 OPTIONAL -- Need OR
}  
nonCriticalExtension SystemInformationBlockType1-v1320-IEs OPTIONAL
}

SystemInformationBlockType1-v1320-IEs ::= SEQUENCE {
  freqHoppingParametersDL-r13  SEQUENCE {
    mpdcch-pdsch-HoppingNB-r13 ENUMERATED {nb2, nb4} OPTIONAL, -- Need OR
    interval-DLHoppingConfigCommonModeA-r13 CHOICE {
      interval-FDD-r13 ENUMERATED {int1, int2, int4, int8},
      interval-TDD-r13 ENUMERATED {int1, int5, int10, int20}
    } OPTIONAL, -- Need OR
    interval-DLHoppingConfigCommonModeB-r13 CHOICE {
      interval-FDD-r13 ENUMERATED {int2, int4, int8, int16},
      interval-TDD-r13 ENUMERATED {int5, int10, int20, int40}
    } OPTIONAL, -- Need OR
    mpdcch-pdsch-HoppingOffset-r13  INTEGER (1..maxAvailNarrowBands-r13) OPTIONAL -- Need OR
  } OPTIONAL, -- Cond Hopping
  nonCriticalExtension SystemInformationBlockType1-v1350-IEs OPTIONAL
}

SystemInformationBlockType1-v1350-IEs ::= SEQUENCE {
  cellSelectionInfoCE1-r13 CellSelectionInfoCE1-r13 OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType1-v1360-IEs OPTIONAL
}

SystemInformationBlockType1-v1360-IEs ::= SEQUENCE {
  cellSelectionInfoCE1-v1360 CellSelectionInfoCE1-v1360 OPTIONAL, -- Cond
  QrxlevminCE1 nonCriticalExtension SystemInformationBlockType1-v1430-IEs OPTIONAL
}

SystemInformationBlockType1-v1430-IEs ::= SEQUENCE {
  eCallOverIMS-Support-r14 ENUMERATED {true} OPTIONAL, -- Need OR
  tdd-Config-v1430 TDD-Config-v1430 OPTIONAL, -- Cond TDD-OR
  cellAccessRelatedInfoList-r14 SEQUENCE (SIZE (1..maxPLMN-r14)) OF CellAccessRelatedInfo-r14 OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType1-v1450-IEs OPTIONAL
}

SystemInformationBlockType1-v1450-IEs ::= SEQUENCE {
  tdd-Config-v1450 TDD-Config-v1450 OPTIONAL, -- Cond TDD-OR
  nonCriticalExtension SystemInformationBlockType1-v1530-IEs OPTIONAL
}

SystemInformationBlockType1-v1530-IEs ::= SEQUENCE {
  hsdn-Cell-r15 ENUMERATED {true} OPTIONAL, -- Need OR
  cellSelectionInfoCE-v1530 CellSelectionInfoCE-v1530 OPTIONAL, -- Need OR
  crs-IntfMitigConfig-r15 CHOICE {
    crs-IntfMitigEnabled-15 NULL,
    crs-IntfMitigNumPRBs-r15 ENUMERATED {n6, n24}
  } OPTIONAL, -- Need OR
  cellBarred-CRS-r15 ENUMERATED {barred, notBarred},
  plmn-IdentityList-v1530 PLMN-IdentityList-v1530 OPTIONAL, -- Need OR
  posSchedulingInfoList-r15 PosSchedulingInfoList-r15 OPTIONAL, -- Need OR
  cellAccessRelatedInfo-5GC-r15 SEQUENCE {
    cellBarred-5GC-r15 ENUMERATED {barred, notBarred},
    cellBarred-5GC-CRS-r15 ENUMERATED {barred, notBarred},
    cellAccessRelatedInfoList-5GC-r15SEQUENCE (SIZE (1..maxPLMN-r11)) OF CellAccessRelatedInfo-5GC-r15
  } OPTIONAL, -- Need OR
  ims-EmergencySupport5GC-r15 ENUMERATED {true} OPTIONAL, -- Need OR
  eCallOverIMS-Support5GC-r15 ENUMERATED {true} OPTIONAL, -- Need OR
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

PLMN-IdentityList ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::= SEQUENCE {
  plmn-Identity PLMN-Identity,
  cellReservedForOperatorUse ENUMERATED {reserved, notReserved}
}
PLMN-IdentityList-v1530 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo-v1530

PLMN-IdentityInfo-v1530 ::= SEQUENCE {
    cellReservedForOperatorUse-CRS-r15 ENUMERATED {reserved, notReserved}
}

PLMN-IdentityList-r15 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo-r15

PLMN-IdentityInfo-r15 ::= SEQUENCE {
    plmn-Identity-5GC-r15 PLMN-Identity,
    plmn-Index-r15 INTEGER (1..maxPLMN-r11),
    cellReservedForOperatorUse-r15 ENUMERATED {reserved, notReserved},
    cellReservedForOperatorUse-CRS-r15 ENUMERATED {reserved, notReserved}
}

SchedulingInfoList ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SchedulingInfo

SchedulingInfo ::= SEQUENCE {
    si-Periodicity ENUMERATED {rf8, rf16, rf32, rf64, rf128, rf256, rf512},
    sib-MappingInfo SIB-MappingInfo
}

SchedulingInfoList-BR-r13 ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SchedulingInfo-BR-r13

SchedulingInfo-BR-r13 ::= SEQUENCE {
    si-Narrowband-r13 INTEGER (1..maxAvailNarrowBands-r13),
    si-TBS-r13 ENUMERATED {b152, b208, b256, b328, b408, b504, b600, b712, b808, b936}
}

SIB-MappingInfo ::= SEQUENCE (SIZE (0..maxSIB-1)) OF SIB-Type

SIB-Type ::= ENUMERATED {
    sibType3, sibType4, sibType5, sibType6,
    sibType7, sibType8, sibType9, sibType10,
    sibType11, sibType12-v920, sibType13-v920,
    sibType14-v1130, sibType15-v1130,
    sibType16-v1130, sibType17-v1250, sibType18-v1250,
    ..., sibType19-v1250, sibType20-v1310, sibType21-v1430,
    sibType22-v1530, sibType23-v1530, sibType24-v1530}

SystemInfoValueTagList-r13 ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SystemInfoValueTagSI-r13

SystemInfoValueTagSI-r13 ::= INTEGER (0..3)

CellSelectionInfo-v920 ::= SEQUENCE {
    q-QualMin-r9 Q-QualMin-r9,
    q-QualMinOffset-r9 INTEGER (1..8) OPTIONAL -- Need OP
}

CellSelectionInfo-v1130 ::= SEQUENCE {
    q-QualMin-r11 Q-QualMin-r9
}

CellSelectionInfo-v1250 ::= SEQUENCE {
    q-QualMinRSRQ-OnAllSymbols-r12 Q-QualMin-r9
}

CellAccessRelatedInfo-r14 ::= SEQUENCE {
    plmn-IdentityList-r14 PLMN-IdentityList, TrackingAreaCode, CellIdentity
}

CellAccessRelatedInfo-5GC-r15 ::= SEQUENCE {
    plmn-IdentityList-r15 PLMN-IdentityList-r15,
    ran-AreaCode-r15 RAN-AreaCode-r15 OPTIONAL, -- Need OR
    trackingAreaCode-5GC-r15 TrackingAreaCode-5GC-r15,
    cellIdentity-5GC-r15 CellIdentity-5GC-r15
}

CellIdentity-5GC-r15 ::= CHOICE{
    cellIdentity-r15 CellIdentity,
    cellId-Index-r15 INTEGER (1..maxPLMN-r11)
PosSchedulingInfoList-r15 ::= SEQUENCE (SIZE (1..maxSI-Message)) OF PosSchedulingInfo-r15

PosSchedulingInfo-r15 ::= SEQUENCE {
  posSI-Periodicity-r15  ENUMERATED {rf8, rf16, rf32, rf64, rf128, rf256, rf512},
  posSIB-MappingInfo-r15  PosSIB-MappingInfo-r15
}

PosSIB-MappingInfo-r15 ::= SEQUENCE (SIZE (1..maxSIB)) OF PosSIB-Type-r15

PosSIB-Type-r15 ::= SEQUENCE {
  encrypted-r15  ENUMERATED { true }        OPTIONAL, -- Need OP
  gnss-id-r15   GNSS-ID-r15          OPTIONAL, -- Need OP
  sbas-id-r15   SBAS-ID-r15          OPTIONAL, -- Need OP
  posSibType-r15 ENUMERATED {  posSibType1-1,  
                               posSibType1-2, 
                               posSibType1-3, 
                               posSibType1-4, 
                               posSibType1-5, 
                               posSibType1-6, 
                               posSibType1-7, 
                               posSibType2-1, 
                               posSibType2-2, 
                               posSibType2-3, 
                               posSibType2-4, 
                               posSibType2-5, 
                               posSibType2-6, 
                               posSibType2-7, 
                               posSibType2-8, 
                               posSibType2-9, 
                               posSibType2-10, 
                               posSibType2-11, 
                               posSibType2-12, 
                               posSibType2-13, 
                               posSibType2-14, 
                               posSibType2-15, 
                               posSibType2-16, 
                               posSibType2-17, 
                               posSibType2-18, 
                               posSibType2-19, 
                               posSibType3-1, 
                               ... }
}

-- ASN1STOP
**SystemInformationBlockType1 field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bandwithReducedAccessRelatedInfo</strong></td>
<td>Access related information for BL UEs and UEs in CE. NOTE 3.</td>
</tr>
<tr>
<td><strong>category0Allowed</strong></td>
<td>The presence of this field indicates category 0 UEs are allowed to access the cell.</td>
</tr>
<tr>
<td><strong>cellAccessRelatedInfoList</strong></td>
<td>This field contains a list allowing signalling of access related information per PLMN. One PLMN can be included in only one entry of this list. NOTE 4.</td>
</tr>
<tr>
<td><strong>cellAccessRelatedInfoList-5GC</strong></td>
<td>This field contains a PLMN list and a list allowing signalling of access related information per PLMN for PLMNs that provides connectivity to 5GC. One PLMN can be included in only one entry of this list. NOTE 4.</td>
</tr>
<tr>
<td><strong>cellBarred, cellBarred-CRS</strong></td>
<td>barred means the cell is barred, as defined in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>cellBarred-5GC, cellBarred-5GC-CRS</strong></td>
<td>barred means the cell is barred for connectivity to 5GC, as defined in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>cellIdentity</strong></td>
<td>Indicates the cell identity. NOTE 2.</td>
</tr>
<tr>
<td><strong>cellId-index</strong></td>
<td>the index of the cell ID in the PLMN lists for EPC, indicates UE the corresponding cell ID is used for 5GC. Value 1 indicates the cell ID of the 1st PLMN list for EPC in the SIB1. Value 2 indicates the cell ID of the 2nd PLMN list for EPC, and so on.</td>
</tr>
<tr>
<td><strong>cellReservedForOperatorUse, cellReservedForOperatorUse-CRS</strong></td>
<td>As defined in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>cellSelectionInfoCE</strong></td>
<td>Cell selection information for BL UEs and UEs in CE. If absent, coverage enhancement S criteria is not applicable. NOTE 3.</td>
</tr>
<tr>
<td><strong>cellSelectionInfoCE1</strong></td>
<td>Cell selection information for BL UEs and UEs in CE supporting CE Mode B. E-UTRAN includes this IE only if cellSelectionInfoCE is present in SystemInformationBlockType1-BR. NOTE 3.</td>
</tr>
<tr>
<td><strong>crs-IntfMitigConf</strong></td>
<td>For BL UEs or UEs in CE supporting ce-CRS-IntfMitig, presence of crs-IntfMitigNumPRBs indicates CRS interference mitigation is enabled in the cell, as specified in TS 36.133 [16], subclauses 3.6.1.1, 3.6.1.2 and 3.6.1.3, and the value of crs-IntfMitigNumPRBs indicates number of PRBs, i.e. 6 or 24 PRBs, for CRS transmission in the central cell BW when CRS interference mitigation is enabled. For UEs not supporting this feature, the behaviour is undefined if this field is configured and the field cellBarred is set to notbarred.</td>
</tr>
<tr>
<td><strong>csg-Identity</strong></td>
<td>Identity of the Closed Subscriber Group the cell belongs to.</td>
</tr>
<tr>
<td><strong>csg-Indication</strong></td>
<td>If set to TRUE the UE is only allowed to access the cell if it is a CSG member cell, if selected during manual CSG selection or to obtain limited service, see TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>eCallOverIMS-Support</strong></td>
<td>Indicates whether the cell supports eCall over IMS services via EPC for UEs as defined in TS 23.401 [41]. If absent, eCall over IMS via EPC is not supported by the network in the cell. NOTE 2.</td>
</tr>
<tr>
<td><strong>eCallOverIMS-Support5GC</strong></td>
<td>Indicates whether the cell supports eCall over IMS services via 5GC as defined in TS 23.401 [41]. If absent, eCall over IMS via 5GC is not supported by the network in the cell. NOTE 2.</td>
</tr>
<tr>
<td><strong>eDRX-Allowed</strong></td>
<td>The presence of this field indicates if idle mode extended DRX is allowed in the cell. The UE shall stop using extended DRX in idle mode if eDRX-Allowed is not present.</td>
</tr>
<tr>
<td><strong>encrypted</strong></td>
<td>The presence of this field indicates that the posSibType is encrypted as specified in TS 36.355 [54].</td>
</tr>
<tr>
<td><strong>fdd-DownlinkOrTddSubframeBitmapBR</strong></td>
<td>The set of valid subframes for FDD downlink or TDD transmissions, see TS 36.213 [23]. If this field is present, SystemInformationBlockType1-BR-r13 is transmitted in RRCConnectionReconfiguration, and if RRCConnectionReconfiguration does not include systemInformationBlockType2Dedicated, UE may assume the valid subframes in fdd-DownlinkOrTddSubframeBitmapBR are not indicated as MBSFN subframes. If this field is not present, the set of valid subframes is the set of non-MBSFN subframes as indicated by mbsfn-SubframeConfigList. If neither this field nor mbsfn-SubframeConfigList is present, all subframes are considered as valid subframes for FDD downlink transmission, all DL subframes according to the uplink-downlink configuration (see TS 36.211 [21]) are considered as valid subframes for TDD DL transmission, and all UL subframes according to the uplink-downlink configuration (see TS 36.211 [21]) are considered as valid subframes for TDD UL transmission. The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod x = 0, where x is the size of the bit string divided by 10. Value 0 in the bitmap indicates that the corresponding subframe is invalid for transmission. Value 1 in the bitmap indicates that the corresponding subframe is valid for transmission.</td>
</tr>
</tbody>
</table>
**SystemInformationBlockType1 field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fdd-UplinkSubframeBitmapBR</td>
<td>The set of valid subframes for FDD uplink transmissions for BL UEs, see TS 36.213 [23].</td>
</tr>
<tr>
<td>freqBandIndicatorPriority</td>
<td>If the field is not present, then UE considers all uplink subframes as valid subframes for FDD uplink transmissions. The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod x = 0, where x is the size of the bit string divided by 10. Value 0 in the bitmap indicates that the corresponding subframe is invalid for transmission. Value 1 in the bitmap indicates that the corresponding subframe is valid for transmission.</td>
</tr>
<tr>
<td>freqBandInfo</td>
<td>A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, for the frequency band in freqBandIndicator. If E-UTRAN includes freqBandInfo-v10l0 it includes the same number of entries, and listed in the same order, as in freqBandInfo-v10.</td>
</tr>
<tr>
<td>freqHoppingParametersDL</td>
<td>Downlink frequency hopping parameters for BR versions of SI messages, MPDCCH/PDSCH of paging, MPDCCH/PDSCH of RAR/Msg4 and unicast MPDCCH/PDSCH. If not present, the UE is not configured downlink frequency hopping.</td>
</tr>
<tr>
<td>gnss-ID</td>
<td>The presence of this field indicates that the posSibType is for a specific GNSS.</td>
</tr>
<tr>
<td>hsdn-Cell</td>
<td>This field indicates this is a HSDN cell as specified in TS 36.304 [4].</td>
</tr>
<tr>
<td>hyperSFN</td>
<td>Indicates hyper SFN which increments by one when the SFN wraps around.</td>
</tr>
<tr>
<td>ims-EmergencySupport</td>
<td>Indicates whether the cell supports IMS emergency bearer services via EPC for UEs in limited service mode. If absent, IMS emergency call via EPC is not supported by the network in the cell for UEs in limited service mode. NOTE 2.</td>
</tr>
<tr>
<td>ims-EmergencySupport5GC</td>
<td>Indicates whether the cell supports IMS emergency bearer services for UEs in limited service mode via 5GC. If absent, IMS emergency call via 5GC is not supported by the network in the cell for UEs in limited service mode. NOTE 2.</td>
</tr>
<tr>
<td>intraFreqReselection</td>
<td>Used to control cell reselection to intra-frequency cells when the highest ranked cell is barred, or treated as barred by the UE, as specified in TS 36.304 [4]. NOTE 2.</td>
</tr>
<tr>
<td>multiBandInfoList</td>
<td>A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 5.5-1] that the cell belongs to. If the UE supports the frequency band in the freqBandIndicator field it shall apply that frequency band. Otherwise, the UE shall apply the first listed band which it supports in the multiBandInfoList field. If E-UTRAN includes multiBandInfoList-v9e0 it includes the same number of entries, and listed in the same order, as in multiBandInfoList (i.e. without suffix). See Annex D for more descriptions. The UE shall ignore the rule defined in this field description if freqBandIndicatorPriority is present and supported by the UE.</td>
</tr>
<tr>
<td>multiBandInfoList-v10j0</td>
<td>A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, for the frequency bands in multiBandInfoList (i.e. without suffix) and multiBandInfoList-v9e0. If E-UTRAN includes multiBandInfoList-v10j0, it includes the same number of entries, and listed in the same order, as in multiBandInfoList (i.e. without suffix). If E-UTRAN includes multiBandInfoList-v10l0 it includes the same number of entries, and listed in the same order, as in multiBandInfoList-v10j0.</td>
</tr>
<tr>
<td>plmn-IdentityList</td>
<td>List of PLMN identities. The first listed PLMN-Identity is the primary PLMN. If plmn-IdentityList-v1530 is included, E-UTRAN includes the same number of entries, and listed in the same order, as in plmn-IdentityList (without suffix). NOTE 2.</td>
</tr>
<tr>
<td>plmn-index</td>
<td>Index of the PLMN in the plmn-IdentityList fields included in SIB1for EPC, indicating the same PLMN ID is connected to 5GC too. If the 1st PLMN is from the 1st plmn-IdentityList included in SIB1, 2 if the 2nd PLMN is from the same plmn-IdentityList, or when no more PLMN are present within the same plmn-IdentityList; then the PLMN listed 1st in the subsequent plmn-IdentityList within the same SIB1 and so on. NOTE 6.</td>
</tr>
<tr>
<td>p-Max</td>
<td>Value applicable for the cell. If absent the UE applies the maximum power according to its capability as specified in TS 36.101 [42, 6.2.2]. NOTE 2.</td>
</tr>
<tr>
<td>posSIB-MappingInfo</td>
<td>List of the posSIBs mapped to this SystemInformation message.</td>
</tr>
<tr>
<td>posSibType</td>
<td>The positioning SIB type is defined in TS 36.355 [54].</td>
</tr>
</tbody>
</table>
### SystemInformationBlockType1 field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>q-QualMin</strong></td>
<td>Parameter &quot;Q\textsubscript{ualmin}&quot; in TS 36.304 [4]. If cellSelectionInfo-v920 is not present, the UE applies the (default) value of negative infinity for Q\textsubscript{ualmin}. NOTE 1.</td>
</tr>
<tr>
<td><strong>q-QualMinRSRQ-OnAllSymbols</strong></td>
<td>If this field is present and supported by the UE, the UE shall, when performing RSRQ measurements, perform RSRQ measurement on all OFDM symbols in accordance with TS 36.214 [48]. NOTE 1.</td>
</tr>
<tr>
<td><strong>q-QualMinOffset</strong></td>
<td>Parameter Q\textsubscript{ualminoffset} in TS 36.304 [4]. Actual value Q\textsubscript{ualminoffset} = field value [dB]. If cellSelectionInfo-v920 is not present or the field is not present, the UE applies the (default) value of 0 dB for Q\textsubscript{ualminoffset}. Affects the minimum required quality level in the cell.</td>
</tr>
<tr>
<td><strong>q-QualMinWB</strong></td>
<td>If this field is present and supported by the UE, the UE shall, when performing RSRQ measurements, use a wider bandwidth in accordance with TS 36.133 [16]. NOTE 1.</td>
</tr>
<tr>
<td><strong>q-RxLevMinOffset</strong></td>
<td>Parameter Q\textsubscript{rxlevminoffset} in TS 36.304 [4]. Actual value Q\textsubscript{rxlevminoffset} = field value * 2 [dB]. If absent, the UE applies the (default) value of 0 dB for Q\textsubscript{rxlevminoffset}. Affects the minimum required Rx level in the cell.</td>
</tr>
<tr>
<td><strong>sbas-ID</strong></td>
<td>The presence of this field indicates that the posSibType is for a specific SBAS.</td>
</tr>
<tr>
<td><strong>sib-MappingInfo</strong></td>
<td>List of the SIBs mapped to this SystemInformation message. There is no mapping information of SIB2; it is always present in the first SystemInformation message listed in the schedulingInfoList list.</td>
</tr>
<tr>
<td><strong>si-HoppingConfigCommon</strong></td>
<td>Frequency hopping activation/deactivation for BR versions of SI messages and MPDCCH/PDSCH of paging.</td>
</tr>
<tr>
<td><strong>si-Narrowband</strong></td>
<td>This field indicates the index of a narrowband used to broadcast the SI message towards BL UEs and UEs in CE, see TS 36.211 [21, 6.4.1] and TS 36.213 [23, 7.1.6]. Field values (1..maxAvailNarrowBands-r13) correspond to narrowband indices (0..[maxAvailNarrowBands-r13-1]) as specified in TS 36.211 [21].</td>
</tr>
<tr>
<td><strong>si-RepetitionPattern</strong></td>
<td>Indicates the radio frames within the SI window used for SI message transmission. Value everyRF corresponds to every radio frame, value every2ndRF corresponds to every 2 radio frames, and so on. The first transmission of the SI message is transmitted from the first radio frame of the SI window.</td>
</tr>
<tr>
<td><strong>si-Periodicity, possSI-Periodicity</strong></td>
<td>Periodicity of the SI-message in radio frames, such that rf8 denotes 8 radio frames, rf16 denotes 16 radio frames, and so on.</td>
</tr>
<tr>
<td><strong>si-TBS</strong></td>
<td>This field indicates the transport block size information used to broadcast the SI message towards BL UEs and UEs in CE, see TS 36.211 [21, Table 7.1.7.2.1-1] for a 6 PRB bandwidth and a QPSK modulation.</td>
</tr>
<tr>
<td><strong>schedulingInfoList-BR</strong></td>
<td>Indicates additional scheduling information of SI messages for BL UEs and UEs in CE. It includes the same number of entries, and listed in the same order, as in schedulingInfoList (without suffix).</td>
</tr>
<tr>
<td><strong>si-ValidityTime</strong></td>
<td>Indicates system information validity timer. If set to TRUE, the timer is set to 3h, otherwise the timer is set to 24h.</td>
</tr>
<tr>
<td><strong>si-WindowLength, si-WindowLength-BR</strong></td>
<td>Common SI scheduling window for all SIs. Unit in milliseconds, where ms1 denotes 1 millisecond, ms2 denotes 2 milliseconds and so on. In case si-WindowLength-BR-r13 is present and the UE is a BL UE or a UE in CE, the UE shall use si-WindowLength-BR-r13 and ignore the original field si-WindowLength (without suffix). UEs other than BL UEs or UEs in CE shall ignore the extension field si-WindowLength-BR-r13.</td>
</tr>
<tr>
<td><strong>startSymbolBR</strong></td>
<td>For BL UEs and UEs in CE, indicates the OFDM starting symbol for any MPDCCH, PDSCH scheduled on the same cell except the PDSCH carrying SystemInformationBlockType1-BR, see TS 36.213 [23]. Values 1, 2, and 3 are applicable for dl-Bandwidth greater than 10 resource blocks. Values 2, 3, and 4 are applicable otherwise.</td>
</tr>
<tr>
<td><strong>systemInfoValueTagList</strong></td>
<td>Indicates SI message specific value tags for BL UEs and UEs in CE. It includes the same number of entries, and listed in the same order, as in schedulingInfoList (without suffix).</td>
</tr>
<tr>
<td><strong>systemInfoValueTagSI</strong></td>
<td>SI message specific value tag as specified in subclause 5.2.1.3. Common for all SIBs within the SI message other than MIB, SIB1, SIB10, and SIB11.</td>
</tr>
<tr>
<td><strong>systemInfoValueTag</strong></td>
<td>Common for all SIBs other than MIB, MIB-MBMS, SIB1, SIB1-MBMS, SIB10, SIB11, and SIB12 and SIB14. Change of MIB. MIB-MBMS, SIB1 and SIB1-MBMS is detected by acquisition of the corresponding message.</td>
</tr>
<tr>
<td><strong>tdf-Config</strong></td>
<td>Specifies the TDD specific physical channel configurations. NOTE 2.</td>
</tr>
<tr>
<td><strong>trackingAreaCode/trackingAreaCode-5GC</strong></td>
<td>A trackingAreaCode that is common for all the PLMNs listed. NOTE2. NOTE 5.</td>
</tr>
</tbody>
</table>
NOTE 1: The value the UE applies for parameter "Q\textsuperscript{qualmin}" in TS 36.304 [4] depends on the $q$-$\text{QualMin}$ fields signalled by E-UTRAN and supported by the UE. In case multiple candidate options are available, the UE shall select the highest priority candidate option according to the priority order indicated by the following table (top row is highest priority).

<table>
<thead>
<tr>
<th>q-$\text{QualMinRSRQ-OnAllSymbols}$</th>
<th>q-$\text{QualMinWB}$</th>
<th>Value of parameter &quot;Q$\text{qualmin}$&quot; in TS 36.304 [4]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Included</td>
<td>Included</td>
<td>$q$-$\text{QualMinRSRQ-OnAllSymbols} - (q$-$\text{QualMinWB})$</td>
</tr>
<tr>
<td>Included</td>
<td>Not included</td>
<td>$q$-$\text{QualMinRSRQ-OnAllSymbols}$</td>
</tr>
<tr>
<td>Not included</td>
<td>Included</td>
<td>$q$-$\text{QualMinWB}$</td>
</tr>
<tr>
<td>Not included</td>
<td>Not included</td>
<td>$q$-$\text{QualMin}$</td>
</tr>
</tbody>
</table>

NOTE 2: E-UTRAN sets this field to the same value for all instances of SIB1 message that are broadcasted within the same cell.

NOTE 3: E-UTRAN configures this field only in the BR version of SIB1 message.

NOTE 4: E-UTRAN configures at most 6 EPC PLMNs in total (i.e. across all the PLMN lists except for PLMN lists in cellAccessRelatedInfoList-5GC in SIB1). E-UTRAN configures at most 6 5GC PLMNs in total (i.e. across all the PLMN lists in cellAccessRelatedInfoList-5GC in SIB1).

NOTE 5: E-UTRAN configures only one value for this parameter per PLMN.

NOTE 6: E-UTRAN configures plmn-index only if the cellBarred is set to notBarred.

---

**SystemInformationBlockType1-MBMS**

SystemInformationBlockType1-MBMS contains information relevant for receiving service from MBMS-dedicated cell and defines the scheduling of other system information.
SystemInformationBlockType1-MBMS message

```asn1
-- ASN1START
SystemInformationBlockType1-MBMS-r14 ::= SEQUENCE {
  cellAccessRelatedInfo-r14  SET OF PLMN-IdentityList-MBMS-r14,
  trackingAreaCode-r14      CellIdentity,
  cellIdentity-r14         INTEGER (0..31),
  freqBandIndicator-r14    FreqBandIndicator-r11,
  multiBandInfoList-r14    MultiBandInfoList-r11 OPTIONAL, -- Need OR
  schedulingInfoList-MBMS-r14  SchedulingInfoList-MBMS-r14,
  si-WindowLength-r14      ENUMERATED {
    ms1, ms2, ms5, ms10, ms15, ms20, ms40, ms80},
  systemInfoValueTag-r14   INTEGER (0..31),
  nonMBSFN-SubframeConfig-r14  NonMBSFN-SubframeConfig-r14 OPTIONAL, -- Need OR
  pdsch-ConfigCommon-r14   PDSCH-ConfigCommon,
  systemInformationBlockType13-r14  SystemInformationBlockType13-r9 OPTIONAL, -- Need OR
  cellAccessRelatedInfoList-r14  SET OF CellAccessRelatedInfo-r14 OPTIONAL, -- Need OR
  nonCriticalExtension     SEQUENCE {} OPTIONAL
}
PLMN-IdentityList-MBMS-r14 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-Identity
SchedulingInfoList-MBMS-r14 ::= SEQUENCE (SIZE (1..maxSI-Message)) OF SchedulingInfo-MBMS-r14
SchedulingInfo-MBMS-r14 ::= SEQUENCE {
  si-Periodicity-r14       ENUMERATED {rf16, rf32, rf64, rf128, rf256, rf512},
  sib-MappingInfo-r14      SIB-MappingInfo-MBMS-r14
}
SIB-MappingInfo-MBMS-r14 ::= SEQUENCE (SIZE (0..maxSIB-1)) OF SIB-Type-MBMS-r14
SIB-Type-MBMS-r14 ::= ENUMERATED {
  sibType10, sibType11, sibType12-v920, sibType13-v920,
  sibType15-v1130, sibType16-v1130, ...}
NonMBSFN-SubframeConfig-r14 ::= SEQUENCE {
  radioFrameAllocationPeriod-r14  ENUMERATED {rf4, rf8, rf16, rf32, rf64, rf128, rf512},
  radioFrameAllocationOffset-r14  INTEGER (0..7),
  subframeAllocation-r14         BIT STRING (SIZE(9))
}
-- ASN1STOP
```

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channels: BCCH

Direction: E-UTRAN to UE
SystemInformationBlockType1-MBMS field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellAccessRelatedInfoList</td>
<td>This field contains a list allowing signalling of access related information per PLMN. One PLMN can be included in only one entry of this list. NOTE 2.</td>
</tr>
<tr>
<td>cellIdentity</td>
<td>Indicates the cell identity. NOTE 1.</td>
</tr>
<tr>
<td>freqBandIndicator</td>
<td>A list of as defined in TS 36.101 [42, table 6.2.4-1] for the frequency band in freqBandIndicator.</td>
</tr>
<tr>
<td>multiBandInfoList</td>
<td>A list of additional frequency band indicators, as defined in TS 36.101 [42, table 5.5-1] that the cell belongs to. If the UE supports the frequency band in the freqBandIndicator field it shall apply that frequency band. Otherwise, the UE shall apply the first listed band which it supports in the multiBandInfoList field.</td>
</tr>
<tr>
<td>nonMBSFN-SubframeConfig</td>
<td>Defines the non-MBSFN subframes within the radio frame allocation period defined by the radioFrameAllocationPeriod and the radioFrameAllocationOffset.</td>
</tr>
<tr>
<td>plmn-IdentityList</td>
<td>List of PLMN identities. The first listed PLMN-Identity is the primary PLMN. NOTE 1.</td>
</tr>
<tr>
<td>radioFrameAllocationPeriod, radioFrameAllocationOffset</td>
<td>Radio-frames that contain non-MBSFN subframes occur when equation SFN mod radioFrameAllocationPeriod = radioFrameAllocationOffset is satisfied. Value rf4 for radioframeAllocationPeriod denotes 4 radio frames, rf8 detones 8 radion frames, and so on.</td>
</tr>
<tr>
<td>schedulingInfoList-MBMS</td>
<td>Indicates additional scheduling information of SI messages on MBMS-dedicated cell.</td>
</tr>
<tr>
<td>sib-MappingInfo</td>
<td>List of the SIBs mapped to this SystemInformation message.</td>
</tr>
<tr>
<td>si-Periodicity</td>
<td>Periodicity of the SI-message in radio frames, such that rf16 denotes 16 radio frames, rf32 denotes 32 radio frames, and so on.</td>
</tr>
<tr>
<td>si-WindowLength</td>
<td>Common SI scheduling window for all SIs. Unit in milliseconds, where ms1 denotes 1 millisecond, ms2 denotes 2 milliseconds and so on.</td>
</tr>
<tr>
<td>subframeAllocation</td>
<td>Defines the subframes that are allocated for non-MBSFN within the radio frame allocation period defined by the radioFrameAllocationPeriod and the radioFrameAllocationOffset. &quot;0&quot; denotes that the corresponding subframe is a MBSFN subframe. &quot;1&quot; denotes that the corresponding subframe is a non-MBSFN subframe. If E-UTRAN configures a value other than &quot;0&quot; for additionalNonMBSFNSubframes within MasterInformationBlock-MBMS, subframeAllocation configuration should also indicate subframes pointed out by additionalNonMBSFNSubframes as non-MBSFN subframes.</td>
</tr>
<tr>
<td>systemInformationBlockType13</td>
<td>E-UTRAN does not configure this field if schedulingInfoList–MBMS indicates that SystemInformationBlockType13 is present.</td>
</tr>
<tr>
<td>systemInfoValueTag</td>
<td>Common for all SIBs other than MIB, SIB1, SIB10, SIB11, SIB12 and SIB14. Change of MIB and SIB1 is detected by acquisition of the corresponding message.</td>
</tr>
<tr>
<td>trackingAreaCode</td>
<td>A trackingAreaCode that is common for all the PLMNs listed. NOTE1.</td>
</tr>
</tbody>
</table>

NOTE 1: E-UTRAN sets this field to the same value for all instances of SIB1-MBMS message that are broadcasted within the same cell.

UEAssistanceInformation

The UEAssistanceInformation message is used for the indication of UE assistance information to the eNB.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

UEAssistanceInformation message

-- ASN1START
UEAssistanceInformation-r11 ::= SEQUENCE {

-- ASN1END
criticalExtensions
   CHOICE {
      c1
         CHOICE {
            ueAssistanceInformation-r11
               UEAssistanceInformation-r11-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
         },
      criticalExtensionsFuture
         SEQUENCE ()
   }
}

UEAssistanceInformation-r11-IEs ::= SEQUENCE {
   powerPrefIndication-r11
      ENUMERATED {normal, lowPowerConsumption} OPTIONAL,
   lateNonCriticalExtension
      OCTET STRING OPTIONAL,
   nonCriticalExtension
      UEAssistanceInformation-v1430-IEs OPTIONAL
}

UEAssistanceInformation-v1430-IEs ::= SEQUENCE {
   bw-preference-r14
      BW-Preference-r14 OPTIONAL,
   sps-AssistanceInformation-r14
      SEQUENCE {
         trafficPatternInfoListSL-r14
            TrafficPatternInfoList-r14 OPTIONAL,
         trafficPatternInfoListUL-r14
            TrafficPatternInfoList-r14 OPTIONAL
      } OPTIONAL,
   rlM-Report-r14
      SEQUENCE {
         rlM-Event-r14
            ENUMERATED {earlyOutOfSync, earlyInSync},
         excessRep-MPDCCH-r14
            ENUMERATED {excessRep1, excessRep2} OPTIONAL
      } OPTIONAL,
   delayBudgetReport-r14
      DelayBudgetReport-r14 OPTIONAL,
   nonCriticalExtension
      UEAssistanceInformation-v1450-IEs OPTIONAL
}

UEAssistanceInformation-v1450-IEs ::= SEQUENCE {
   overheatingAssistance-r14
      OverheatingAssistance-r14 OPTIONAL,
   nonCriticalExtension
      UEAssistanceInformation-v1530-IEs OPTIONAL
}

UEAssistanceInformation-v1530-IEs ::= SEQUENCE {
   sps-AssistanceInformation-v1530
      SEQUENCE {
         trafficPatternInfoListSL-v1530
            TrafficPatternInfoList-v1530 OPTIONAL,
      } OPTIONAL,
   nonCriticalExtension
      SEQUENCE {} OPTIONAL
}

BW-Preference-r14 ::= SEQUENCE {
   dl-preference-r14
      ENUMERATED {mhz1dot4, mhz5, mhz20} OPTIONAL,
   ul-preference-r14
      ENUMERATED {mhz1dot4, mhz5} OPTIONAL
}

TrafficPatternInfoList-r14 ::= SEQUENCE (SIZE (1..maxTrafficPattern-r14)) OF TrafficPatternInfo-r14

TrafficPatternInfo-r14 ::= SEQUENCE {
   trafficPeriodicity-r14
      ENUMERATED {
         sf20, sf50, sf100, sf200, sf300, sf400, sf500,
         sf600, sf700, sf800, sf900, sf1000
      },
   timingOffset-r14
      INTEGER (0..10239),
   priorityInfoSL-r14
      SL-Priority-r13 OPTIONAL,
   logicalChannelIdentityUL-r14
      INTEGER (3..10) OPTIONAL,
   messageSize-r14
      BIT STRING (SIZE (6))
}

TrafficPatternInfoList-v1530 ::= SEQUENCE (SIZE (1..maxTrafficPattern-r14)) OF TrafficPatternInfo-v1530

TrafficPatternInfo-v1530 ::= SEQUENCE {
   trafficDestination-r15
      SL-DestinationIdentity-r12 OPTIONAL,
   reliabilityInfoSL-r15
      SL-Reliability-r15 OPTIONAL
}

DelayBudgetReport-r14 ::= CHOICE {
   type1
      ENUMERATED {
         msMinus1280, msMinus640, msMinus320, msMinus160,
         msMinus80, msMinus60, msMinus40, msMinus20, ms0, ms20,
         ms40, ms60, ms80, ms160, ms320, ms640, ms1280,
      },
   type2
      ENUMERATED {
         msMinus192, msMinus168, msMinus144, msMinus120,
         msMinus96, msMinus72, msMinus48, msMinus24, ms0, ms24,
         ms48, ms72, ms96, ms120, ms144, ms168, ms192
      }
}
OverheatingAssistance-r14 ::= SEQUENCE {
    reducedUE-Category SEQUENCE {
        reducedUE-CategoryDL INTEGER (0..19),
        reducedUE-CategoryUL INTEGER (0..21)
    } OPTIONAL,
    reducedMaxCCs SEQUENCE {
        reducedCCsDL INTEGER (0..31),
        reducedCCsUL INTEGER (0..31)
    } OPTIONAL
}

-- ASN1STOP
### UEAssistanceInformation field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>delayBudgetReport</td>
<td>Indicates the UE-preferred adjustment to connected mode DRX or coverage enhancement configuration.</td>
</tr>
<tr>
<td>dl-Preference</td>
<td>Indicates UE's preference on configuration of maximum PDSCH bandwidth. The value mhz1dot4 corresponds to CE mode usage in 1.4MHz bandwidth, mhz5 corresponds to CE mode usage in 5MHz bandwidth, and mhz20 corresponds to CE mode usage in 20MHz bandwidth or normal coverage.</td>
</tr>
<tr>
<td>excessRep-MPDCCH</td>
<td>Indicates the excess number of repetitions on MPDCCH. Value excessRep1 and excessRep2 indicate the excess number of repetitions defined in TS 36.133 [16].</td>
</tr>
<tr>
<td>logicalChannelIdentityUL</td>
<td>Indicates the logical channel identity associated with the reported traffic pattern in the uplink logical channel.</td>
</tr>
<tr>
<td>messageSize</td>
<td>Indicates the maximum TB size based on the observed traffic pattern. The value refers to the index of TS 36.321 [6, table 6.1.3.1-1].</td>
</tr>
<tr>
<td>powerPrefIndication</td>
<td>Value lowPowerConsumption indicates the UE prefers a configuration that is primarily optimised for power saving. Otherwise the value is set to normal.</td>
</tr>
<tr>
<td>priorityInfoSL</td>
<td>Indicates the traffic priority (i.e., PPPP) associated with the reported traffic pattern for V2X sidelink communication.</td>
</tr>
<tr>
<td>reducedCCsDL</td>
<td>Indicates the UE's preference on reduced configuration corresponding to the maximum number of downlink SCells indicated by the field, to address overheating. This maximum number includes both SCells of E-UTRA and PCell/SCells of NR in EN-DC.</td>
</tr>
<tr>
<td>reducedCCsUL</td>
<td>Indicates the UE's preference on reduced configuration corresponding to the maximum number of uplink SCells indicated by the field, to address overheating. This maximum number includes both SCells of E-UTRA and PCell/SCells of NR in EN-DC.</td>
</tr>
<tr>
<td>reducedUE-CategoryDL, reducedUE-CategoryUL</td>
<td>Indicates that UE prefers a configuration corresponding to the reduced UE category, to address overheating. The reduced UE DL category and reduced UE UL category should be indicated according to supported combinations for UE UL and DL Categories, see TS 36.306 [5, Table 4.1A-6].</td>
</tr>
<tr>
<td>reliabilityInfoSL</td>
<td>Indicates the traffic reliability (i.e., PPPR) associated with the reported traffic pattern for V2X sidelink communication.</td>
</tr>
<tr>
<td>rlm-Event</td>
<td>This field provides the RLM event (&quot;early-out-of-sync&quot; or &quot;early-in-sync&quot;).</td>
</tr>
<tr>
<td>rlm-Report</td>
<td>This field provides the RLM report for BL UEs and UEs in CE.</td>
</tr>
<tr>
<td>sps-AssistanceInformation</td>
<td>Indicates the UE assistance information to assist E-UTRAN to configure SPS.</td>
</tr>
<tr>
<td>timingOffset</td>
<td>This field indicates the estimated timing for a packet arrival in a SL/UL logical channel. Specifically, the value indicates the timing offset with respect to subframe#0 of SFN#0 in milliseconds.</td>
</tr>
<tr>
<td>trafficDestination</td>
<td>Indicates the destination associated with the reported traffic pattern for V2X sidelink communication.</td>
</tr>
<tr>
<td>trafficPatternInfoListSL</td>
<td>This field provides the traffic characteristics of sidelink logical channel(s) that are setup for V2X sidelink communication. If trafficPatternInfoListSL-v1530 is included, it includes the same number of entries, and listed in the same order, as in trafficPatternInfoListSL-r14.</td>
</tr>
<tr>
<td>trafficPatternInfoListUL</td>
<td>This field provides the traffic characteristics of uplink logical channel(s).</td>
</tr>
<tr>
<td>type1</td>
<td>Indicates the preferred amount of increment/decrement to the connected mode DRX cycle length with respect to the current configuration. Value in number of milliseconds. Value ms40 corresponds to 40 milliseconds, msMinus40 corresponds to -40 milliseconds and so on.</td>
</tr>
<tr>
<td>type2</td>
<td>Indicates the preferred amount of increment/decrement to the coverage enhancement configuration with respect to the current configuration so that the Uu air interface delay changes by the indicated amount. Value in number of milliseconds. Value ms24 corresponds to 24 milliseconds, msMinus24 corresponds to -24 milliseconds and so on.</td>
</tr>
<tr>
<td>ul-Preference</td>
<td>Indicates UE's preference on configuration of maximum PUSCH bandwidth. The value mhz1dot4 corresponds to CE mode usage in 1.4MHz bandwidth, and mhz5 corresponds to CE mode usage in 5MHz bandwidth.</td>
</tr>
</tbody>
</table>
**UECapabilityEnquiry**

The **UECapabilityEnquiry** message is used to request the transfer of UE radio access capabilities for E-UTRA as well as for other RATs.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

---

**UECapabilityEnquiry message**

```asn1
UECapabilityEnquiry ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      ueCapabilityEnquiry-r8    UECapabilityEnquiry-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
UECapabilityEnquiry-r8-IEs ::=  SEQUENCE {
  ue-CapabilityRequest    UE-CapabilityRequest,
  nonCriticalExtension    UECapabilityEnquiry-v8a0-IEs  OPTIONAL
}
UECapabilityEnquiry-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    UECapabilityEnquiry-v1180-IEs
}
UECapabilityEnquiry-v1180-IEs ::= SEQUENCE {
  requestedFrequencyBands-r11   SEQUENCE (SIZE (1..16)) OF FreqBandIndicator-r11
  OPTIONAL,
  nonCriticalExtension    UECapabilityEnquiry-v1310-IEs
}
UECapabilityEnquiry-v1310-IEs ::= SEQUENCE {
  requestReducedFormat-r13 ENUMERATED {true}     OPTIONAL, -- Need ON
  requestSkipFallbackComb-r13 ENUMERATED {true}     OPTIONAL, -- Need ON
  requestedMaxCCsUL-r13   INTEGER (2..32)     OPTIONAL, -- Need ON
  requestReducedIntNonContComb-r13 ENUMERATED {true}     OPTIONAL, -- Need ON
  nonCriticalExtension    UECapabilityEnquiry-v1430-IEs  OPTIONAL
}
UECapabilityEnquiry-v1430-IEs ::= SEQUENCE {
  requestDiffFallbackCombList-r14  BandCombinationList-r14   OPTIONAL, -- Need ON
  nonCriticalExtension    UECapabilityEnquiry-v1530-IEs     OPTIONAL
}
UECapabilityEnquiry-v1530-IEs ::= SEQUENCE {
  requestedFreqBandsNR-MRDC-r15  OCTET STRING     OPTIONAL,
  nonCriticalExtension    UECapabilityEnquiry-v1510-IEs      OPTIONAL
}
UECapabilityEnquiry-v1510-IEs ::= SEQUENCE {
  requestSTTI-SPT-Capability-r15  ENUMERATED {true}    OPTIONAL,
  eutra-nr-only-r15 ENUMERATED {true}     OPTIONAL,
  nonCriticalExtension    SEQUENCE {}      OPTIONAL
}
UE-CapabilityRequest ::=   SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT-Type
```

---

**ETSI**
**UECapabilityEnquiry field descriptions**

**eutra-nr-only**
Indicates that the UE is requested to provide UE capabilities related to EN-DC only as specified in TS38.331 [82].

**requestDiffFallbackCombList**
List of CA band combinations for which the UE is requested to provide different capabilities for their fallback band combinations in conjunction with the capabilities supported for the CA band combinations in this list. The UE shall exclude fallback band combinations for which their supported UE capabilities are the same as the CA band combination indicated in this list.

**requestReducedFormat**
Indicates that the UE if supported is requested to provide supported CA band combinations in the supportedBandCombinationReduced-r13 instead of the supportedBandCombination-r10. The E-UTRAN includes this field if requestSkipFallbackComb or requestDiffFallbackCombList is included in the message.

**requestSkipFallbackComb**
Indicates that the UE shall explicitly exclude fallback CA band combinations in capability signalling.

**ue-CapabilityRequest**
List of the RATs for which the UE is requested to transfer the UE radio access capabilities i.e. E-UTRA, UTRA, GERAN-CS, GERAN-PS, CDMA2000.

**requestedFrequencyBands**
List of frequency bands for which the UE is requested to provide supported CA band combinations and non CA bands.

**requestFreqBandsNR-MRDC**
Includes the NR FreqBandList IE as specified in TS 38.331 [82]. It concerns a list of NR and/ or E-UTRA frequency bands for which the UE is requested to provide its supported NR CA and/or MR-DC band combinations (i.e. within the UE capability containers for NR and MR-DC, as requested by E-UTRAN).

**requestedMaxCCsDL, requestedMaxCCsUL**
Indicates the maximum number of CCs for which the UE is requested to provide supported CA band combinations and non-CA bands.

**requestReducedIntNonContComb**
Indicates that the UE shall explicitly exclude supported intra-band non-contiguous CA band combinations other than included in capability signalling as specified in TS 36.306 [5, 4.3.5.21].

**requestSTTI-SPT-Capability**
Indicates that the UE shall include all the short TTI and SPT capabilities in capability signalling.

---

**UECapabilityInformation**

The **UECapabilityInformation** message is used to transfer of UE radio access capabilities requested by the E-UTRAN.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

---

**UECapabilityInformation message**

```asn1
UECapabilityInformation ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
    c1 CHOICE{
      ueCapabilityInformation-r8 UECapabilityInformation-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE {}
  }
}

UECapabilityInformation-r8-IEs ::= SEQUENCE {
  ue-CapabilityRAT-ContainerList UE-CapabilityRAT-ContainerList,
  nonCriticalExtension UECapabilityInformation-v8a0-IEs OPTIONAL
}

UECapabilityInformation-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension UECapabilityInformation-v1250-IEs OPTIONAL
}
```
UECapabilityInformation-v1250-IEs ::= SEQUENCE {
  ue-RadioPagingInfo-r12 UE-RadioPagingInfo-r12 OPTIONAL,
  nonCriticalExtension SEQUENCE () OPTIONAL
}

-- ASN1STOP

**UECapabilityInformation field descriptions**

*ue-RadioPagingInfo*

This field contains UE capability information used for paging.

---

**-- ASN1START**

UEInformationRequest-r9 ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
    c1 CHOICE {
      ueInformationRequest-r9 UEInformationRequest-r9-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE ()
  }
}

UEInformationRequest-r9-IEs ::= SEQUENCE {
  rach-ReportReq-r9 BOOLEAN,
  rlf-ReportReq-r9 BOOLEAN,
  nonCriticalExtension UEInformationRequest-v930-IEs OPTIONAL
}

UEInformationRequest-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension UEInformationRequest-v1020-IEs OPTIONAL
}

UEInformationRequest-v1020-IEs ::= SEQUENCE {
  logMeasReportReq-r10 ENUMERATED {true} OPTIONAL, -- Need ON
  nonCriticalExtension UEInformationRequest-v1130-IEs OPTIONAL
}

UEInformationRequest-v1130-IEs ::= SEQUENCE {
  connEstFailReportReq-r11 ENUMERATED {true} OPTIONAL, -- Need ON
  nonCriticalExtension UEInformationRequest-v1250-IEs OPTIONAL
}

UEInformationRequest-v1250-IEs ::= SEQUENCE {
  mobilityHistoryReportReq-r12 ENUMERATED {true} OPTIONAL, -- Need ON
  nonCriticalExtension UEInformationRequest-v1530-IEs OPTIONAL
}

UEInformationRequest-v1530-IEs ::= SEQUENCE {
  idleModeMeasurementReq-r15 ENUMERATED {true} OPTIONAL, -- Need ON
  flightPathInfoReq-r15 FlightPathInfoReportConfig-r15 OPTIONAL, -- Need ON
  nonCriticalExtension SEQUENCE () OPTIONAL
}

-- ASN1STOP
### UEInformationRequest field descriptions

**rach-ReportReq**

This field is used to indicate whether the UE shall report information about the random access procedure.

---

**UEInformationResponse**

The **UEInformationResponse** message is used by the UE to transfer the information requested by the E-UTRAN.

- **Signalling radio bearer**: SRB1 or SRB2 (when logged measurement information is included)
- **RLC-SAP**: AM
- **Logical channel**: DCCH
- **Direction**: UE to E-UTRAN

### UEInformationResponse message

```asn1
UEInformationResponse-r9 ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        c1        CHOICE {
            ueInformationResponse-r9    UEInformationResponse-r9-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture    SEQUENCE {}    -- ASN1START
    }
}

UEInformationResponse-r9-IEs ::=  SEQUENCE {
    rach-Report-r9       SEQUENCE {
        numberOfPreamblesSent-r9    NumberOfPreamblesSent-r11,
        contentionDetected-r9     BOOLEAN
    }      OPTIONAL,
    rlf-Report-r9       RLF-Report-r9   OPTIONAL,
    nonCriticalExtension     UEInformationResponse-v930-IEs    OPTIONAL
}

UEInformationResponse-v9e0-IEs ::= SEQUENCE {
    rlf-Report-v9e0      RLF-Report-v9e0     OPTIONAL,
    nonCriticalExtension    SEQUENCE {}      OPTIONAL
}

UEInformationResponse-v930-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING (CONTAINING UEInformationResponse-v9e0-IEs)    OPTIONAL,
    nonCriticalExtension    UEInformationResponse-v1020-IEs  OPTIONAL
}

UEInformationResponse-v1020-IEs ::= SEQUENCE {
    logMeasReport-r10     LogMeasReport-r10    OPTIONAL,
    nonCriticalExtension    UEInformationResponse-v1130-IEs OPTIONAL
}

UEInformationResponse-v1130-IEs ::= SEQUENCE {
    connEstFailReport-r11    ConnEstFailReport-r11   OPTIONAL,
    nonCriticalExtension    UEInformationResponse-v1250-IEs OPTIONAL
}

UEInformationResponse-v1250-IEs ::= SEQUENCE {
    mobilityHistoryReport-r12    MobilityHistoryReport-r12   OPTIONAL,
    nonCriticalExtension    UEInformationResponse-v1530-IEs OPTIONAL
}

UEInformationResponse-v1530-IEs ::= SEQUENCE {
    measResultListIdle-r15    MeasResultListIdle-r15   OPTIONAL,
    flightPathInfoReport-r15    FlightPathInfoReport-r15   OPTIONAL,
    nonCriticalExtension    SEQUENCE {}      OPTIONAL
}
```

---
RLF-Report-r9 ::= SEQUENCE {
  measResultLastServCell-r9  SEQUENCE {
    rsrpResult-r9  RSRP-Range,
    rsrqResult-r9  RSRQ-Range  OPTIONAL
  },
  measResultNeighCells-r9  SEQUENCE {
    measResultListEUTRA-r9  MeanResultList2EUTRA-r9  OPTIONAL,
    measResultListUTRA-r9  MeanResultList2UTRA-r9  OPTIONAL,
    measResultListGERAN-r9  MeanResultListGERAN  OPTIONAL,
    measResultsCDMA2000-r9  MeanResultList2CDMA2000-r9  OPTIONAL
  }  OPTIONAL,
  ...,
  locationInfo-r10  LocationInfo-r10  OPTIONAL,
  failedPCellId-r10  CHOICE {
    cellGlobalId-r10  CellGlobalIdEUTRA,
    pci-arfcn-r10  SEQUENCE {
      physCellId-r10  PhysCellId,
      carrierFreq-r10  ARFCN-ValueEUTRA
    }  OPTIONAL,
  }  OPTIONAL,
  reestablishmentCellId-r10  CellGlobalIdEUTRA  OPTIONAL,
  timeConnFailure-r10  INTEGER (0..1023)  OPTIONAL,
  connectionFailureType-r10  ENUMERATED {rlf, hof}  OPTIONAL,
  previousPCellId-r10  CellGlobalIdEUTRA  OPTIONAL
},
[[ failedPCellId-v1090  SEQUENCE {
    carrierFreq-v1090  ARFCN-ValueEUTRA-v9e0
  }  OPTIONAL
]},
[[ basicFields-r11  SEQUENCE {
    c-RNTI-r11  C-RNTI,
    rlf-Cause-r11  ENUMERATED {
      t310-Expiry, randomAccessProblem,
      rlc-MaxNumRetx, t312-Expiry-r12},
    timeSinceFailure-r11  TimeSinceFailure-r11
  }  OPTIONAL,
  previousUTRA-CellId-r11  SEQUENCE {
    carrierFreq-r11  ARFCN-ValueUTRA,
    physCellId-r11  CHOICE {
      fdd-r11  PhysCellIdUTRA-FDD,
      tdd-r11  PhysCellIdUTRA-TDD
    },
    cellGlobalId-r11  CellGlobalIdUTRA  OPTIONAL
  }  OPTIONAL,
  selectedUTRA-CellId-r11  SEQUENCE {
    carrierFreq-r11  ARFCN-ValueUTRA,
    physCellId-r11  CHOICE {
      fdd-r11  PhysCellIdUTRA-FDD,
      tdd-r11  PhysCellIdUTRA-TDD
    }
  }  OPTIONAL
},
[[ failedPCellId-v1250  SEQUENCE {
    tsc-FailedPCell-r12  TrackingAreaCode
  }  OPTIONAL,
  measResultLastServCell-v1250  RSRQ-Range-v1250  OPTIONAL,
  lastServCellRSRQ-Type-r12  RSRQ-Type-r12  OPTIONAL,
  measResultListEUTRA-v1250  MeanResultList2EUTRA-v1250  OPTIONAL
},
[[ drb-EstablishedWithQCI-1-r13  ENUMERATED {qci1}  OPTIONAL
],
[[ measResultLastServCell-v1360  RSRP-Range-v1360  OPTIONAL
],
[[ logMeasResultListBT-r15  LogMeasResultListBT-r15  OPTIONAL,
  logMeasResultListWLAN-r15  LogMeasResultListWLAN-r15  OPTIONAL
]]
}

RLF-Report-v9e0 ::= SEQUENCE {
  measResultListEUTRA-v9e0  MeanResultList2EUTRA-v9e0
}

MeasResultListEUTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2EUTRA-r9
MeasResultListEUTRA-v9e0 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2EUTRA-v9e0
MeasResultListEUTRA-v1250 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2EUTRA-v1250
MeasResult2EUTRA-r9 ::= SEQUENCE {
  carrierFreq-r9 ARFCN-ValueEUTRA,
  measResultList-r9 MeasResultListEUTRA
}

MeasResult2EUTRA-v9e0 ::= SEQUENCE {
  carrierFreq-v9e0 ARFCN-ValueEUTRA-v9e0 OPTIONAL
}

MeasResult2EUTRA-v1250 ::= SEQUENCE {
  rsrq-Type-r12 RSRQ-Type-r12 OPTIONAL
}

MeasResultList2EUTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2EUTRA-r9

MeasResult2UTRA-r9 ::= SEQUENCE {
  carrierFreq-r9 ARFCN-ValueUTRA,
  measResultList-r9 MeasResultListUTRA
}

MeasResultList2UTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2UTRA-r9

MeasResult2CDMA2000-r9 ::= SEQUENCE {
  carrierFreq-r9 CarrierFreqCDMA2000,
  measResultList-r9 MeasResultListCDMA2000
}

LogMeasReport-r10 ::= SEQUENCE {
  absoluteTimeStamp-r10 AbsoluteTimeInfo-r10,
  traceReference-r10 TraceReference-r10,
  traceRecordingSessionRef-r10 OCTET STRING (SIZE (2)),
  tce-Id-r10 OCTET STRING (SIZE (1)),
  logMeasInfoList-r10 LogMeasInfoList-r10,
  logMeasAvailable-r10 ENUMERATED {true} OPTIONAL,
  ...
  [
    logMeasAvailableBT-r15 ENUMERATED {true} OPTIONAL,
    logMeasAvailableWLAN-r15 ENUMERATED {true} OPTIONAL
  ]
}

LogMeasInfoList-r10 ::= SEQUENCE (SIZE (1..maxLogMeasReport-r10)) OF LogMeasInfo-r10

LogMeasInfo-r10 ::= SEQUENCE {
  locationInfo-r10 LocationInfo-r10 OPTIONAL,
  relativeTimeStamp-r10 INTEGER (0..7200),
  servCellIdentity-r10 CellGlobalIdEUTRA,
  measResultServCell-r10 SEQUENCE {
    rsrpResult-r10 RSRP-Range,
    rsrqResult-r10 RSRQ-Range
  },
  measResultNeighCells-r10 SEQUENCE {
    measResultListEUTRA-r10 MeasResultList2EUTRA-r9 OPTIONAL,
    measResultListUTRA-r10 MeasResultList2UTRA-r9 OPTIONAL,
    measResultListGERAN-r10 MeasResultList2GERAN-r10 OPTIONAL,
    measResultListCDMA2000-r10 MeasResultList2CDMA2000-r9 OPTIONAL
  } OPTIONAL,
  ...
  [
    measResultListEUTRA-v1090 MeasResultList2EUTRA-v9e0 OPTIONAL
  ]
}

MeasResultListMBSFN-r12 ::= SEQUENCE (SIZE (1..maxMBSFN-Area)) OF MeasResultMBSFN-r12

MeasResultMBSFN-r12 ::= SEQUENCE {
  mbsfn-Area-r12 SEQUENCE {
    mbsfn-AreaId-r12 MBSFN-AreaId-r12,
    ...
carrierFreq-r12       ARFCN-ValueEUTRA-r9
},
rsrpResultMBSFN-r12     RSRP-Range,
rsrqResultMBSFN-r12     MBSFN-RSRQ-Range-r12,
signallingBLER-Result-r12  BLER-Result-r12    OPTIONAL,
dataBLER-MCH-ResultList-r12    DataBLER-MCH-ResultList-r12 OPTIONAL,
...}
DataBLER-MCH-ResultList-r12 ::=  SEQUENCE (SIZE (1..maxPMCH-PerMBSFN)) OF DataBLER-MCH-Result-r12
DataBLER-MCH-ResultList-r12 ::=  SEQUENCE {
    mch-Index-r12       INTEGER (1..maxPMCH-PerMBSFN),
dataBLER-Result-r12    BLER-Result-r12
}
BLER-Result-r12 ::=  SEQUENCE {
    bler-r12    BLER-Range-r12,
    blocksReceived-r12    SEQUENCE {
        n-r12         BIT STRING (SIZE (3)),
m-r12         BIT STRING (SIZE (8))
    }
}
BLER-Range-r12 ::=  INTEGER (0..31)
MeasResultList2GERAN-r10 ::=  SEQUENCE (SIZE (1..maxCellListGERAN)) OF MeasResultListGERAN
ConnEstFailReport-r11 ::=  SEQUENCE {
    failedCellId-r11     CellGlobalIdEUTRA,
    locationInfo-r11     LocationInfo-r10    OPTIONAL,
    measResultFailedCell-r11    SEQUENCE {
        rsrpResult-r11     RSRP-Range,
        rsrqResult-r11     RSRQ-Range
    }
},
measResultNeighCells-r11    SEQUENCE {
    measResultListEUTRA-r11    MeasResultList2EUTRA-r9   OPTIONAL,
    measResultListUTRA-r11    MeasResultList2UTRA-r9   OPTIONAL,
    measResultListGERAN-r11    MeasResultList2GERAN    OPTIONAL,
    measResultsCDMA2000-r11    MeasResultList2CDMA2000-r9  OPTIONAL
} OPTIONAL,
numberOfPreamblesSent-r11   NumberOfPreamblesSent-r11,
maxTxPowerReached-r11    BOOLEAN,
timeSinceFailure-r11    TimeSinceFailure-r11,
measResultListEUTRA-v1130    MeasResultList2EUTRA-v9e0  OPTIONAL,
...[[
    measResultFailedCell-v1250    RSRQ-Range-v1250  OPTIONAL,
    failedCellRSRQ-Type-r12     RSRQ-Type-r12     OPTIONAL,
    measResultListEUTRA-v1250    MeasResultList2EUTRA-v1250  OPTIONAL
]],
[[
    logMeasResultListBT-r15    LogMeasResultListBT-r15  OPTIONAL,
    measResultListWLAN-r15    MeasResultList2WLAN-r15  OPTIONAL
]]
}
NumberOfPreamblesSent-r11 ::=  INTEGER (1..200)
TimeSinceFailure-r11    INTEGER (0..172800)
MobilityHistoryReport-r12 ::=  VisitedCellInfoList-r12
FlightPathInfoReport-r15 ::=  SEQUENCE {
    flightPath-r15    SEQUENCE (SIZE (1..maxWayPoint-r15)) OF WayPointLocation-r15    OPTIONAL,
    nonCriticalExtension    SEQUENCE ()    OPTIONAL
}
WayPointLocation-r15    ::=  SEQUENCE {
    locationInfo-r10,
timeStamp-r15    AbsoluteTimeInfo-r10    OPTIONAL
}
**UEInformationResponse field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>absoluteTimeStamp</code></td>
<td>Indicates the absolute time when the logged measurement configuration logging is provided, as indicated by E-UTRAN within <code>absoluteTimeInfo</code>.</td>
</tr>
<tr>
<td><code>bler</code></td>
<td>Indicates the measured BLER value. The coding of BLER value is defined in TS 36.133 [16].</td>
</tr>
<tr>
<td><code>blocksReceived</code></td>
<td>Indicates total number of MCH blocks, which were received by the UE and used for the corresponding BLER calculation, within the measurement period as defined in TS 36.133 [16].</td>
</tr>
<tr>
<td><code>carrierFreq</code></td>
<td>In case the UE includes <code>carrierFreq-v9e0</code> and/or <code>carrierFreq-v1090</code>, the UE shall set the corresponding entry of <code>carrierFreq-r9</code> and/or <code>carrierFreq-r10</code> respectively to <code>maxEARFCN</code>. For E-UTRA and UTRA frequencies, the UE sets the ARFCN according to the band used when obtaining the concerned measurement results.</td>
</tr>
<tr>
<td><code>connectionFailureType</code></td>
<td>This field is used to indicate whether the connection failure is due to radio link failure or handover failure.</td>
</tr>
<tr>
<td><code>contentionDetected</code></td>
<td>This field is used to indicate that contention was detected for at least one of the transmitted preambles, see TS 36.321 [6].</td>
</tr>
<tr>
<td><code>c-RNTI</code></td>
<td>This field indicates the C-RNTI used in the PCell upon detecting radio link failure or the C-RNTI used in the source PCell upon handover failure.</td>
</tr>
<tr>
<td><code>dataBLER-MCH-ResultList</code></td>
<td>Includes a BLER result per MCH on subframes using <code>dataMCS</code>, with the applicable MCH(s) listed in the same order as in <code>pmch-InfoList</code> within <code>MBSFNAreaConfiguration</code>.</td>
</tr>
<tr>
<td><code>drb-EstablishedWithQCI-1</code></td>
<td>This field is used to indicate the radio link failure occurred while a bearer with QCI value equal to 1 was configured, see TS 24.301 [35].</td>
</tr>
<tr>
<td><code>failedCellId</code></td>
<td>This field is used to indicate the cell in which connection establishment failed.</td>
</tr>
<tr>
<td><code>failedPCellId</code></td>
<td>This field is used to indicate the PCell in which RLF is detected or the target PCell of the failed handover. The UE sets the EARFCN according to the band used for transmission/reception when the failure occurred.</td>
</tr>
<tr>
<td><code>inDeviceCoexDetected</code></td>
<td>Indicates that measurement logging is suspended due to IDC problem detection.</td>
</tr>
<tr>
<td><code>logMeasResultListBT</code></td>
<td>This field refers to the Bluetooth measurement results.</td>
</tr>
<tr>
<td><code>logMeasResultListWLAN</code></td>
<td>This field refers to the WLAN measurement results.</td>
</tr>
<tr>
<td><code>maxTxPowerReached</code></td>
<td>This field is used to indicate whether or not the maximum power level was used for the last transmitted preamble, see TS 36.321 [6].</td>
</tr>
<tr>
<td><code>mch-Index</code></td>
<td>Indicates the MCH by referring to the entry as listed in <code>pmch-InfoList</code> within <code>MBSFNAreaConfiguration</code>.</td>
</tr>
<tr>
<td><code>measResultFailedCell</code></td>
<td>This field refers to the last measurement results taken in the cell, where connection establishment failure happened. For UE supporting CE Mode B, when CE mode B is not restricted by upper layers, <code>measResultFailedCell-v1360</code> is reported if the measured RSRP is less than -140 dBm.</td>
</tr>
<tr>
<td><code>measResultLastServCell</code></td>
<td>This field refers to the last measurement results taken in the PCell, where radio link failure or handover failure happened. For BL UEs or UE in CE, when operating in CE Mode B, <code>measResultLastServCell-v1360</code> is reported if the measured RSRP is less than -140 dBm.</td>
</tr>
<tr>
<td><code>measResultListEUTRA</code></td>
<td>If <code>measResultListEUTRA-v9e0</code>, <code>measResultListEUTRA-v1090</code> or <code>measResultListEUTRA-v1130</code> is included, the UE shall include the same number of entries, and listed in the same order, as in <code>measResultListEUTRA-r9</code>, <code>measResultListEUTRA-r10</code> and/or <code>measResultListEUTRA-r11</code> respectively.</td>
</tr>
<tr>
<td><code>measResultListEUTRA-v1250</code></td>
<td>If included in <code>RLF-Report-r9</code> the UE shall include the same number of entries, and listed in the same order, as in <code>measResultListEUTRA-r9</code>; If included in <code>LogMeasInfo-r10</code> the UE shall include the same number of entries, and listed in the same order, as in <code>measResultListEUTRA-r10</code>; If included in <code>ConnEstFailReport-r11</code> the UE shall include the same number of entries, and listed in the same order, as in <code>measResultListEUTRA-r11</code>;</td>
</tr>
<tr>
<td><code>measResultListIdle</code></td>
<td>This field indicates the measurement results done during IDLE mode at network request.</td>
</tr>
</tbody>
</table>
**UEInformationResponse field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>measResultServCell</em></td>
<td>This field refers to the log measurement results taken in the Serving cell. For UE supporting CE Mode B, when CE mode B is not restricted by upper layers, <em>measResultServCell-v1360</em> is reported if the measured RSRP is less than -140 dBm.</td>
</tr>
<tr>
<td><em>mobilityHistoryReport</em></td>
<td>This field is used to indicate the time of stay in 16 most recently visited E-UTRA cells or of stay out of E-UTRA.</td>
</tr>
<tr>
<td><em>numberOfPreamblesSent</em></td>
<td>This field is used to indicate the number of RACH preambles that were transmitted. Corresponds to parameter PREAMBLE_TRANSMISSION_COUNTER in TS 36.321 [6].</td>
</tr>
<tr>
<td><em>previousPCellId</em></td>
<td>This field is used to indicate the source PCell of the last handover (source PCell when the last RRC-Connection-Reconfiguration message including mobilityControlInfo was received).</td>
</tr>
<tr>
<td><em>previousUTRACellId</em></td>
<td>This field is used to indicate the source UTRA cell of the last successful handover to E-UTRAN, when RLF occurred at the target PCell. The UE sets the ARFCN according to the band used for transmission/reception on the concerned cell.</td>
</tr>
<tr>
<td><em>reestablishmentCellId</em></td>
<td>This field is used to indicate the cell in which the re-establishment attempt was made after connection failure.</td>
</tr>
<tr>
<td><em>relativeTimeStamp</em></td>
<td>Indicates the time of logging measurement results, measured relative to the <em>absoluteTimeStamp</em>. Value in seconds.</td>
</tr>
<tr>
<td><em>rlf-Cause</em></td>
<td>This field is used to indicate the cause of the last radio link failure that was detected. In case of handover failure information reporting (i.e., the connectionFailureType is set to ‘hof’), the UE is allowed to set this field to any value.</td>
</tr>
<tr>
<td><em>selectedUTRACellId</em></td>
<td>This field is used to indicate the UTRA cell that the UE selects after RLF is detected, while T311 is running. The UE sets the ARFCN according to the band selected for transmission/reception on the concerned cell.</td>
</tr>
<tr>
<td><em>signallingBLER-Result</em></td>
<td>Includes a BLER result of MBSFN subframes using signallingMCS.</td>
</tr>
<tr>
<td><em>tac-FailedPCell</em></td>
<td>This field is used to indicate the Tracking Area Code of the PCell in which RLF is detected.</td>
</tr>
<tr>
<td><em>tce-Id</em></td>
<td>Parameter Trace Collection Entity Id: See TS 32.422 [58].</td>
</tr>
<tr>
<td><em>timeConnFailure</em></td>
<td>This field is used to indicate the time elapsed since the last HO initialization until connection failure. Actual value = field value * 100ms. The maximum value 1023 means 102.3s or longer.</td>
</tr>
<tr>
<td><em>timeSinceFailure</em></td>
<td>This field is used to indicate the time that elapsed since the connection (establishment) failure. Value in seconds. The maximum value 172800 means 172800s or longer.</td>
</tr>
<tr>
<td><em>timeStamp</em></td>
<td>Includes time stamps for the waypoints that describe planned locations for the UE.</td>
</tr>
<tr>
<td><em>traceRecordingSessionRef</em></td>
<td>Parameter Trace Recording Session Reference: See TS 32.422 [58].</td>
</tr>
<tr>
<td><em>wayPointLocation</em></td>
<td>Includes location coordinates for a UE for Aerial UE operation. The waypoints describe planned locations for the UE.</td>
</tr>
</tbody>
</table>

---

**ULHandoverPreparationTransfer (CDMA2000)**

The *ULHandoverPreparationTransfer* message is used for the uplink transfer of handover related CDMA2000 information when requested by the higher layers.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

---

**ULHandoverPreparationTransfer message**

```asn1
ULHandoverPreparationTransfer ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE {
      ulHandoverPreparationTransfer-r8  ULHandoverPreparationTransfer-r8-IEs,
    }
  }
}
```

---
spare3 NULL, spare2 NULL, spare1 NULL
},
criticalExtensionsFuture  SEQUENCE {}
}

ULHandoverPreparationTransfer-r8-IEs ::= SEQUENCE {
cdma2000-Type      CDMA2000-Type,
meid        BIT STRING (SIZE (56)) OPTIONAL,
dedicatedInfo      DedicatedInfoCDMA2000,
nonCriticalExtension    ULHandoverPreparationTransfer-v8a0-IEs OPTIONAL
}

ULHandoverPreparationTransfer-v8a0-IEs ::= SEQUENCE {
lateNonCriticalExtension   OCTET STRING      OPTIONAL,
nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

-- ASN1STOP

ULHandoverPreparationTransfer field descriptions

meid
The 56 bit mobile identification number provided by the CDMA2000 Upper layers.

-- ULInformationTransfer

The ULInformationTransfer message is used for the uplink transfer of NAS or non-3GPP dedicated information.

Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet). If SRB2 is suspended, the UE does not send this message until SRB2 is resumed

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

ULInformationTransfer message

-- ASN1START

ULInformationTransfer ::=   SEQUENCE {
criticalExtensions     CHOICE {
c1         CHOICE {
ulInformationTransfer-r8   ULInformationTransfer-r8-IEs,
spare3 NULL, spare2 NULL, spare1 NULL
},
criticalExtensionsFuture  SEQUENCE {}
}
}

ULInformationTransfer-r8-IEs ::= SEQUENCE {
dedicatedInfoType   CHOICE {
dedicatedInfoNAS     DedicatedInfoNAS,
dedicatedInfoCDMA2000-1XRTT   DedicatedInfoCDMA2000-1XRTT,
dedicatedInfoCDMA2000-HRPD   DedicatedInfoCDMA2000-HRPD
},
nonCriticalExtension    ULInformationTransfer-v8a0-IEs OPTIONAL
}

ULInformationTransfer-v8a0-IEs ::= SEQUENCE {
lateNonCriticalExtension   OCTET STRING      OPTIONAL,
nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

-- ASN1STOP
-- ULInformationTransferMRDC

The ULInformationTransferMRDC message is used for the uplink transfer of MR DC information (i.e. for the case the SCG employs another RAT e.g. for transferring the NR RRC Measurement Report message).

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

ULInformationTransferMRDC message

-- ASN1START

ULInformationTransferMRDC-r15 ::= SEQUENCE {
criticalExtensions     CHOICE {
c1         CHOICE {
ulInformationTransferMRDC-r15   ULInformationTransferMRDC-r15-IEs,
spare3 NULL, spare2 NULL, spare1 NULL
},
criticalExtensionsFuture   SEQUENCE {}
}
ULInformationTransferMRDC-r15-IEs ::= SEQUENCE {
ul-DCCH-MessageNR-r15   OCTET STRING      OPTIONAL,
lateNonCriticalExtension  OCTET STRING      OPTIONAL,
nonCriticalExtension   SEQUENCE {}       OPTIONAL
}

-- ASN1STOP

ULInformationTransferMRDC field descriptions

ul-DCCH-MessageNR Includes the UL-DCCH-Message as defined in TS 38.331 [82]. In this version of the specification, the field is only used to transfer the NR RRC MeasurementReport message.

-- WLANConnectionStatusReport

The WLANConnectionStatusReport message is used to inform the successful connection to WLAN or failure of the WLAN connection or connection attempt(s).

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

WLANConnectionStatusReport message

-- ASN1START

WLANConnectionStatusReport-r13 ::= SEQUENCE {
criticalExtensions     CHOICE {
c1         CHOICE {
wlanConnectionStatusReport-r13 WLANConnectionStatusReport-r13-IEs,
spare3 NULL, spare2 NULL, spare1 NULL
},
criticalExtensionsFuture   SEQUENCE {}
}
WLANConnectionStatusReport-r13-IEs ::= SEQUENCE {
wlan-Status-r13 WLAN-Status-r13,
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lateNonCriticalExtension OCTET STRING OPTIONAL,
nonCriticalExtension WLANConnectionStatusReport-v1430-IEs OPTIONAL

WLANConnectionStatusReport-v1430-IEs ::= SEQUENCE {
  wlan-Status-v1430 WLAN-Status-v1430,
  nonCriticalExtension SEQUENCE () OPTIONAL
}

WLANConnectionStatusReport-v1430-IEs ::= SEQUENCE {
  wlan-Status-v1430 WLAN-Status-v1430,
  nonCriticalExtension SEQUENCE () OPTIONAL
}

-- ASN1STOP

WLANConnectionStatusReport field descriptions

wlan-Status Indicates the connection status to WLAN and the cause of failures. If the wlan-Status-v1430 is included, E-UTRAN ignores the wlan-Status-r13.

6.3 RRC information elements

6.3.1 System information blocks

– SystemInformationBlockPos

The IE SystemInformationBlockPos contains positioning assistance data as defined in TS 36.355 [54].

SystemInformationBlockPos information element

-- ASN1START

SystemInformationBlockPos-r15 ::= SEQUENCE {
  assistanceDataSIB-Element-r15 OCTET STRING,
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  ...
}

-- ASN1STOP

SystemInformationBlockPos field descriptions

assistanceDataSIB-Element Parameter AssistanceDataSIBelement defined in TS 36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.

– SystemInformationBlockType2

The IE SystemInformationBlockType2 contains radio resource configuration information that is common for all UEs.

NOTE: UE timers and constants related to functionality for which parameters are provided in another SIB are included in the corresponding SIB.

SystemInformationBlockType2 information element

-- ASN1START

SystemInformationBlockType2 ::= SEQUENCE {
  ac-BarringInfo SEQUENCE {
    ac-BarringForEmergency BOOLEAN,
    ac-BarringForMO-Signalling AC-BarringConfig OPTIONAL, -- Need OP
    ac-BarringForMO-Data AC-BarringConfig OPTIONAL -- Need OP
  } OPTIONAL, -- Need OP
  radioResourceConfigCommon RadioResourceConfigCommonSIB,
  ue-TimersAndConstants UE-TimersAndConstants,
  freqInfo SEQUENCE {
    ul-CarrierFreq ARFCN-ValueEUTRA OPTIONAL, -- Need OP
    ul-Bandwidth ENUMERATED {n6, n15, n25, n50, n75, n100} OPTIONAL, -- Need OP
    additionalSpectrumEmission AdditionalSpectrumEmission
  },
  mbsfn-SubframeConfigList MBSFN-SubframeConfigList OPTIONAL, -- Need OR
}

-- ASN1STOP
timeAlignmentTimerCommon ::= TimeAlignmentTimer,
...,
laterNonCriticalExtension OPTIONAL,
OCTET STRING (CONTAINING SystemInformationBlockType2-v8h0-IEs),

[[ ssac-BarringForMMTEL-Voice-r9 AC-BarringConfig OPTIONAL, -- Need OP
  ssac-BarringForMMTEL-Video-r9 AC-BarringConfig OPTIONAL -- Need OP
  ],
[[ ac-BarringForCSFB-r10 AC-BarringConfig OPTIONAL -- Need OP
  ],
[[ ac-BarringSkipForMMTELVoice-r12 ENUMERATED {true} OPTIONAL, -- Need OP
  ac-BarringSkipForMMTELVedio-video-r12 ENUMERATED {true} OPTIONAL, -- Need OP
  ac-BarringPerPLMN-List-r12 AC-BarringPerPLMN-List-r12 OPTIONAL -- Need OP
  ],
[[ voiceServiceCauseIndication-r12 ENUMERATED {true} OPTIONAL -- Need OP
  ],
[[ ac-BarringForCommon-r13 ACDC-BarringForCommon-r13 OPTIONAL, -- Need OP
  ac-BarringPerPLMN-List-r13 ACDC-BarringPerPLMN-List-r13 OPTIONAL -- Need OP
  ],
[[  udt-RestrictingForCommon-r13 UDT-Restricting-r13 OPTIONAL, -- Need OR
  udt-RestrictingPerPLMN-List-r13 UDT-RestrictingPerPLMN-List-r13 OPTIONAL, -- Need OR
  cIoT-EPS-OptimisationInfo-r13 CIoT-EPS-OptimisationInfo-r13 OPTIONAL, -- Need OP
  useFullResumeID-r13 ENUMERATED {true} OPTIONAL -- Need OP
  ],
[[  mbsfn-SubframeConfigList-v1430 MBSFN-SubframeConfigList-v1430 OPTIONAL, -- Need OP
  videoServiceCauseIndication-r14 ENUMERATED {true} OPTIONAL -- Need OP
  ],
[[  plmn-InfoList-r15 PLMN-InfoList-r15 OPTIONAL -- Need OP
  ],
[[  cp-EDT-r15 ENUMERATED {true} OPTIONAL, -- Need OR
  up-EDT-r15 ENUMERATED {true} OPTIONAL, -- Need OR
  idleModeMeasurements-r15 ENUMERATED {true} OPTIONAL, -- Need OR
  reducedCP-LatencyEnabled-r15 ENUMERATED {true} OPTIONAL -- Need OR
  ]]
} SystemInformationBlockType2-v8h0-IEs ::= SEQUENCE {
  multiBandInfoList SEQUENCE (SIZE (1..maxMultiBands)) OF AdditionalSpectrumEmission
  OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType2-v9e0-IEs OPTIONAL
}

SystemInformationBlockType2-v9e0-IEs ::= SEQUENCE {
  ul-CarrierFreq-v9e0 ARFCN-ValueEUTRA-v9e0 OPTIONAL, -- Cond ul-FreqMax
  nonCriticalExtension SystemInformationBlockType2-v910-IEs OPTIONAL
}

SystemInformationBlockType2-v910-IEs ::= SEQUENCE {
  -- Following field is for any non-critical extensions from REL-9
  nonCriticalExtension OCTET STRING (CONTAINING SystemInformationBlockType2-v10m0-IEs)
  OPTIONAL,
  dummy SEQUENCE {} OPTIONAL
}

SystemInformationBlockType2-v10m0-IEs ::= SEQUENCE {
  freqInfo-v1010 SEQUENCE {
    additionalSpectrumEmission-v1010 AdditionalSpectrumEmission-v1010
    OPTIONAL,
    multiBandInfoList-v1010 SEQUENCE (SIZE (1..maxMultiBands)) OF AdditionalSpectrumEmission-v1010
    OPTIONAL,
    -- Following field is for non-critical extensions from REL-10
    nonCriticalExtension SEQUENCE {} OPTIONAL
  }
  -- Need OR
}

AC-BarringConfig ::= SEQUENCE {
  ac-BarringFactor ENUMERATED {
    p00, p05, p10, p15, p20, p25, p30, p40,
    p50, p60, p70, p75, p80, p85, p90, p95,
  }
  ac-BarringTime ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512},
  ac-BarringForSpecialAC BIT STRING (SIZE(8))
}

MBSFN-SubframeConfigList ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig
MBSFN-SubframeConfigList-v1430 ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig-v1430

AC-BarringPerPLMN-List-r12 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF AC-BarringPerPLMN-r12

AC-BarringPerPLMN-r12 ::= SEQUENCE {
  plmn-IdentityIndex-r12       INTEGER (1..maxPLMN-r11),
  ac-BarringInfo-r12           SEQUENCE {
    ac-BarringForEmergency-r12  BOOLEAN,
    ac-BarringForMO-Signalling-r12  AC-BarringConfig OPTIONAL, -- Need OP
    ac-BarringForMO-Data-r12    AC-BarringConfig OPTIONAL -- Need OP
  } OPTIONAL, -- Need OP,
  ac-BarringSkipForMMTELVoice-r12 ENUMERATED {true}  OPTIONAL, -- Need OP
  ac-BarringSkipForMMTELVideo-r12 ENUMERATED {true}  OPTIONAL, -- Need OP
  ac-BarringSkipForCSFB-r12   AC-BarringConfig OPTIONAL, -- Need OP
  ssac-BarringForMMTEL-Voice-r12 AC-BarringConfig OPTIONAL, -- Need OP
  ssac-BarringForMMTEL-Video-r12 AC-BarringConfig OPTIONAL -- Need OP
}

ACDC-BarringForCommon-r13 ::= SEQUENCE {
  acdc-HPLMNonly-r13     BOOLEAN,
  barringPerACDC-CategoryList-r13    BarringPerACDC-CategoryList-r13
}

ACDC-BarringPerPLMN-List-r13 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF ACDC-BarringPerPLMN-r13

ACDC-BarringPerPLMN-r13 ::= SEQUENCE {
  plmn-IdentityIndex-r13    INTEGER (1..maxPLMN-r11),
  acdc-OnlyForHPLMN-r13     BOOLEAN,
  barringPerACDC-CategoryList-r13    BarringPerACDC-CategoryList-r13
}

BarringPerACDC-CategoryList-r13 ::= SEQUENCE (SIZE (1..maxACDC-Cat-r13)) OF BarringPerACDC-Category-r13

BarringPerACDC-Category-r13 ::= SEQUENCE {
  acdc-Category-r13    INTEGER (1..maxACDC-Cat-r13),
  acdc-BarringConfig-r13   SEQUENCE {
    ac-BarringFactor-r13   ENUMERATED {p00, p05, p10, p15, p20, p25, p30, p40, p50, p60, p70, p75, p80, p85, p90, p95,
                                    p02, p04, p06, p08, p16, p32, p64, s128, s256, s512
                                 } OPTIONAL -- Need OP
  } OPTIONAL
}

UDT-Restricting-r13 ::= SEQUENCE {
  udt-Restricting-r13     ENUMERATED {true}   OPTIONAL, --Need OR
  udt-RestrictingTime-r13    ENUMERATED {s4, s8, s16, s32, s128, s256, s512} OPTIONAL --Need OR
}

UDT-RestrictingPerPLMN-List-r13 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF UDT-RestrictingPerPLMN-r13

UDT-RestrictingPerPLMN-r13 ::= SEQUENCE {
  plmn-IdentityIndex-r13     INTEGER (1..maxPLMN-r11),
  udt-Restricting-r13       UDT-Restricting-r13  OPTIONAL --Need OR
}

CIOT-EPS-OptimisationInfo-r13 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF CIOT-OptimisationPLMN-r13

CIOT-OptimisationPLMN-r13 ::= SEQUENCE {
  up-CIOT-EPS-Optimisation-r13 ENUMERATED {true}   OPTIONAL, -- Need OP
  cp-CIOT-EPS-Optimisation-r13 ENUMERATED {true}   OPTIONAL, -- Need OP
  attachWithoutPDN-Connectivity-r13 ENUMERATED {true}   OPTIONAL -- Need OP
}

PLMN-InfoList-r15 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-Info-r15

PLMN-Info-r15 ::= SEQUENCE {
  upperLayerIndication-r15   ENUMERATED {true}   OPTIONAL -- Need OR
}

-- ASN1STOP
**SystemInformationBlockType2 field descriptions**

**ac-BarringFactor**  
If the random number drawn by the UE is lower than this value, access is allowed. Otherwise the access is barred. The values are interpreted in the range [0,1): p00 = 0, p05 = 0.05, p10 = 0.10, ..., p95 = 0.95. Values other than p00 can only be set if all bits of the corresponding ac-BarringForSpecialAC are set to 0.

**ac-BarringForCSFB**  
Access class barring for mobile originating CS fallback.

**ac-BarringForEmergency**  
Access class barring for AC 10.

**ac-BarringForMO-Data**  
Access class barring for mobile originating calls.

**ac-BarringForMO-Signalling**  
Access class barring for mobile originating signalling.

**ac-BarringForSpecialAC**  
Access class barring for AC 11-15. The first/leftmost bit is for AC 11, the second bit is for AC 12, and so on.

**ac-BarringTime**  
Mean access barring time value in seconds.

**acdc-BarringConfig**  
Barring configuration for an ACDC category. If the field is absent, access to the cell is considered as not barred for the ACDC category in accordance with subclause 5.3.3.13.

**acdc-Category**  
Indicates the ACDC category as defined in TS 24.105 [72].

**acdc-OnlyForHPLMN**  
Indicates whether ACDC is applicable for UEs not in their HPLMN for the corresponding PLMN. TRUE indicates that ACDC is applicable only for UEs in their HPLMN and UEs not in their HPLMN for the corresponding PLMN.

**additionalSpectrumEmission**  
The UE requirements related to IE AdditionalSpectrumEmission are defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs. NOTE 1.

**attachWithoutPDN-Connectivity**  
If present, the field indicates that attach without PDN connectivity as specified in TS 24.301 [35] is supported for this PLMN.

**barringPerACDC-CategoryList**  
A list of barring information per ACDC category according to the order defined in TS 22.011 [10]. The first entry in the list corresponds to the highest ACDC category of which applications are the least restricted in access attempts at a cell, the second entry in the list corresponds to the ACDC category of which applications are restricted more than applications of the highest ACDC category in access attempts at a cell, and so on. The last entry in the list corresponds to the lowest ACDC category of which applications are the most restricted in access attempts at a cell.

**cIoT-EPS-OptimisationInfo**  
A list of CIoT EPS related parameters. Value 1 indicates parameters for the PLMN listed 1st in the 1st plmn-IdentityList included in SIB1. Value 2 indicates parameters for the PLMN listed 2nd in the same plmn-IdentityList, or when no more PLMN are present within the same plmn-IdentityList, then the value indicates parameters for PLMN listed 1st in the subsequent plmn-IdentityList within the same SIB1 and so on. NOTE 1.

**cp-CIoT-EPS-Optimisation**  
This field indicates if the UE is allowed to establish the connection with Control plane CIoT EPS Optimisation, see TS 24.301 [35].

**cp-EDT**  
This field indicates whether the UE is allowed to initiate CP-EDT, see 5.3.3.1b.

**dummy**  
This field is not used in the specification. If received it shall be ignored by the UE.

**idleModeMeasurements**  
This field indicates that the eNB can process indication of IDLE mode measurements from UE.

**mbsfn-SubframeConfigList**  
Defines the subframes that are reserved for MBSFN in downlink.

NOTE 1. If the cell is a FeMBMS/Unicast mixed cell, EUTRAN includes mbsfn-SubframeConfigList-v1430. If a FeMBMS/Unicast mixed cell does not use sub-frames #4 or #9 as MBSFN sub-frames, mbsfn-SubframeConfigList-v1430 is still included and indicates all sub-frames as non-MBSFN sub-frames.

**multiBandInfoList**  
A list of AdditionalSpectrumEmission i.e. one for each additional frequency band included in multiBandInfoList in SystemInformationBlockType1, listed in the same order. If E-UTRAN includes multiBandInfoList-v1010 it includes the same number of entries, and listed in the same order, as in multiBandInfoList.

**plmn-IdentityIndex**  
Index of the PLMN across the plmn-IdentityList fields included in SIB1. Value 1 indicates the PLMN listed 1st in the 1st plmn-IdentityList included in SIB1. Value 2 indicates the PLMN listed 2nd in the same plmn-IdentityList, or when no more PLMN are present within the same plmn-IdentityList, then the PLMN listed 1st in the subsequent plmn-IdentityList within the same SIB1 and so on. NOTE 1.
SystemInformationBlockType2 field descriptions

plmn-InfoList
If E-UTRAN includes this field, it includes the same number of entries, and listed in the same order as PLMNs across the plmn-IdentityList fields included in SIB1. I.e. the first entry corresponds to the first entry of the combined list that results from concatenating the entries included in the second to the original plmn-IdentityList field.

reducedCP-LatencyEnabled
If present, reduced control plane latency is enabled. UEs supporting reduced CP latency transmit Msg3 according to $k \geq 5$ timing as specified in TS 36.213 [23] when transmitting RRCConnectionResumeRequest in Msg3.

ssac-BarringForMMTEL-Video
Service specific access class barring for MMTEL video originating calls.

ssac-BarringForMMTEL-Voice
Service specific access class barring for MMTEL voice originating calls.

utd-Restricting
Value TRUE indicates that the UE should indicate to the higher layers to restrict unattended data traffic TS 22.101 [77] irrespective of the UE being in RRC_IDLE or RRC_CONNECTED. The UE shall not indicate to the higher layers if the UE has one or more Access Classes, as stored on the USIM, with a value in the range 11..15, which is valid for the UE to use according to TS 22.011 [10] and TS 23.122 [11].

utd-RestrictingTime
If present and when the utd-Restricting changes from TRUE, the UE runs a timer for a period equal to rand * utd-RestrictingTime, where rand is a random number drawn that is uniformly distributed in the range $0 \leq \text{rand} < 1$ value in seconds. The timer stops if utd-Restricting changes to TRUE. Upon timer expiry, the UE indicates to the higher layers that the restriction is alleviated.

unicastFreqHoppingInd
This field indicates if the UE is allowed to indicate support of frequency hopping for unicast MPDCCH/PDSCH/PUSCH as described in TS 36.321 [6]. This field is included only in the BR version of SI message carrying SystemInformationBlockType2.

ul-Bandwidth
Parameter: transmission bandwidth configuration, Npta, in uplink, see TS 36.101 [42, table 5.6-1]. Value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If for FDD this parameter is absent, the uplink bandwidth is equal to the downlink bandwidth. For TDD this parameter is absent and it is equal to the downlink bandwidth. NOTE 1.

ul-CarrierFreq
For FDD: If absent, the (default) value determined from the default TX-RX frequency separation defined in TS 36.101 [42, table 5.7.3-1] applies. For TDD: This parameter is absent and it is equal to the downlink frequency. NOTE 1.

up-CIoT-EPS-Optimisation
This field indicates if the UE is allowed to resume the connection with User plane CIoT EPS Optimisation, see TS 24.301 [35].

up-EDT
This field indicates whether the UE is allowed to initiate UP-EDT, see 5.3.3.1b.

upperLayerIndication
Indication to be provided to upper layers.

useFullResumeID
This field indicates if the UE indicates full resume ID of 40 bits in RRCConnectionResumeRequest.

videoServiceCauseIndication
Indicates whether the UE is requested to use the establishment cause mo-VoiceCall for mobile originating MMTEL video calls.

voiceServiceCauseIndication
Indicates whether UE is requested to use the establishment cause mo-VoiceCall for mobile originating MMTEL voice calls.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ul-FreqMax</td>
<td>The field is mandatory present if ul-CarrierFreq (i.e. without suffix) is present and set to maxEARFCN. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

NOTE 1: E-UTRAN sets this field to the same value for all instances of SI message that are broadcasted within the same cell.
The IE `SystemInformationBlockType3` contains cell re-selection information common for intra-frequency, inter-frequency and/or inter-RAT cell re-selection (i.e. applicable for more than one type of cell re-selection but not necessarily all) as well as intra-frequency cell re-selection information other than neighbouring cell related.

**SystemInformationBlockType3 information element**

```asn
SystemInformationBlockType3 ::= SEQUENCE {
  cellReselectionInfoCommon
    SEQUENCE {
      q-Hyst        ENUMERATED {
        dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10,
        dB12, dB14, dB16, dB18, dB20, dB22, dB24},

      cellReselectionServingFreqInfo
        SEQUENCE {
          s-NonIntraSearch     ReselectionThreshold OPTIONAL,  -- Need OP
          threshServingLow     ReselectionThreshold,
          cellReselectionPriority
        },

      intraFreqCellReselectionInfo
        SEQUENCE {
          q-RxLevMin       Q-RxLevMin,
          p-Max        P-Max OPTIONAL,  -- Need OP
          s-IntraSearch      ReselectionThreshold OPTIONAL,  -- Need OP
          allowedMeasBandwidth
          presenceAntennaPort1
          neighCellConfig
          t-ReselectionEUTRA
          t-ReselectionEUTRA-SF
          SpeedStateScaleFactors OPTIONAL  -- Need OP
        },

      lateNonCriticalExtension
    OCTET STRING (CONTAINING SystemInformationBlockType3-v10j0-IEs) OPTIONAL,
    [[[ s-IntraSearch-v920
      SEQUENCE {
        s-IntraSearchP-r9     ReselectionThreshold,
        s-IntraSearchQ-r9     ReselectionThresholdQ-r9
      }

      s-NonIntraSearch-v920
        SEQUENCE {
          s-NonIntraSearchP-r9    ReselectionThreshold,
          s-NonIntraSearchQ-r9    ReselectionThresholdQ-r9
        }

      q-QualMin-r9      Q-QualMin-r9    OPTIONAL,  -- Need OP
      thresdBwSWLQ-r9    ReselectionThresholdQ-r9 OPTIONAL  -- Need OP
    },

    [[[ q-QualMinRSRQ-OnAllSymbols-r12   Q-QualMin-r9    OPTIONAL   -- Cond RSRQ
      ],

    ][[ q-QualMinRSRQ-OnAllSymbols-r12   Q-QualMin-r9    OPTIONAL   -- Cond RSRQ
      ],

    ],

    cellReselectionServingFreqInfo-v1310
      CellReselectionServingFreqInfo-v1310 OPTIONAL,  -- Need OP

    redistributionServingInfo-v13
      RedistributionServingInfo-v13 OPTIONAL,  -- Need OR

    cellSelectionInfoCE-v13
      CellSelectionInfoCE-v13 OPTIONAL,  -- Need OP

    t-ReselectionEUTRA-CE-v13
      T-ReselectionEUTRA-CE-v13 OPTIONAL  -- Need OP

    ],

    [[[ cellSelectionInfoCE1-v13
      CellSelectionInfoCE1-v13 OPTIONAL  -- Need OP
      ],

    ],

    [[[ cellSelectionInfoCommon-v1460  CellSelectionInfoCommon-v1460 OPTIONAL  -- Need OR
      ],

    ],

    [[[ cellSelectionInfoCE-v1530  CellSelectionInfoCE-v1530 OPTIONAL,  -- Need OR
      ],

    ],

    [[[ cellSelectionInfoCE1-v1530  CellSelectionInfoCE1-v1530 OPTIONAL,  -- Need OR
      ],

    ]

  },

  speedStateReselectionPars
    SEQUENCE {
      mobilityStateParameters
        SEQUENCE {
          q-HystSF
            SEQUENCE {
              sf-Medium      ENUMERATED {
                dB-6, dB-4, dB-2, dB0},
              sf-High      ENUMERATED {
                dB-6, dB-4, dB-2, dB0},
          }
        },

      intraFreqCellReselectionInfo
        SEQUENCE {
          q-RxLevMin       Q-RxLevMin,
          p-Max        P-Max OPTIONAL,  -- Need OP
          s-IntraSearch      ReselectionThreshold OPTIONAL,  -- Need OP
          allowedMeasBandwidth
          presenceAntennaPort1
          neighCellConfig
          t-ReselectionEUTRA
          t-ReselectionEUTRA-SF
          SpeedStateScaleFactors OPTIONAL  -- Need OP
        },

      lateNonCriticalExtension
    OCTET STRING (CONTAINING SystemInformationBlockType3-v10j0-IEs) OPTIONAL,
    [[[ s-IntraSearch-v920
      SEQUENCE {
        s-IntraSearchP-r9     ReselectionThreshold,
        s-IntraSearchQ-r9     ReselectionThresholdQ-r9
      }

      s-NonIntraSearch-v920
        SEQUENCE {
          s-NonIntraSearchP-r9    ReselectionThreshold,
          s-NonIntraSearchQ-r9    ReselectionThresholdQ-r9
        }

      q-QualMin-r9      Q-QualMin-r9    OPTIONAL,  -- Need OP
      thresdBwSWLQ-r9    ReselectionThresholdQ-r9 OPTIONAL  -- Need OP
    },

    [[[ q-QualMinRSRQ-OnAllSymbols-r12   Q-QualMin-r9    OPTIONAL   -- Cond RSRQ
      ],

    ],

    cellReselectionServingFreqInfo-v1310
      CellReselectionServingFreqInfo-v1310 OPTIONAL,  -- Need OP

    redistributionServingInfo-v13
      RedistributionServingInfo-v13 OPTIONAL,  -- Need OR

    cellSelectionInfoCE-v13
      CellSelectionInfoCE-v13 OPTIONAL,  -- Need OP

    t-ReselectionEUTRA-CE-v13
      T-ReselectionEUTRA-CE-v13 OPTIONAL  -- Need OP

    ],

    [[[ cellSelectionInfoCE1-v13
      CellSelectionInfoCE1-v13 OPTIONAL  -- Need OP
      ],

    ],

    [[[ cellSelectionInfoCommon-v1460  CellSelectionInfoCommon-v1460 OPTIONAL  -- Need OR
      ],

    ],

    [[[ cellSelectionInfoCE-v1530  CellSelectionInfoCE-v1530 OPTIONAL,  -- Need OR
      ],

    ],

    [[[ cellSelectionInfoCE1-v1530  CellSelectionInfoCE1-v1530 OPTIONAL,  -- Need OR
      ],

    ]

  }

  },

  lateNonCriticalExtension
}
```
 redistributedServingInfo-r13 ::= SEQUENCE {
  redistributionFactorServing-r13 INTEGER (0..10),
  redistributionFactorCell-r13 ENUMERATED {true} OPTIONAL, -- Need OP
  t360-r13 ENUMERATED {min4, min8, min16, min32, infinity, spare3, spare2, spare1},
  redistrOnPagingOnly-r13 ENUMERATED {true} OPTIONAL -- Need OP
}

CellReselectionServingFreqInfo-v1310 ::= SEQUENCE {
  cellReselectionSubPriority-r13 CellReselectionSubPriority-r13
}

-- Late non critical extensions
SystemInformationBlockType3-v10j0-IEs ::= SEQUENCE {
  freqBandInfo-r10     NS-PmaxList-r10    OPTIONAL, -- Need OR
  multiBandInfoList-v10j0    MultiBandInfoList-v10j0  OPTIONAL, -- Need OR
  nonCriticalExtension    SystemInformationBlockType3-v10l0-IEs
    OPTIONAL
}

SystemInformationBlockType3-v10l0-IEs ::= SEQUENCE {
  freqBandInfo-v10l0     NS-PmaxList-v10l0   OPTIONAL, -- Need OR
  multiBandInfoList-v10l0    MultiBandInfoList-v10l0  OPTIONAL, -- Need OR
  nonCriticalExtension    SEQUENCE {}     OPTIONAL
}

CellReselectionInfoCommon-v1460 ::= SEQUENCE {
  s-SearchDeltaP-r14     ENUMERATED {dB6, dB9, dB12, dB15}
}

CellReselectionInfoHSDN-r15 ::= SEQUENCE {
  cellEquivalentSize-r15    INTEGER (2..16)
}

-- ASN1STOP
SystemInformationBlockType3 field descriptions

allowedMeasBandwidth
If absent, the value corresponding to the downlink bandwidth indicated by the dl-Bandwidth included in MasterInformationBlock applies.

cellEquivalentSize
The number of cell count used for mobility state estimation for this cell as specified in TS 36.304 [4].

cellSelectionInfoCE
Parameters included in coverage enhancement S criteria for BL UEs and UEs in CE, applicable for intra-frequency neighbour cells. If absent, coverage enhancement S criteria is not applicable.

cellSelectionInfoCE1
Parameters included in coverage enhancement S criteria for BL UEs and UEs in CE supporting CE Mode B, applicable for intra-frequency neighbour cells. E-UTRAN includes this IE only if cellSelectionInfoCE in SIB3 is present.

cellReselectionInfoCommon
Cell re-selection information common for cells.

cellReselectionServingFreqInfo
Information common for Cell re-selection to inter-frequency and inter-RAT cells.

crs-IntfMitigNeighCellsCE
For BL UEs or UEs in CE supporting ce-CRS-IntfMitig, this field indicates CRS interference mitigation, as specified in TS 36.133 [16], subclause 3.6.1.2 and 3.6.1.3, is enabled in any of the intra-frequency neighbour cells, and the UE shall perform intra-frequency neighbour cell RRM measurements in the center 6 PRBs.

freqBandInfo
A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, applicable for the intra-frequency neighbouring E-UTRA cells if the UE selects the frequency bands from freqBandIndicator in SystemInformationBlockType1. If E-UTRAN includes freqBandInfo-v10l0 it includes the same number of entries, and listed in the same order, as in freqBandInfo-v10.

intraFreqCellReselectionInfo
Cell re-selection information common for intra-frequency cells.

multiBandInfoList-v10j0
A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, applicable for the intra-frequency neighbouring E-UTRA cells if the UE selects the frequency bands in multiBandInfoList (i.e. without suffix) or multiBandInfoList-v9e0. If E-UTRAN includes multiBandInfoList-v10j0, it includes the same number of entries, and listed in the same order, as in multiBandInfoList (i.e. without suffix). If E-UTRAN includes multiBandInfoList-v10l0 it includes the same number of entries, and listed in the same order, as in multiBandInfoList-v10j0.

p-Max
Value applicable for the intra-frequency neighbouring E-UTRA cells. If absent the UE applies the maximum power according to its capability as specified in TS 36.101 [42, 6.2.2].

redistrOnPagingOnly
If this field is present and the UE is redistribution capable, the UE shall only wait for the paging message to trigger E-UTRAN inter-frequency redistribution procedure as specified in 5.2.4.10 of TS 36.304 [4].

q-Hyst
Parameter Qhyst in TS 36.304 [4]. Value in dB. Value dB1 corresponds to 1 dB, dB2 corresponds to 2 dB and so on.

q-HystSF
Parameter "Speed dependent ScalingFactor for Qhyst" in TS 36.304 [4]. The sf-Medium and sf-High concern the additional hysteresis to be applied, in Medium and High Mobility state respectively, to Qhyst as defined in TS 36.304 [4]. In dB. Value dB-6 corresponds to -6dB, dB-4 corresponds to -4dB and so on.

q-QualMin
Parameter "Qqualmin" in TS 36.304 [4], applicable for intra-frequency neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin. NOTE 1.

q-QualMinRSRQ-OnAllSymbols
If this field is present and supported by the UE, the UE shall, when performing RSRQ measurements, perform RSRQ measurement on all OFDM symbols in accordance with TS 36.214 [48]. NOTE 1.

q-QualMinWB
If this field is present and supported by the UE, the UE shall, when performing RSRQ measurements, use a wider bandwidth in accordance with TS 36.133 [16]. NOTE 1.

q-RxLevMin
Parameter "Qrxlevmin" in TS 36.304 [4], applicable for intra-frequency neighbour cells.

redistributionFactorCell
If redistributionFactorCell is present, redistributionFactorServing is only applicable for the serving cell otherwise it is applicable for serving frequency.

redistributionFactorServing
Parameter redistributionFactorServing in TS 36.304 [4].

s-IntraSearch
Parameter "S-IntraSearch" in TS 36.304 [4]. If the field s-IntraSearchP is present, the UE applies the value of s-IntraSearchP instead. Otherwise if neither s-IntraSearch nor s-IntraSearchP is present, the UE applies the (default) value of infinity for S-IntraSearchP.

q-RxLevMin
SystemInformationBlockType3 field descriptions

- **s-IntraSearchP**

- **s-IntraSearchQ**
  Parameter "s-IntraSearchQ" in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of 0 dB for s-IntraSearchQ.

- **s-NonIntraSearchP**
  Parameter "s-NonIntraSearchP" in TS 36.304 [4]. If the field s-NonIntraSearchP is present, the UE applies the value of s-NonIntraSearchP instead. Otherwise if neither s-NonIntraSearch nor s-NonIntraSearchP is present, the UE applies the (default) value of infinity for SnonIntraSearchP.

- **s-NonIntraSearchQ**

- **s-SearchDeltaP**
  Parameter "s-SearchDeltaP" in TS 36.304 [4]. This parameter is only applicable for UEs supporting relaxed monitoring as specified in TS 36.306 [5]. Value dB6 corresponds to 6 dB, dB9 corresponds to 9 dB and so on.

- **speedStateReselectionPars**
  Speed dependent reselection parameters, see TS 36.304 [4]. If this field is absent, i.e, mobilityStateParameters is also not present, UE behaviour is specified in TS 36.304 [4].

- **t360**
  Parameter "T360" in TS 36.304 [4]. Value min4 corresponds to 4 minutes, value min8 corresponds to 8 minutes, and so on.

- **threshServingLow**
  Parameter "threshServingLow" in TS 36.304 [4].

- **threshServingLowQ**
  Parameter "threshServingLowQ" in TS 36.304 [4].

- **tReselectionEUTRA**
  Parameter "tReselectionEUTRA" in TS 36.304 [4].

- **tReselectionEUTRA-SF**
  Parameter "Speed dependent ScalingFactor for TreselectionEUTRA" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

---

NOTE 1: The value the UE applies for parameter "Q qualmin" in TS 36.304 [4] depends on the q-QualMin fields signalled by E-UTRAN and supported by the UE. In case multiple candidate options are available, the UE shall select the highest priority candidate option according to the priority order indicated by the following table (top row is highest priority).

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Included</td>
<td>Included</td>
<td>q-QualMinRSRQ-OnAllSymbols = (q-QualMin - q-QualMinWB)</td>
</tr>
<tr>
<td>Included</td>
<td>Not included</td>
<td>q-QualMinRSRQ-OnAllSymbols</td>
</tr>
<tr>
<td>Not included</td>
<td>Included</td>
<td>q-QualMinWB</td>
</tr>
<tr>
<td>Not included</td>
<td>Not included</td>
<td>q-QualMin</td>
</tr>
</tbody>
</table>

**Conditional presence**

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>OrxlevminCE1</td>
<td>The field is optionally present, Need OR, if q-RxLevMinCE1-r13 is set below -140 dBm. Otherwise the field is not present.</td>
</tr>
<tr>
<td>RSRQ</td>
<td>The field is optionally present, Need OR, if threshServingLowQ is present in SIB3; otherwise it is not present.</td>
</tr>
<tr>
<td>WB-RSRQ</td>
<td>The field is optionally present, need OP if the measurement bandwidth indicated by allowedMeasBandwidth is 50 resource blocks or larger; otherwise it is not present.</td>
</tr>
</tbody>
</table>

---

**SystemInformationBlockType4**

The IE SystemInformationBlockType4 contains neighbouring cell related information relevant only for intra-frequency cell re-selection. The IE includes cells with specific re-selection parameters as well as blacklisted cells.
SystemInformationBlockType4 field descriptions

csg-PhysCellIdRange
Set of physical cell identities reserved for CSG cells on the frequency on which this field was received. The received
 csg-PhysCellIdRange applies if less than 24 hours has elapsed since it was received and the UE is camped on a cell
 of the same primary PLMN where this field was received. The 3 hour validity restriction (section 5.2.1.3) does not
 apply to this field. The UE shall not apply any stored csg-PhysCellIdRange when it is in any cell selection state defined
 in TS 36.304 [4].

intraFreqBlackCellList
List of blacklisted intra-frequency neighbouring cells.

intraFreqNeighCellList
List of intra-frequency neighbouring cells with specific cell re-selection parameters.

intraFreqNeighHSDN-CellList
List of intra-frequency neighbouring HSDN cells as specified in TS 36.304 [4].

q-OffsetCell
Parameter "Qoffset,n" in TS 36.304 [4].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSG</td>
<td>This field is optional, need OP, for non-CSG cells, and mandatory for CSG cells.</td>
</tr>
</tbody>
</table>

SystemInformationBlockType5

The IE SystemInformationBlockType5 contains information relevant only for inter-frequency cell re-selection i.e.
information about other E-UTRA frequencies and inter-frequency neighbouring cells relevant for cell re-selection. The
IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

SystemInformationBlockType5 information element

-- ASN1START

SystemInformationBlockType5 ::= SEQUENCE {
  interFreqCarrierFreqList     InterFreqCarrierFreqList,
  ...,
  lateNonCriticalExtension   OCTET STRING (CONTAINING SystemInformationBlockType5-v8h0-IEs) OPTIONAL,
  [[ interFreqCarrierFreqList-v1250 InterFreqCarrierFreqList-v1250 OPTIONAL, -- Need OR
    interFreqCarrierFreqListExt-r12 InterFreqCarrierFreqListExt-r12 OPTIONAL -- Need OR ]],
  [[ interFreqCarrierFreqListExt-v1280 InterFreqCarrierFreqListExt-v1280 OPTIONAL -- Need OR ]],
  [[ interFreqCarrierFreqList-v1310 InterFreqCarrierFreqList-v1310 OPTIONAL, -- Need OR
    interFreqCarrierFreqListExt-v1310 InterFreqCarrierFreqListExt-v1310 OPTIONAL -- Need OR ]],
  [[ interFreqCarrierFreqList-v1350 InterFreqCarrierFreqList-v1350 OPTIONAL, -- Need OR
    interFreqCarrierFreqListExt-v1350 InterFreqCarrierFreqListExt-v1350 OPTIONAL -- Need OR ]],
  ...}

-- ASN1STOP
SystemInformationBlockType5-v8h0-IEs ::= SEQUENCE {
  interFreqCarrierFreqList-v8h0 SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v8h0
    OPTIONAL, -- Need OP
  nonCriticalExtension SystemInformationBlockType5-v9e0-IEs
    OPTIONAL
}

SystemInformationBlockType5-v9e0-IEs ::= SEQUENCE {
  interFreqCarrierFreqList-v9e0 SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v9e0
    OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType5-v10j0-IEs
    OPTIONAL
}

SystemInformationBlockType5-v10j0-IEs ::= SEQUENCE {
  interFreqCarrierFreqList-v10j0 SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v10j0
    OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType5-v10l0-IEs
    OPTIONAL
}

SystemInformationBlockType5-v10l0-IEs ::= SEQUENCE {
  interFreqCarrierFreqList-v10l0 SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v10l0
    OPTIONAL, -- Need OR
  nonCriticalExtension SystemInformationBlockType5-v13a0-IEs
    OPTIONAL
}

SystemInformationBlockType5-v13a0-IEs ::= SEQUENCE {
  -- Late non critical extensions from REL-10 upto REL-12
  lateNonCriticalExtension OCTET STRING
    OPTIONAL, -- Need OR
  interFreqCarrierFreqList-v13a0 InterFreqCarrierFreqList-v13a0
    OPTIONAL, -- Need OR
  -- Late non critical extensions from REL-13
  nonCriticalExtension SEQUENCE ()
    OPTIONAL
}

InterFreqCarrierFreqList ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo

InterFreqCarrierFreqList-v1250 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1250

InterFreqCarrierFreqList-v1310 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1310

InterFreqCarrierFreqList-v1350 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1350

InterFreqCarrierFreqList-v13a0 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v13a0

InterFreqCarrierFreqList-v1530 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1530

InterFreqCarrierFreqListExt-v12 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v12

InterFreqCarrierFreqListExt-v1310 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1310

InterFreqCarrierFreqListExt-v1350 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1350

InterFreqCarrierFreqListExt-v1360 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1360

InterFreqCarrierFreqListExt-v1530 ::= SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo-v1530

InterFreqCarrierFreqInfo ::= SEQUENCE {
}
InterFreqCarrierFreqInfo-v8h0 ::= SEQUENCE {
multiBandInfoList MultiBandInfoList OPTIONAL -- Need OR
}

InterFreqCarrierFreqInfo-v9e0 ::= SEQUENCE {
dl-CarrierFreq-v9e0 ARFCN-ValueEUTRA-v9e0 OPTIONAL, -- Cond dl-FreqMax
multiBandInfoList-v9e0 MultiBandInfoList-v9e0 OPTIONAL -- Need OR
}

InterFreqCarrierFreqInfo-v10j0 ::= SEQUENCE {
freqBandInfo-v10j0 NS-PmaxList-r10 OPTIONAL, -- Need OR
multiBandInfoList-v10j0 MultiBandInfoList-v10j0 OPTIONAL -- Need OR
}

InterFreqCarrierFreqInfo-v10l0 ::= SEQUENCE {
freqBandInfo-v10l0 NS-PmaxList-v10l0 OPTIONAL, -- Need OR
multiBandInfoList-v10l0 MultiBandInfoList-v10l0 OPTIONAL -- Need OR
}

InterFreqCarrierFreqInfo-v1250 ::=  SEQUENCE {
reducedMeasPerformance-r12 ENUMERATED {true} OPTIONAL, -- Need OP
q-QualMinRSRQ-OnAllSymbols-r12 Q-QualMin-r9 OPTIONAL -- Cond RSRQ2
}

InterFreqCarrierFreqInfo-r12 ::=  SEQUENCE {
dl-CarrierFreq-r12 ARFCN-ValueEUTRA-r9,
q-RxLevMin-r12 Q-RxLevMin,
p-Max-r12 P-Max OPTIONAL, -- Need OP
t-ReselectionEUTRA-r12 T-Reselection,
t-ReselectionEUTRA-SF-r12 SpeedStateScaleFactors OPTIONAL, -- Need OP
threshX-High-r12 ReselectionThreshold, threshX-Low-r12 ReselectionThreshold, allowedMeasBandwidth-r12 AllowedMeasBandwidth, presenceAntennaPort1-r12 PresenceAntennaPort1, cellReselectionPriority-r12 CellReselectionPriority OPTIONAL, -- Need OP
neighCellConfig-r12 NeighCellConfig,
q-OffsetFreq-r12 Q-OffsetRange DEFAULT dB0,
InterFreqNeighborCellList-r12 InterFreqNeighborCellList OPTIONAL, -- Need OR
InterFreqBlackCellList-r12 InterFreqBlackCellList OPTIONAL, -- Need OR

...[
  q-QualMin-r9 Q-QualMin-r9 OPTIONAL, -- Need OP
  threshX-Q-r9 SEQUENCE {
    threshX-HighQ-r9 ReselectionThresholdQ-r9, threshX-LowQ-r9 ReselectionThresholdQ-r9
  } OPTIONAL -- Cond RSRQ
  ],
...[
  q-QualMinWB-r11 Q-QualMin-r9 OPTIONAL -- Cond WB-RSRQ
  ]
]

InterFreqCarrierFreqInfo-v1310 ::= SEQUENCE {
cellReselectionSubPriority-r13 CellReselectionSubPriority-r13 OPTIONAL, -- Need OP
redistributionInterFreqInfo-r13 RedistributionInterFreqInfo-r13 OPTIONAL, --Need OP
cellSelectionInfoCE-r13 CellSelectionInfoCE-r13 OPTIONAL, -- Need OP
t-ReselectionEUTRA-CB-r13 T-ReselectionEUTRA-CB-r13 OPTIONAL -- Need OP
}

InterFreqCarrierFreqInfo-v1350 ::= SEQUENCE {
cellSelectionInfoCE1-r13 CellSelectionInfoCE1-r13 OPTIONAL -- Need OP
}

InterFreqCarrierFreqInfo-v1360 ::= SEQUENCE {
cellSelectionInfoCE1-v1360 CellSelectionInfoCE1-v1360 OPTIONAL -- Cond QrxlevminCE1
}

InterFreqCarrierFreqInfo-v1530 ::= SEQUENCE {
hsdn-Indication-r15 BOOLEAN,
interFreqNeighborHSDN-CellList-r15 InterFreqNeighborHSDN-CellList-r15 OPTIONAL, -- Need OR
cellSelectionInfoCE-v1530 CellSelectionInfoCE-v1530 OPTIONAL -- Need OP
}

InterFreqNeighborCellList ::= SEQUENCE (SIZE (1..maxCellInter)) OF InterFreqNeighborCellInfo

InterFreqNeighborHSDN-CellList-r15 ::= SEQUENCE (SIZE (1..maxCellInter)) OF PhysCellIdRange

InterFreqNeighborCellInfo ::= SEQUENCE {
physCellId PhysCellId,
q-OffsetCell Q-OffsetRange
}

InterFreqBlackCellList ::= SEQUENCE (SIZE (1..maxCellBlack)) OF PhysCellIdRange

RedistributionInterFreqInfo-r13 ::= SEQUENCE {
redistributionFactorFreq-r13 RedistributionFactor-r13 OPTIONAL, --Need OP
redistributionNeighborCellList-r13 RedistributionNeighborCellList-r13 OPTIONAL --Need OP
}

RedistributionNeighborCellList-r13 ::= SEQUENCE (SIZE (1..maxCellInter)) OF RedistributionNeighborCell-r13

RedistributionNeighborCell-r13 ::= SEQUENCE {
physCellId-r13 PhysCellId,
redistributionFactorCell-r13 RedistributionFactor-r13
}

RedistributionFactor-r13 ::= INTEGER(1..10)

-- ASN1STOP
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cellSelectionInfoCE</strong></td>
<td>Parameters included in coverage enhancement S criteria for BL UEs and UEs in CE, applicable for inter-frequency neighbour cells. If absent, coverage enhancement S criteria is not applicable.</td>
</tr>
<tr>
<td><strong>cellSelectionInfoCE1</strong></td>
<td>Parameters included in coverage enhancement S criteria for BL UEs and UEs in CE supporting CE Mode B. E-UTRAN includes this IE only in an entry of InterFreqCarrierFreqList-v1350 or InterFreqCarrierFreqListExt-v1350 if cellSelectionInfoCE is present in the corresponding entry of InterFreqCarrierFreqList-v1310 or InterFreqCarrierFreqListExt-v1310 is present.</td>
</tr>
<tr>
<td><strong>freqBandInfo</strong></td>
<td>A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, for the frequency band represented by dl-CarrierFreq for which cell reselection parameters are common. If E-UTRAN includes freqBandInfo-v10l0 it includes the same number of entries, and listed in the same order, as in freqBandInfo-r10.</td>
</tr>
<tr>
<td><strong>hsdn-Indication</strong></td>
<td>Indicates whether there are deployed HSDN cells or not on the the DL carrier frequency indicated by dl-CarrierFreq-r12.</td>
</tr>
<tr>
<td><strong>interFreqCarrierFreqList</strong></td>
<td>List of blacklisted inter-frequency neighbouring cells.</td>
</tr>
<tr>
<td><strong>interFreqCarrierFreqListExt</strong></td>
<td>List of neighbouring inter-frequencies. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the E-ARFCN used to indicate this. If E-UTRAN includes interFreqCarrierFreqList-v8h0, interFreqCarrierFreqList-v9e0, InterFreqCarrierFreqList-v1250, InterFreqCarrierFreqList-v1310, InterFreqCarrierFreqList-v1350, InterFreqCarrierFreqList-v15a0 and/or InterFreqCarrierFreqList-v1530, it includes the same number of entries, and listed in the same order, as in interFreqCarrierFreqList (i.e. without suffix). See Annex D for more descriptions.</td>
</tr>
<tr>
<td><strong>interFreqCarrierFreqListExt</strong></td>
<td>InterFreqCarrierFreqListExt list of additional neighbouring inter-frequencies, i.e. extending the size of the inter-frequency carrier list using the general principles specified in 5.1.2. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the E-ARFCN used to indicate this. EUTRAN may include interFreqCarrierFreqListExt even if interFreqCarrierFreqList (i.e without suffix) does not include maxFreq entries. If E-UTRAN includes interFreqCarrierFreqListExt-v1310, InterFreqCarrierFreqListExt-v1350, InterFreqCarrierFreqListExt-v1360 and/or InterFreqCarrierFreqListExt-v1340 it includes the same number of entries, and listed in the same order, as in interFreqCarrierFreqListExt-r12.</td>
</tr>
<tr>
<td><strong>interFreqNegCellList</strong></td>
<td>List of inter-frequency neighbouring cells with specific cell re-selection parameters.</td>
</tr>
<tr>
<td><strong>interFreqNegHSDN-CellList</strong></td>
<td>List of inter-frequency neighbouring HSDN cells as specified in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>multiBandInfoList</strong></td>
<td>Indicates the list of frequency bands in addition to the band represented by dl-CarrierFreq for which cell reselection parameters are common. E-UTRAN indicates at most maxMultBands frequency bands (i.e. the total number of entries across both multiBandInfoList and multiBandInfoList-v9e0 is below this limit).</td>
</tr>
<tr>
<td><strong>multiBandInfoList-v10j0</strong></td>
<td>A list of additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, for the frequency bands in multiBandInfoList (i.e. without suffix) and multiBandInfoList-v9e0. If E-UTRAN includes multiBandInfoList-v10j0 it includes the same number of entries, and listed in the same order, as in multiBandInfoList (i.e. without suffix). If E-UTRAN includes multiBandInfoList-v10l0 it includes the same number of entries, and listed in the same order, as in multiBandInfoList-v10j0.</td>
</tr>
<tr>
<td><strong>p-Max</strong></td>
<td>Value applicable for the neighbouring E-UTRA cells on this carrier frequency. If absent the UE applies the maximum power according to its capability as specified in TS 36.101 [42, 6.2.2].</td>
</tr>
<tr>
<td><strong>q-OffsetCell</strong></td>
<td>Parameter &quot;Qoffset-cell&quot; in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>q-OffsetFreq</strong></td>
<td>Parameter &quot;Qoffset-frequency&quot; in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>q-QualMin</strong></td>
<td>Parameter &quot;Qqualmin&quot; in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin. NOTE 1.</td>
</tr>
<tr>
<td><strong>q-QualMinRSRQ-OnAllSymbols</strong></td>
<td>If this field is present and supported by the UE, the UE shall, when performing RSRQ measurements, perform RSRQ measurement on all OFDM symbols in accordance with TS 36.214 [48]. NOTE 1.</td>
</tr>
<tr>
<td><strong>q-QualMinWB</strong></td>
<td>If this field is present and supported by the UE, the UE shall, when performing RSRQ measurements, use a wider bandwidth in accordance with TS 36.133 [16]. NOTE 1.</td>
</tr>
<tr>
<td><strong>redistributionFactorFreq</strong></td>
<td>Parameter redistributionFactorFreq in TS 36.304 [4].</td>
</tr>
</tbody>
</table>
**SystemInformationBlockType5 field descriptions**

- **redistributionFactorCell**
  Parameter `redistributionFactorCell` in TS 36.304 [4].

- **reducedMeasPerformance**
  Value `TRUE` indicates that the neighbouring inter-frequency is configured for reduced measurement performance, see TS 36.133 [16]. If the field is not included, the neighbouring inter-frequency is configured for normal measurement performance, see TS 36.133 [16].

- **scptm-FreqOffset**
  Parameter `QoffsetSCPTM` in TS 36.304 [4]. Actual value `QoffsetSCPTM` = field value * 2 [dB]. If the field is not present, the UE uses infinite dBs for the SC-PTM frequency offset with cell ranking as specified in TS 36.304 [4].

- **threshX-High**
  Parameter "`ThreshX_High`" in TS 36.304 [4].

- **threshX-HighQ**
  Parameter "`ThreshX_HighQ`" in TS 36.304 [4].

- **threshX-Low**
  Parameter "`ThreshX_Low`" in TS 36.304 [4].

- **threshX-LowQ**
  Parameter "`ThreshX_LowQ`" in TS 36.304 [4].

- **t-ReselectionEUTRA**
  Parameter "`TreselectionEUTRA`" in TS 36.304 [4].

- **t-ReselectionEUTRA-SF**
  Parameter "`Speed dependent ScalingFactor for TreselectionEUTRA`" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

**NOTE 1:** The value the UE applies for parameter "`Q qualmin`" in TS 36.304 [4] depends on the `q-QualMin` fields signalled by E-UTRAN and supported by the UE. In case multiple candidate options are available, the UE shall select the highest priority candidate option according to the priority order indicated by the following table (top row is highest priority).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Included</th>
<th>Not included</th>
<th>Value of parameter &quot;<code>Q qualmin</code>&quot; in TS 36.304 [4]</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>q-QualMinRSRQ-OnAllSymbols</code></td>
<td>Included</td>
<td>Not included</td>
<td><code>q-QualMinRSRQ-OnAllSymbols - (q-QualMin \text{-} q-QualMinWB)</code></td>
</tr>
<tr>
<td><code>q-QualMinWB</code></td>
<td>Included</td>
<td>Not included</td>
<td><code>q-QualMinWB</code></td>
</tr>
<tr>
<td><code>q-QualMinWB</code></td>
<td>Not included</td>
<td>Not included</td>
<td><code>q-QualMin</code></td>
</tr>
<tr>
<td><code>q-QualMinWB</code></td>
<td>Not included</td>
<td>Not included</td>
<td><code>q-QualMin</code></td>
</tr>
</tbody>
</table>

**Conditional presence** | **Explanation**

- **dl-FreqMax**
  The field is mandatory present if, for the corresponding entry in `InterFreqCarrierFreqList` (i.e. without suffix), `dl-CarrierFreq` (i.e. without suffix) is set to `maxEARFCN`. Otherwise the field is not present.

- **QrxlevminCE1**
  The field is optionally present, Need OR, if `q-RxLevMinCE1-r13` is set below -140 dBm. Otherwise the field is not present.

- **RSRQ**
  The field is mandatory present if `threshServingLowQ` is present in `systemInformationBlockType3`; otherwise it is not present.

- **RSRQ2**
  The field is mandatory present for all EUTRA carriers listed in SIB5 if `q-QualMinRSRQ-OnAllSymbols` is present in SIB3; otherwise it is not present and the UE shall delete any existing value for this field.

- **WB-RSRQ**
  The field is optionally present, need OP if the measurement bandwidth indicated by `allowedMeasBandwidth` is 50 resource blocks or larger; otherwise it is not present.

---

**SystemInformationBlockType6**

The IE `SystemInformationBlockType6` contains information relevant only for inter-RAT cell re-selection i.e. information about UTRA frequencies and UTRA neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency.

**SystemInformationBlockType6 information element**

```ASN1
SystemInformationBlockType6 ::= SEQUENCE {
  carrierFreqListUTRA-FDDCarrierFreqListUTRA-FDD OPTIONAL, -- Need OR
carrierFreqListUTRA-TDDCarrierFreqListUTRA-TDD OPTIONAL, -- Need OR
t-ReselectionUTRA     T-Reselection,
t-ReselectionUTRA-SF  SpeedStateScaleFactors OPTIONAL, -- Need OP
}
```
..., lateNonCriticalExtension OCTET STRING (CONTAINING SystemInformationBlockType6-v8h0-IEs) OPTIONAL,
    [[ carrierFreqListUTRA-FDD-v1250 SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqInfoUTRA-FDD-v1250 OPTIONAL, -- Cond UTRA-FDD
      carrierFreqListUTRA-TDD-v1250 SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF CarrierFreqInfoUTRA-TDD-v1250 OPTIONAL, -- Cond UTRA-TDD
      carrierFreqListUTRA-FDD-Ext-r12 CarrierFreqListUTRA-FDD-Ext-r12 OPTIONAL, -- Cond UTRA-FDD
      carrierFreqListUTRA-TDD-Ext-r12 CarrierFreqListUTRA-TDD-Ext-r12 OPTIONAL -- Cond UTRA-TDD
    ]]
}
SystemInformationBlockType6-v8h0-IEs ::= SEQUENCE {
    carrierFreqListUTRA-FDD-v8h0 SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqInfoUTRA-FDD-v8h0 OPTIONAL, -- Cond UTRA-FDD
    nonCriticalExtension SEQUENCE [] OPTIONAL
}
CarrierFreqInfoUTRA-v1250 ::= SEQUENCE {
    reducedMeasPerformance-r12 ENUMERATED {true} OPTIONAL -- Need OP
}
CarrierFreqListUTRA-FDD ::= SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqUTRA-FDD
CarrierFreqUTRA-FDD ::= SEQUENCE {
    carrierFreq ARFCN-ValueUTRA,
    cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
    threshX-High ReselectionThreshold,
    threshX-Low ReselectionThreshold,
    q-RxLevMin INTEGER (-60..-13),
    p-MaxUTRA INTEGER (-50..33),
    q-QualMin INTEGER (-24..0),
    ...,
    [[ threshX-Q-r9 SEQUENCE {
      threshX-HighQ-r9 ReselectionThresholdQ-r9,
      threshX-LowQ-r9 ReselectionThresholdQ-r9
    } OPTIONAL -- Cond RSRQ
    ]]
}
CarrierFreqInfoUTRA-FDD-v8h0 ::= SEQUENCE {
    multiBandInfoList Sequence (SIZE (1..maxMultiBands)) OF FreqBandIndicator-UTRA-FDD OPTIONAL -- Need OR
}
CarrierFreqListUTRA-FDD-Ext-r12 ::= SEQUENCE (SIZE (1..maxUTRA-FDD-Carrier)) OF CarrierFreqUTRA-FDD-Ext-r12
CarrierFreqUTRA-FDD-Ext-r12 ::= SEQUENCE {
    carrierFreq-r12 ARFCN-ValueUTRA,
    cellReselectionPriority-r12 CellReselectionPriority OPTIONAL, -- Need OP
    threshX-High-r12 ReselectionThreshold,
    threshX-Low-r12 ReselectionThreshold,
    q-RxLevMin-r12 INTEGER (-60..-13),
    p-MaxUTRA-r12 INTEGER (-50..33),
    q-QualMin-r12 INTEGER (-24..0),
    threshX-Q-r12 SEQUENCE {
      threshX-HighQ-r12 ReselectionThresholdQ-r9,
      threshX-LowQ-r12 ReselectionThresholdQ-r9
    } OPTIONAL -- Cond RSRQ
    multiBandInfoList-r12 SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator-UTRA-FDD OPTIONAL, -- Need OR
    reducedMeasPerformance-r12 ENUMERATED {true} OPTIONAL, -- Need OP
    ...
}
CarrierFreqListUTRA-TDD ::= SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF CarrierFreqUTRA-TDD
CarrierFreqUTRA-TDD ::= SEQUENCE {
    carrierFreq ARFCN-ValueUTRA,
    cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
    threshX-High ReselectionThreshold,
    threshX-Low ReselectionThreshold,
    q-RxLevMin INTEGER (-60..-13),
    p-MaxUTRA INTEGER (-50..33),
    ...
}
CarrierFreqListUTRA-TDD-Ext-r12 ::= SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF
CarrierFreqUTRA-TDD-r12

CarrierFreqUTRA-TDD-r12 ::= SEQUENCE {
carrierFreq-r12 ARFCN-ValueUTRA,
cellReselectionPriority-r12 CellReselectionPriority OPTIONAL, -- Need OP
threshX-High-r12 ReselectionThreshold,
threshX-Low-r12 ReselectionThreshold,
q-RxLevMin-r12 INTEGER (-60..-13),
p-MaxUTRA-r12 INTEGER (-50..33),
reducedMeasPerformance-r12 ENUMERATED {true} OPTIONAL, -- Need OP...
}

FreqBandIndicator-UTRA-FDD ::= INTEGER (1..86)

-- ASN.1 STOP

SystemInformationBlockType6 field descriptions

carrierFreqListUTRA-FDD
List of carrier frequencies of UTRA FDD. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the ARFCN used to indicate this. If E-UTRAN includes carrierFreqListUTRA-FDD-v8h0 and/or carrierFreqListUTRA-FDD-v1250, it includes the same number of entries, and listed in the same order, as in carrierFreqListUTRA-FDD (i.e. without suffix). See Annex D for more descriptions.

carrierFreqListUTRA-FDD-Ext
List of additional carrier frequencies of UTRA FDD. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the ARFCN used to indicate this. EUTRAN may include carrierFreqListUTRA-FDD-Ext even if carrierFreqListUTRA-FDD (i.e without suffix) does not include maxUTRA-FDD-Carrier entries.

carrierFreqListUTRA-TDD
List of carrier frequencies of UTRA TDD. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the ARFCN used to indicate this if E-UTRAN includes carrierFreqListUTRA-TDD-v1250, it includes the same number of entries, and listed in the same order, as in carrierFreqListUTRA-TDD (i.e without suffix).

carrierFreqListUTRA-TDD-Ext
List of additional carrier frequencies of UTRA TDD. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the ARFCN used to indicate this. EUTRAN may include carrierFreqListUTRA-TDD-Ext even if carrierFreqListUTRA-TDD (i.e without suffix) does not include maxUTRA-TDD-Carrier entries.

multiBandInfoList
Indicates the list of frequency bands in addition to the band represented by carrierFreq in the CarrierFreqUTRA-FDD for which UTRA cell reselection parameters are common.

p-MaxUTRA
The maximum allowed transmission power on the (uplink) carrier frequency, see TS 25.304 [40]. In dBm

g-QualMin
Parameter “Q\_qualmin” in TS 25.304 [40]. Actual value = field value [dB].

g-RxLevMin
Parameter “Q\_rxlevmin” in TS 25.304 [40]. Actual value = field value * 2+1 [dBm].

reducedMeasPerformance
Value TRUE indicates that the UTRA carrier frequency is configured for reduced measurement performance, see TS 36.133 [16]. If the field is not included, the UTRA carrier frequency is configured for normal measurement performance, see TS 36.133 [16].

r-ReselectionUTRA
Parameter “Treselection\_UTRAN” in TS 36.304 [4].

r-ReselectionUTRA-SF
Parameter “Speed dependent ScalingFactor for Treselection\_UTRA” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

threshX-High
Parameter “Thresh\_x, Highp” in TS 36.304 [4].

threshX-HighQ
Parameter “Thresh\_x, Highq” in TS 36.304 [4].

threshX-Low
Parameter “Thresh\_x, Lowp” in TS 36.304 [4].

threshX-LowQ
Parameter “Thresh\_x, Lowq” in TS 36.304 [4].

-- ETSI
Conditional presence | Explanation
--- | ---
**RSRQ** | The field is mandatory present if the `threshServingLowQ` is present in `systemInformationBlockType3`; otherwise it is not present.
**UTRA-FDD** | The field is optionally present, need OR, if the `carrierFreqListUTRA-FDD` is present. Otherwise it is not present.
**UTRA-TDD** | The field is optionally present, need OR, if the `carrierFreqListUTRA-TDD` is present. Otherwise it is not present.

--

**SystemInformationBlockType7**

The IE `SystemInformationBlockType7` contains information relevant only for inter-RAT cell re-selection i.e. information about GERAN frequencies relevant for cell re-selection. The IE includes cell re-selection parameters for each frequency.

**SystemInformationBlockType7 information element**

```plaintext
-- ASN1START
SystemInformationBlockType7 ::= SEQUENCE {
  t-ReselectionGERAN    T-Reselection,  
  t-ReselectionGERAN-SF    SpeedStateScaleFactors    OPTIONAL, -- Need OR
  carrierFreqsInfoList    CarrierFreqsInfoListGERAN    OPTIONAL, -- Need OR
  ...,
  lateNonCriticalExtension    OCTET STRING    OPTIONAL
}
CarrierFreqsInfoListGERAN ::= SEQUENCE (SIZE (1..maxGNFG)) OF CarrierFreqsInfoGERAN
CarrierFreqsInfoGERAN ::= SEQUENCE {
  carrierFreqs    CarrierFreqsGERAN,  
  commonInfo    SEQUENCE {
    cellReselectionPriority    CellReselectionPriority    OPTIONAL, -- Need OP
    ncc-Permitted      BIT STRING (SIZE (8)),
    q-RxLevMin       INTEGER (0..45),
    p-MaxGERAN       INTEGER (0..39)     OPTIONAL, -- Need OP
    threshX-High      ReselectionThreshold,  
    threshX-Low       ReselectionThreshold
  },
  ...

-- ASN1STOP
```
### SystemInformationBlockType7 field descriptions

- **carrierFreqs**
  - The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.

- **carrierFreqsInfoList**
  - Provides a list of neighbouring GERAN carrier frequencies, which may be monitored for neighbouring GERAN cells.
  - The GERAN carrier frequencies are organised in groups and the cell reselection parameters are provided per group of GERAN carrier frequencies.

- **commonInfo**
  - Defines the set of cell reselection parameters for the group of GERAN carrier frequencies.

- **ncc-Permitted**
  - Field encoded as a bit map, where bit N is set to “0” if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to “1” if the BCCH carrier with NCC = N-1 is permitted for monitoring; N = 1 to 8; bit 1 of the bitmap is the leading bit of the bit string.

- **p-MaxGERAN**
  - Maximum allowed transmission power for GERAN on an uplink carrier frequency, see TS 45.008 [28]. Value in dBm.
  - Applicable for the neighbouring GERAN cells on this carrier frequency. If \( p_{\text{maxGERAN}} \) is absent, the maximum power according to the UE capability is used.

- **q-RxLevMin**
  - Parameter “Q_{r,txmin}” in TS 36.304 [4], minimum required RX level in the GSM cell. The actual value of \( Q_{r,txmin} \) in dBm = (field value \times 2) – 115.

- **threshX-High**
  - Parameter “ThreshX, High” in TS 36.304 [4].

- **threshX-Low**
  - Parameter “ThreshX, Low” in TS 36.304 [4].

- **t-ReselectionGERAN**
  - Parameter “TreselectionGERAN” in TS 36.304 [4].

- **t-ReselectionGERAN-SF**
  - Parameter “Speed dependent ScalingFactor for Treselection\_GERAN” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

---

### SystemInformationBlockType8

The IE **SystemInformationBlockType8** contains information relevant only for inter-RAT cell re-selection i.e. information about CDMA2000 frequencies and CDMA2000 neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

#### SystemInformationBlockType8 information element

```asn
-- ASN1START
SystemInformationBlockType8 ::= SEQUENCE {
  systemTimeInfo      SystemTimeInfoCDMA2000 OPTIONAL, -- Need OR
  searchWindowSize     INTEGER (0..15) OPTIONAL, -- Need OR
  parametersHRPD      SEQUENCE {
    preRegistrationInfoHRPD     PreRegistrationInfoHRPD, -- Need OR
    cellReselectionParametersHRPD  CellReselectionParametersCDMA2000 OPTIONAL -- Need OR
  } OPTIONAL, -- Need OR
  parameters1XRTT      SEQUENCE {
    csfb-RegistrationParam1XRTT   CSFB-RegistrationParam1XRTT OPTIONAL, -- Need OR
    longCodeState1XRTT     BIT STRING (SIZE (42)) OPTIONAL, -- Need OR
    cellReselectionParameters1XRTT  CellReselectionParametersCDMA2000 OPTIONAL -- Need OR
  } OPTIONAL, -- Need OR
  ...,
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  
  [ [ csfb-SupportForDualRxUEs-r9  BOOLEAN OPTIONAL, -- Need OR
    cellReselectionParametersHRPD-v920  CellReselectionParametersCDMA2000-v920 OPTIONAL, -- Cond NCL-HRPD
  ] [ [ csfb-DualRxTxSupport-r10  ENUMERATED {true} OPTIONAL, -- Cond REG-1XRTT
    ] [ [ sib8-PerPLMN-List-r11  SIB8-PerPLMN-List-r11 OPTIONAL, -- Need OR
      ] ]
  ]
-- ASN1END
```
CellReselectionParametersCDMA2000 ::= SEQUENCE {
  bandClassList           BandClassListCDMA2000,
  neighCellList           NeighCellListCDMA2000,
  t-ReselectionCDMA2000   T-Reselection,
  t-ReselectionCDMA2000-SF SpeedStateScaleFactors  OPTIONAL -- Need OP
}

CellReselectionParametersCDMA2000-r11 ::= SEQUENCE {
  bandClassList           BandClassListCDMA2000,
  neighCellList-r11       NeighCellListCDMA2000-r11,
  t-ReselectionCDMA2000   T-Reselection,
  t-ReselectionCDMA2000-SF SpeedStateScaleFactors  OPTIONAL -- Need OP
}

CellReselectionParametersCDMA2000-v920 ::= SEQUENCE {
  neighCellList-v920     NeighCellListCDMA2000-v920
}

NeighCellListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF NeighCellCDMA2000

NeighCellCDMA2000 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  neighCellsPerFreqList    NeighCellsPerBandclassListCDMA2000
}

NeighCellCDMA2000-r11 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  neighFreqInfoList-r11    NeighCellsPerBandclassCDMA2000-r11
}

NeighCellsPerBandclassListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF NeighCellsPerBandclassCDMA2000

NeighCellsPerBandclassCDMA2000 ::= SEQUENCE {
  arfcn        ARFCN-ValueCDMA2000,
  physCellIdList      PhysCellIdListCDMA2000
}

NeighCellsPerBandclassCDMA2000-r11 ::= SEQUENCE {
  arfcn        ARFCN-ValueCDMA2000,
  physCellIdList-r11     PhysCellIdListCDMA2000-r11
}

NeighCellListCDMA2000-v920 ::= SEQUENCE (SIZE (1..16)) OF NeighCellCDMA2000-v920

NeighCellsPerBandclassListCDMA2000-v920 ::= SEQUENCE (SIZE (1..16)) OF NeighCellsPerBandclassCDMA2000-v920

NeighCellsPerBandclassCDMA2000-v920 ::= SEQUENCE {
  physCellIdList-v920     PhysCellIdListCDMA2000-v920
}

PhysCellIdListCDMA2000 ::= SEQUENCE (SIZE (1..16)) OF PhysCellIdCDMA2000

PhysCellIdListCDMA2000-v920 ::= SEQUENCE (SIZE (0..24)) OF PhysCellIdCDMA2000

BandClassListCDMA2000 ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandClassInfoCDMA2000

BandClassInfoCDMA2000 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  cellReselectionPriority    CellReselectionPriority    OPTIONAL, -- Need OP
  threshX-High      INTEGER (0..63),
  threshX-Low       INTEGER (0..63),
  ...}

AC-BarringConfig1XRTT-r9 ::= SEQUENCE {
  ac-Barring0to9-r9     INTEGER (0..63),
  ac-Barring10-r9       INTEGER (0..7),
  ac-Barring11-r9       INTEGER (0..7),
  ac-Barring12-r9       INTEGER (0..7),
  ac-Barring13-r9       INTEGER (0..7),
  ac-Barring14-r9       INTEGER (0..7),
  ac-Barring15-r9       INTEGER (0..7),
SIB8-PerPLMN-List-r11 ::= SEQUENCE ($\{0..\text{maxPLMN-r11}\}$) OF SIB8-PerPLMN-r11

SIB8-PerPLMN-r11 ::= SEQUENCE {
  plmn-Identity-r11 INTEGER ($\{0..\text{maxPLMN-r11}\}$),
  ac-BarringMsg-r9     INTEGER (0..7),
  ac-BarringReg-r9     INTEGER (0..7),
  ac-BarringEmg-r9     INTEGER (0..7)
}

SIB8-PerPLMN-List-r11 ::= SEQUENCE {
  parametersCDMA2000-r11 CHOICE {
    explicitValue ParametersCDMA2000-r11,
    defaultValue NULL
  } OPTIONAL, -- Need OR
  searchWindowSize-r11 INTEGER (0..15),
  ac-BarringConfig1XRTT-r11 AC-BarringConfig1XRTT-r9 OPTIONAL, -- Need OP
  ac-Barring0to9-r11 INTEGER (0..7),
  ac-BarringEmg-r9     INTEGER (0..7),
  ac-BarringN-r11      INTEGER (0..7),
  ac-BarringReg-r9     INTEGER (0..7),
  ac-BarringEmg-r9     INTEGER (0..7)
}

ParametersCDMA2000-r11 ::= SEQUENCE {
  systemTimeInfo-r11 CHOICE {
    explicitValue SystemTimeInfoCDMA2000,
    defaultValue NULL
  } OPTIONAL, -- Need OR
  searchWindowSize-r11 INTEGER (0..15),
  parametersHRPD-r11  SEQUENCE {
    preRegistrationInfoHRPD-r11 PreRegistrationInfoHRPD,
    cellReselectionParametersHRPD-r11 CellReselectionParametersCDMA2000-r11 OPTIONAL -- Need OR
  } OPTIONAL, -- Need OR
  parameters1XRTT-r11 SEQUENCE {
    csfb-RegistrationParam1XRTT-r11 CSFB-RegistrationParam1XRTT OPTIONAL, -- Need OP
    csfb-RegistrationParam1XRTT-Ext-r11 CSFB-RegistrationParam1XRTT-v920 OPTIONAL, -- Cond REG-1XRTT-PerPLMN
    longCodeState1XRTT-r11 BIT STRING ($\{42\}$) OPTIONAL, -- Cond PerPLMN-LC
    cellReselectionParameters1XRTT-r11 CellReselectionParametersCDMA2000-r11 OPTIONAL, -- Need OR
    ac-BarringConfig1XRTT-r11 AC-BarringConfig1XRTT-r9 OPTIONAL, -- Cond REG-1XRTT-PerPLMN
    ac-Barring0to9-r11 INTEGER (0..7),
    ac-BarringEmg-r9     INTEGER (0..7),
    ac-BarringN-r11      INTEGER (0..7),
    ac-BarringReg-r9     INTEGER (0..7),
    ac-BarringEmg-r9     INTEGER (0..7)
  }

-- ASN1STOP

**SystemInformationBlockType8 field descriptions**

**ac-BarringConfig1XRTT**
Contains the access class barring parameters the UE uses to calculate the access class barring factor, see C.S0097 [53].

**ac-Barring0to9**
Parameter used for calculating the access class barring factor for access overload classes 0 through 9. It is the parameter "PSIST" in C.S0004 [34] for access overload classes 0 through 9.

**ac-BarringEmg**
Parameter used for calculating the access class barring factor for emergency calls and emergency message transmissions for access overload classes 0 through 9. It is the parameter "PSIST_EMG" in C.S0004 [34].

**ac-BarringMsg**
Parameter used for modifying the access class barring factor for message transmissions. It is the parameter "MSG_PSIST" in C.S0004 [34].

**ac-BarringN**
Parameter used for calculating the access class barring factor for access overload class N (N = 10 to 15). It is the parameter "PSIST" in C.S0004 [34] for access overload class N.

**ac-BarringReg**
Parameter used for modifying the access class barring factor for autonomous registrations. It is the parameter "REG_PSIST" in C.S0004 [34].

**bandClass**
Identifies the Frequency Band in which the Carrier can be found. Details can be found in C.S0057 [24, Table 1.5].

**bandClassList**
List of CDMA2000 frequency bands.
**SystemInformationBlockType8 field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellReselectionParameters1XRTT</td>
<td>Cell reselection parameters applicable only to CDMA2000 1xRTT system.</td>
</tr>
<tr>
<td>cellReselectionParameters1XRTT-Ext</td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 1XRTT system.</td>
</tr>
<tr>
<td>cellReselectionParameters1XRTT-v920</td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 1XRTT system. The field is not present if cellReselectionParameters1XRTT is not present; otherwise it is optionally present.</td>
</tr>
<tr>
<td>cellReselectionParametersHRPD</td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 HRPD system.</td>
</tr>
<tr>
<td>cellReselectionParametersHRPD-Ext</td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 HRPD system. The field is not present if cellReselectionParametersHRPD is not present; otherwise it is optionally present.</td>
</tr>
<tr>
<td>cellReselectionParametersHRPD-v920</td>
<td>Cell reselection parameters applicable for cell reselection to CDMA2000 HRPD system. The field is not present if cellReselectionParametersHRPD is not present; otherwise it is optionally present.</td>
</tr>
<tr>
<td>csfb-DualRxTxSupport</td>
<td>Value TRUE indicates that the network supports dual Rx/Tx enhanced 1xCSFB, which enables UEs capable of dual Rx/Tx enhanced 1xCSFB to switch off their 1xRTT receiver/transmitter while camped in E-UTRAN [51].</td>
</tr>
<tr>
<td>csfb-RegistrationParam1XRTT</td>
<td>Contains the parameters the UE will use to determine if it should perform a CDMA2000 1xRTT Registration/Re-Registration. This field is included if either CSFB or enhanced CS fallback to CDMA2000 1xRTT is supported.</td>
</tr>
<tr>
<td>csfb-SupportForDualRxUEs</td>
<td>Value TRUE indicates that the network supports dual Rx CSFB [51].</td>
</tr>
<tr>
<td>longCodeState1XRTT</td>
<td>The state of long code generation registers in CDMA2000 1XRTT system as defined in C.S0002 [12, Section 1.3] at [\left\lfloor \frac{t}{10} \right\rfloor \times 10 + 320 \text{ ms}, ] where ( t ) equals to the \text{cdma-SystemTime}. This field is required for reporting CGI for 1xRTT, SRVCC handover and enhanced CS fallback to CDMA2000 1xRTT operation. Otherwise this IE is not needed. This field is excluded when estimating changes in system information, i.e. changes of longCodeState1XRTT should neither result in system information change notifications nor in a modification of systemInfoValueTag in SIB1.</td>
</tr>
<tr>
<td>neighCellList</td>
<td>List of CDMA2000 neighbouring cells. The total number of neighbouring cells in neighCellList for each RAT (1XRTT or HRPD) is limited to 32.</td>
</tr>
<tr>
<td>neighCellList-v920</td>
<td>Extended List of CDMA2000 neighbouring cells. The combined total number of CDMA2000 neighbouring cells in both neighCellList and neighCellList-v920 is limited to 32 for HRPD and 40 for 1xRTT.</td>
</tr>
<tr>
<td>neighCellsPerFreqList</td>
<td>List of carrier frequencies and neighbour cell ids in each frequency within a CDMA2000 Band, see C.S0002 [12] or C.S0024 [26].</td>
</tr>
<tr>
<td>neighCellsPerFreqList-v920</td>
<td>Extended list of neighbour cell ids, in the same CDMA2000 Frequency Band as the corresponding instance in &quot;NeighCellListCDMA2000&quot;:</td>
</tr>
<tr>
<td>parameters1XRTT</td>
<td>Parameters applicable for interworking with CDMA2000 1XRTT system.</td>
</tr>
<tr>
<td>parametersCDMA2000</td>
<td>Provides the corresponding SIB8 parameters for the CDMA2000 network associated with the PLMN indicated in plmn-Identity. A choice is used to indicate whether for this PLMN the parameters are signalled explicitly or set to the (default) values common for all PLMNs i.e. the values not included in sib8-PerPLMN-List.</td>
</tr>
<tr>
<td>parametersHRPD</td>
<td>Parameters applicable only for interworking with CDMA2000 HRPD systems.</td>
</tr>
<tr>
<td>physCellIdList</td>
<td>Identifies the list of CDMA2000 cell ids, see C.S0002 [12] or C.S0024 [26].</td>
</tr>
<tr>
<td>physCellIdList-v920</td>
<td>Extended list of CDMA2000 cell ids, in the same CDMA2000 ARFCN as the corresponding instance in &quot;NeighCellsPerBandclassCDMA2000&quot;:</td>
</tr>
</tbody>
</table>
SystemInformationBlockType8 field descriptions

plmn-identity
Indicates the PLMN associated with this CDMA2000 network. Value 1 indicates the PLMN listed 1st in the 1st plmn-IdentityList included in SIB1, value 2 indicates the PLMN listed 2nd in the same plmn-IdentityList, or when no more PLMN are present within the same plmn_identityList, then the PLMN listed 1st in the subsequent plmn-IdentityList within the same SIB1 and so on. A PLMN which identity is not indicated in the sib8-PerPLMN-List, does not support inter-working with CDMA2000.

preRegistrationInfoHRPD
The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.

searchWindowSize
The search window size is a CDMA2000 parameter to be used to assist in searching for the neighbouring pilots. For values see C.S0005 [25, Table 2.6.6.2.1-1] and C.S0024 [26, Table 8.7.6.2-4]. This field is required for a UE with rx-ConfigHRPD= single and/ or rx-Config1XRTT= single to perform handover, cell re-selection, UE measurement based redirection and enhanced 1xRTT CS fallback from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4].

sib8-PerPLMN-List
This field provides the values for the interworking CDMA2000 networks corresponding, if any, to the UE's RPLMN.

systemTimeInfo
Information on CDMA2000 system time. This field is required for a UE with rx-ConfigHRPD= single and/ or rx-Config1XRTT= single to perform handover, cell re-selection, UE measurement based redirection and enhanced 1xRTT CS fallback from E-UTRAN to CDMA2000 according to this specification and TS 36.304 [4]. This field is excluded when estimating changes in system information, i.e. changes of systemTimeInfo should neither result in system information change notifications nor in a modification of systemInfoValueTag in SIB1. For the field included in ParametersCDMA2000, a choice is used to indicate whether for this PLMN the parameters are signalled explicitly or set to the (default) value common for all PLMNs i.e. the value not included in sib8-PerPLMN-List.

threshX-High
Parameter "ThreshX, High" in TS 36.304 [4]. This specifies the high threshold used in reselection towards this CDMA2000 band class expressed as an unsigned binary number equal to FLOOR (-2 x 10 x log10 Ec/Io) in units of 0.5 dB, as defined in C.S0005 [25].

threshX-Low
Parameter "ThreshX, Low" in TS 36.304 [4]. This specifies the low threshold used in reselection towards this CDMA2000 band class expressed as an unsigned binary number equal to FLOOR (-2 x 10 x log10 Ec/Io) in units of 0.5 dB, as defined in C.S0005 [25].

t-ReselectionCDMA2000
Parameter “TreselectionCDMA_HRPD” or “TreselectionCDMA_1xRTT” in TS 36.304 [4].

t-ReselectionCDMA2000-SF
Parameter “Speed dependent ScalingFactor for TreselectionCDMA_HRPD” or TreselectionCDMA_1xRTT” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

Conditional presence

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCL-1XRTT</td>
<td>The field is optional present, need OR, if cellReselectionParameters1xRTT is present; otherwise it is not present.</td>
</tr>
<tr>
<td>NCL-HRPD</td>
<td>The field is optional present, need OR, if cellReselectionParametersHRPD is present; otherwise it is not present.</td>
</tr>
<tr>
<td>PerPLMN-LC</td>
<td>The field is optional present, need OR, when systemTimeInfo is included in SIB8PerPLMN for this CDMA2000 network; otherwise it is not present.</td>
</tr>
<tr>
<td>REG-1XRTT</td>
<td>The field is optional present, need OR, if csfb-RegistrationParam1XRTT is present; otherwise it is not present.</td>
</tr>
<tr>
<td>REG-1XRTT-PerPLMN</td>
<td>The field is optional present, need OR, if csfb-RegistrationParam1XRTT is included in SIB8PerPLMN for this CDMA2000 network; otherwise it is not present.</td>
</tr>
</tbody>
</table>

SystemInformationBlockType9
The IE SystemInformationBlockType9 contains a home eNB name (HNB Name).

SystemInformationBlockType9 information element

-- ASN1START
SystemInformationBlockType9 ::= SEQUENCE {
  hnb-Name OCTET STRING (SIZE(1..48)) OPTIONAL, -- Need OR
  ...
  lateNonCriticalExtension OCTET STRING OPTIONAL
}

-- ASN1END
SystemInformationBlockType9 field descriptions

hnb-Name
Carries the name of the home eNB, coded in UTF-8 with variable number of bytes per character, see TS 22.011 [10].

SystemInformationBlockType10
The IE SystemInformationBlockType10 contains an ETWS primary notification.

SystemInformationBlockType10 information element

SystemInformationBlockType10 field descriptions

messageIdentifier
Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.1], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

serialNumber
Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.2], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

dummy
This field is not used in the specification. If received it shall be ignored by the UE.

warningType
Identifies the warning type of the ETWS primary notification and provides information on emergency user alert and UE popup. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.50]) contains the first octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.24], and so on.

SystemInformationBlockType11
The IE SystemInformationBlockType11 contains an ETWS secondary notification.

SystemInformationBlockType11 information element

SystemInformationBlockType11 field descriptions

messageIdentifier
Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.1], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

serialNumber
Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.2], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

warningMessageSegmentType
Identifies the warning type of the ETWS primary notification and provides information on emergency user alert and UE popup. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.50]) contains the first octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.24], and so on.
SystemInformationBlockType11 field descriptions

**dataCodingScheme**
Identifies the alphabet/coding and the language applied variations of an ETWS notification. The octet (which is equivalent to the octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.52]) contains the octet of the equivalent IE defined in TS 23.041 [37, 9.4.3.2.3] and encoded according to TS 23.038 [38].

**messageIdentifier**
Identifies the source and type of ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.1], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

**serialNumber**
Identifies variations of an ETWS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.2], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

**warningMessageSegment**
Carries a segment of the Warning Message Contents IE defined in TS 36.413 [39, 9.2.1.53]. The first octet of the Warning Message Contents IE is equivalent to the first octet of the CB data IE defined in and encoded according to TS 23.041 [37, 9.4.2.2.5] and so on.

**warningMessageSegmentNumber**
Segment number of the ETWS warning message segment contained in the SIB. A segment number of zero corresponds to the first segment, one corresponds to the second segment, and so on.

**warningMessageSegmentType**
Indicates whether the included ETWS warning message segment is the last segment or not.

---

SystemInformationBlockType12

The IE SystemInformationBlockType12 contains a CMAS notification.

SystemInformationBlockType12 field descriptions

**dataCodingScheme**
Identifies the alphabet/coding and the language applied variations of a CMAS notification. The octet (which is equivalent to the octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.52]) contains the octet of the equivalent IE defined in TS 23.041 [37, 9.4.3.2.3] and encoded according to TS 23.038 [38].

**messageIdentifier**
Identifies the source and type of CMAS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.44]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.1], while the trailing bit contains bit 0 of second octet of the same equivalent IE.

**serialNumber**
Identifies variations of a CMAS notification. The leading bit (which is equivalent to the leading bit of the equivalent IE defined in TS 36.413 [39, 9.2.1.45]) contains bit 7 of the first octet of the equivalent IE, defined in and encoded according to TS 23.041 [37, 9.4.3.2.2], while the trailing bit contains bit 0 of second octet of the same equivalent IE.
**SystemInformationBlockType12 field descriptions**

**warningAreaCoordinatesSegment**
Carries a segment of the geographical area where the CMAS warning message is valid as defined in [xx]. The first octet of the first `warningAreaCoordinatesSegment` is equivalent to the first octet of Warning Area Coordinates IE defined in and encoded according to TS 23.041 [37] and so on.

**warningMessageSegment**
Carries a segment of the Warning Message Contents IE defined in TS 36.413 [39]. The first octet of the `Warning Message Contents` IE is equivalent to the first octet of the CB data IE defined in and encoded according to TS 23.041 [37, 9.4.2.2.5] and so on.

**warningMessageSegmentNumber**
Segment number of the CMAS warning message segment contained in the SIB. A segment number of zero corresponds to the first segment, one corresponds to the second segment, and so on.

**warningMessageSegmentType**
Indicates whether the included CMAS warning message segment is the last segment or not.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment1</td>
<td>The field is mandatory present in the first segment of SIB12, otherwise it is not present.</td>
</tr>
</tbody>
</table>

**SystemInformationBlockType13**

The IE `SystemInformationBlockType13` contains the information required to acquire the MBMS control information associated with one or more MBSFN areas.

**SystemInformationBlockType13 information element**

```
-- ASN1START
SystemInformationBlockType13-r9 ::= SEQUENCE {
  mbsfn-AreaInfoList-r9    MBSFN-AreaInfoList-r9,
  notificationConfig-r9    MBMS-NotificationConfig-r9, 
  lateNonCriticalExtension OCTET STRING OPTIONAL,
...
[[ notificationConfig-v1430   MBMS-NotificationConfig-v1430 OPTIONAL ]]
}
-- ASN1STOP
```

**SystemInformationBlockType13 field descriptions**

**notificationConfig**
Indicates the MBMS notification related configuration parameters. The UE shall ignore this field when `dl-Bandwidth` included in `MasterInformationBlock` is set to n6.

**SystemInformationBlockType14**

The IE `SystemInformationBlockType14` contains the EAB parameters.

**SystemInformationBlockType14 information element**

```
-- ASN1START
SystemInformationBlockType14-r11 ::= SEQUENCE {
  eab-Param-r11       CHOICE {
    eab-Common-r11       EAB-Config-r11, 
    eab-PerPLMN-List-r11     SEQUENCE (SIZE (1..maxPLMN-r11)) OF EAB-ConfigPLMN-r11
  }              OPTIONAL, -- Need OR
  lateNonCriticalExtension OCTET STRING OPTIONAL, 
...
[[ eab-PerRSRP-r15     ENUMERATED {thresh0, thresh1, thresh2, thresh3} OPTIONAL -- Need OR ]]
}
```

```
EAB-ConfigPLMN-r11 ::=    SEQUENCE {
  eab-Config-r11      EAB-Config-r11    OPTIONAL -- Need OR
}
```
EAB-Config-r11 ::= SEQUENCE {
  eab-Category-r11 ENUMERATED {a, b, c},
  eab-BarringBitmap-r11 BIT STRING (SIZE (10))
}

-- ASN1STOP

SystemInformationBlockType14 field descriptions

eab-BarringBitmap
Extended access class barring for AC 0-9. The first/ leftmost bit is for AC 0, the second bit is for AC 1, and so on.

eab-Category
Indicates the category of UEs for which EAB applies. Value a corresponds to all UEs, value b corresponds to the UEs that are neither in their HPLMN nor in a PLMN that is equivalent to it, and value c corresponds to the UEs that are neither in the PLMN listed as most preferred PLMN of the country where the UEs are roaming in the operator-defined PLMN selector list on the USIM, nor in their HPLMN nor in a PLMN that is equivalent to their HPLMN, see TS 22.011 [10].

eab-Common
The EAB parameters applicable for all PLMN(s).

eab-PerPLMN-List
The EAB parameters per PLMN, listed in the same order as the PLMN(s) listed across the plmn-IdentityList fields in SystemInformationBlockType1.

eab-PerRSRP
Access barring per RSRP. Value thresh0 means access to the cell is barred when in enhanced coverage as specified in TS 36.304 [4] and does not apply to UEs satisfying S criteria for normal coverage. Value thresh1 is compared to the first entry configured in rsrp-ThresholdsPrachInfoList, value thresh2 is compared to the second entry configured in rsrp-ThresholdsPrachInfoList and so on.

SystemInformationBlockType15

The IE SystemInformationBlockType15 contains the MBMS Service Area Identities (SAI) of the current and/or neighbouring carrier frequencies.

SystemInformationBlockType15 information element

-- ASN1START
SystemInformationBlockType15-r11 ::= SEQUENCE {
  mbms-SAI-IntraFreq-r11 MBMS-SAI-List-r11 OPTIONAL, -- Need OR
  mbms-SAI-InterFreqList-r11 MBMS-SAI-InterFreqList-r11 OPTIONAL, -- Need OR
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  ...,
  [[ mbms-SAI-InterFreqList-v1140 MBMS-SAI-InterFreqList-v1140 OPTIONAL -- Cond
    InterFreq ]],
  [[ mbms-IntraFreqCarrierType-r14 MBMS-CarrierType-r14 OPTIONAL, -- Need OR
    mbms-InterFreqCarrierTypeList-r14 MBMS-InterFreqCarrierTypeList-r14 OPTIONAL -- Need OR
  ]]
}
MBMS-SAI-List-r11 ::= SEQUENCE (SIZE (1..maxSAI-MBMS-r11)) OF MBMS-SAI-r11
MBMS-SAI-r11 ::= INTEGER (0..65535)
MBMS-SAI-InterFreqList-r11 ::= SEQUENCE (SIZE (1..maxFreq)) OF MBMS-SAI-InterFreq-r11
MBMS-SAI-InterFreqList-v1140 ::= SEQUENCE (SIZE (1..maxFreq)) OF MBMS-SAI-InterFreq-v1140
MBMS-SAI-InterFreq-r11 ::= SEQUENCE {
  dl-CarrierFreq-r11 ARFCN-ValueEUTRA-r9,
  mbms-SAI-List-r11 MBMS-SAI-List-r11
}
MBMS-SAI-InterFreq-v1140 ::= SEQUENCE {
  multiBandInfoList-r11 MultiBandInfoList-r11 OPTIONAL -- Need OR
}
MBMS-IntraFreqCarrierType-r14 ::= INTEGER (0..maxFreq)
MBMS-CarrierType-r14 ::= SEQUENCE {
  mbms-IntraFreqCarrierType-r14 MBMS-CarrierType-r14 OPTIONAL, -- Need OR
  mbms-InterFreqCarrierTypeList-r14 MBMS-InterFreqCarrierTypeList-r14 OPTIONAL -- Need OR
}
MBMS-InterFreqCarrierTypeList-r14 ::= SEQUENCE (SIZE (1..maxFreq)) OF MBMS-CarrierType-r14
MBMS-CarrierType-r14 ::= SEQUENCE {
  mbms-CarrierType-r14 MBMS-CarrierType-r14 OPTIONAL, -- Need OR
  mbms-InterFreqCarrierTypeList-r14 MBMS-InterFreqCarrierTypeList-r14 OPTIONAL -- Need OR
}
-- ASN1END
carrierType-r14
  ENUMERATED {mbms, fembsMixed, fembsDedicated},
  INTEGER {0..3}             OPTIONAL  -- Need OR

frameOffset-r14

--- ASN1STOP

**SystemInformationBlockType15 field descriptions**

**carrierType**
Indicates whether the carrier is pre-Rel-14 MBMS carrier (mbms) or FeMBMS/Unicast mixed carrier (fembmsMixed) or
MBMS-dedicated carrier (fembmsDedicated).

**frameOffset**
For MBMS-dedicated carrier, the frameOffset gives the radio frame which contains PBCH by SFN mod 4 =
frameOffset.

**mbms-InterFreqCarrierTypeList**
Indicates whether this is an feMBMS carrier. The field is included only if mbms-InterFreqList-r11 is included. The
number of entries is the same in both fields and carrier type relates to the frequency indicated in mbms-SAI-
InterFreqList-r11 in the corresponding entry index.

**mbms-IntraFreqCarrierType**
Contains indication whether the carrier is pre-Rel-14 MBMS carrier, FeMBMS/Unicast mixed carrier or MBMS-
dedicated carrier.

**mbms-SAI-InterFreqList**
Contains a list of neighboring frequencies including additional bands, if any, that provide MBMS services and the
corresponding MBMS SAI.

**mbms-SAI-IntraFreq**
Contains the list of MBMS SAIs for the current frequency. A duplicate MBMS SAI indicates that this and all following
SAIs are not offered by this cell but only by neighbour cells on the current frequency. For MBMS service continuity, the
UE shall use all MBMS SAIs listed in mbms-SAI-IntraFreq to derive the MBMS frequencies of interest.

**mbms-SAI-List**
Contains a list of MBMS SAIs for a specific frequency.

**multiBandInfoList**
A list of additional frequency bands applicable for the cells participating in the MBSFN transmission.
SystemInformationBlockType16 field descriptions

**dayLightSavingTime**
It indicates if and how daylight saving time (DST) is applied to obtain the local time. The semantics is the same as the semantics of the Daylight Saving Time IE in TS 24.301 [35] and TS 24.008 [49]. The first/leftmost bit of the bit string contains the b2 of octet 3, i.e. the value part of the Daylight Saving Time IE, and the second bit of the bit string contains b1 of octet 3.

**leapSeconds**
Number of leap seconds offset between GPS Time and UTC. UTC and GPS time are related i.e. GPS time - leapSeconds = UTC time.

**localTimeOffset**
Offset between UTC and local time in units of 15 minutes. Actual value = field value * 15 minutes. Local time of the day is calculated as UTC time + localTimeOffset.

**timeInfoUTC**
Coordinated Universal Time corresponding to the SFN boundary at or immediately after the ending boundary of the SI-window in which SystemInformationBlockType16 is transmitted. The field counts the number of UTC seconds in 10 ms units since 00:00:00 on Gregorian calendar date 1 January, 1900 (midnight between Sunday, December 31, 1899 and Monday, January 1, 1900). NOTE 1.
This field is excluded when estimating changes in system information, i.e. changes of timeInfoUTC should neither result in system information change notifications nor in a modification of systemInfoValueTag in SIB1.

NOTE 1: The UE may use this field together with the leapSeconds field to obtain GPS time as follows: GPS Time (in seconds) = timeInfoUTC (in seconds) - 2,524,953,600 (seconds) + leapSeconds, where 2,524,953,600 is the number of seconds between 00:00:00 on Gregorian calendar date 1 January, 1900 and 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time).

SystemInformationBlockType17

The IE SystemInformationBlockType17 contains information relevant for traffic steering between E-UTRAN and WLAN.

SystemInformationBlockType17 information element

```
-- ASN1START
SystemInformationBlockType17-r12 ::= SEQUENCE {
  wlan-OffloadInfoPerPLMN-List-r12  SEQUENCE (SIZE (1..maxPLMN-r11)) OF
                                      WLAN-OffloadInfoPerPLMN-r12   OPTIONAL, -- Need OR
  lateNonCriticalExtension    OCTET STRING    OPTIONAL,
  ...
}

WLAN-OffloadInfoPerPLMN-r12 ::= SEQUENCE {
  wlan-OffloadConfigCommon-r12  WLAN-OffloadConfig-r12  OPTIONAL, -- Need OR
  wlan-Id-List-r12     WLAN-Id-List-r12   OPTIONAL, -- Need OR
  ...
}

WLAN-Id-List-r12 ::= SEQUENCE (SIZE (1..maxWLAN-Id-r12)) OF WLAN-Identifiers-r12

WLAN-Identifiers-r12 ::= SEQUENCE {
  ssid-r12      OCTET STRING (SIZE (1..32))  OPTIONAL, -- Need OR
  bssid-r12      OCTET STRING (SIZE (6))   OPTIONAL, -- Need OR
  hessid-r12      OCTET STRING (SIZE (6))   OPTIONAL, -- Need OR
  ...
}

-- ASN1STOP
```

SystemInformationBlockType17 field descriptions

**bssid**
Basic Service Set Identifier (BSSID) defined in IEEE 802.11-2012 [67].

**hessid**
Homogenous Extended Service Set Identifier (HESSID) defined in IEEE 802.11-2012 [67].

**ssid**
Service Set Identifier (SSID) defined in IEEE 802.11-2012 [67].

**wlan-OffloadInfoPerPLMN-List**
The WLAN offload configuration per PLMN includes the same number of entries, listed in the same order as the PLMN(s) listed across the plmn-IdentityList fields in SystemInformationBlockType1.
SystemInformationBlockType18

The IE SystemInformationBlockType18 indicates E-UTRAN supports the sidelink UE information procedure and may contain sidelink communication related resource configuration information.

SystemInformationBlockType18 information element

```
SystemInformationBlockType18-r12 ::= SEQUENCE {
  commConfig-r12             SEQUENCE {
    commRxPool1-r12           SL-CommRxPoolList-r12,  OPTIONAL, -- Need OR
    commTxPoolNormalCommon-r12 SL-CommTxPoolList-r12  OPTIONAL, -- Need OR
    commTxPoolExceptional-r12 SL-CommTxPoolList-r12  OPTIONAL, -- Need OR
    commSyncConfig-r12        SL-SyncConfigList-r12   OPTIONAL -- Need OR
  }  OPTIONAL, -- Need OR
  lateNonCriticalExtension  OCTET STRING  OPTIONAL,
  ...,
  commTxPoolNormalCommonExt-r13 SL-CommTxPoolListExt-r13 OPTIONAL, -- Need OR
  commTxResourceUC-ReqAllowed-r13 ENUMERATED {true}  OPTIONAL, -- Need OR
  commTxAllowRelayCommon-r13 ENUMERATED {true}   OPTIONAL -- Need OR
}
```

SystemInformationBlockType18 field descriptions

**commRxPool**
Indicates the resources by which the UE is allowed to receive sidelink communication while in RRC_IDLE and while in RRC_CONNECTED.

**commSyncConfig**
Indicates the configuration by which the UE is allowed to receive and transmit synchronisation information. E-UTRAN configures `commSyncConfig` including `txParameters` when configuring UEs by dedicated signalling to transmit synchronisation information.

**commTxAllowRelayCommon**
Indicates whether the UE is allowed to transmit relay related sidelink communication data using the transmission pools included in SystemInformationBlockType18 i.e. either via `commTxPoolNormalCommon`, `commTxPoolNormalCommonExt` or via `commTxPoolExceptional`.

**commTxPoolExceptional**
Indicates the resources by which the UE is allowed to transmit sidelink communication in exceptional conditions, as specified in 5.10.4.

**commTxPoolNormalCommon**
Indicates the resources by which the UE is allowed to transmit sidelink communication while in RRC_IDLE or when in RRC_CONNECTED while transmitting sidelink via a frequency other than the primary.

**commTxPoolNormalCommonExt**
Indicates transmission resource pool(s) in addition to the pool(s) indicated by field `commTxPoolNormalCommon`, by which the UE is allowed to transmit sidelink communication while in RRC_IDLE or when in RRC_CONNECTED while transmitting sidelink via a frequency other than the primary. E-UTRAN configures `commTxPoolNormalCommonExt` only when it configures `commTxPoolNormalCommon`.

**commTxResourceUC-ReqAllowed**
Indicates whether the UE is allowed to request transmission pools for non-relay related one-to-one sidelink communication.

SystemInformationBlockType19

The IE SystemInformationBlockType19 indicates E-UTRAN supports the sidelink UE information procedure and may contain sidelink discovery related resource configuration information.

SystemInformationBlockType19 information element

```
SystemInformationBlockType19-r12 ::= SEQUENCE {
  discConfig-r12             SEQUENCE {
    discRxPool1-r12           SL-DiscRxPoolList-r12,  OPTIONAL, -- Need OR
    discTxPoolCommon-r12     SL-DiscTxPoolList-r12  OPTIONAL, -- Need OR
    discTxPowerInfo-r12      SL-DiscTxPowerInfoList-r12 OPTIONAL, -- Cond Tx
  }
  ...,
  discTxAllowRelayCommon-r13 ENUMERATED {true}   OPTIONAL -- Need OR
  discTxResourceUC-ReqAllowed-r13 ENUMERATED {true}  OPTIONAL, -- Need OR
}
```
discSyncConfig-r12  SL-SyncConfigList-r12  OPTIONAL -- Need OR
}  
discInterFreqList-r12  SL-CarrierFreqInfoList-r12  OPTIONAL, -- Need OR
lateNonCriticalExtension  OCTET STRING  OPTIONAL,
...
[[
  discConfig-v1310  SEQUENCE {
    discInterFreqList-v1310  SL-CarrierFreqInfoList-v1310  OPTIONAL, -- Need OR
gapRequestsAllowedCommon  ENUMERATED {true}  OPTIONAL, -- Need OR
  }
]  
discConfigRelay-r13  SEQUENCE {
  relayUE-Config-r13  SL-DiscConfigRelayUE-r13,
  remoteUE-Config-r13  SL-DiscConfigRemoteUE-r13
}  
discConfigPS-13  SEQUENCE {
  discRxPoolPS-13  SL-DiscRxPoolList-r12,
  discTxPoolPS-Common-r13  SL-DiscTxPoolList-r12
}  
]]

SL-CarrierFreqInfoList-r12 ::= SEQUENCE (SIZE (1..maxFreq)) OF SL-CarrierFreqInfo-r12
SL-CarrierFreqInfoList-v1310 ::= SEQUENCE (SIZE (1..maxFreq)) OF SL-CarrierFreqInfo-v1310
SL-CarrierFreqInfo-r12 ::= SEQUENCE {
carrierFreq-r12  ARFCN-ValueEUTRA-r9,
plmn-IdentityList-r12  PLMN-IdentityList4-r12  OPTIONAL -- Need OP
}

SL-DiscConfigRelayUE-r13 ::= SEQUENCE {
  threshHigh-r13  RSRP-RangeSL4-r13  OPTIONAL, -- Need OR
  threshLow-r13  RSRP-RangeSL4-r13  OPTIONAL, -- Need OR
  hystMax-r13  ENUMERATED {dB0, dB3, dB6, dB9, dB12, dBinf} OPTIONAL, -- Cond ThreshHigh
  hystMin-r13  ENUMERATED {dB0, dB3, dB6, dB9, dB12} OPTIONAL -- Cond ThreshLow
}

SL-DiscConfigRemoteUE-r13 ::= SEQUENCE {
  threshHigh-r13  RSRP-RangeSL4-r13  OPTIONAL, -- Need OR
  hystMax-r13  ENUMERATED {dB0, dB3, dB6, dB9, dB12} OPTIONAL, -- Cond ThreshHigh
  reselectionInfoIC-r13  ReselectionInfoRelay-r13
}

ReselectionInfoRelay-r13 ::= SEQUENCE {
  q-RxLevMin-r13  Q-RxLevMin,
-- Note that the mapping of invidual values may be different for PC5, but the granularity/-- number of values is same as for Uu
  filterCoefficient-r13  FilterCoefficient,
  minHyst-r13  ENUMERATED {dB0, dB3, dB6, dB9, dB12, dBinf} OPTIONAL -- Cond ThreshLow
}

SL-CarrierFreqInfo-v1310 ::= SEQUENCE {
  discResourcesNonPS-r13  SL-ResourcesInterFreq-r13  OPTIONAL, -- Need OR
  discResourcesPS-r13  SL-ResourcesInterFreq-r13  OPTIONAL, -- Need OR
  discConfigOther-r13  SL-DiscConfigOtherInterFreq-r13  OPTIONAL, -- Need OR
...}

PLMN-IdentityList4-r12 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo2-r12
PLMN-IdentityInfo2-r12 ::= CHOICE {
  plmn-Index-r12  INTEGER (1..maxPLMN-r11),
  plmnIdentity-r12  PLMN-Identity
}

SL-DiscTxResourcesInterFreq-r13 ::= CHOICE {
  acquireSI-FromCarrier-r13  NULL,
  discTxPoolCommon-r13  SL-DiscTxPoolList-r12,
  requestDedicated-r13  NULL,
  noTxOnCarrier-r13  NULL
}

SL-DiscConfigOtherInterFreq-r13 ::= SEQUENCE {
  txPowerInfo-r13  SL-DiscTxPowerInfoList-r12  OPTIONAL, -- Cond Tx
  refCarrierCommon-r13  ENUMERATED {pCell}
  discSyncConfig-r13  SL-SyncConfigListNFreq-r13  OPTIONAL, -- Need OR
  discCellSelectionInfo-r13  CellSelectionInfoNFreq-r13  OPTIONAL, -- Need OR
SystemInformationBlockType19 field descriptions

**discCellSelectionInfo**
Parameters that may be used by the UE to select/ reselect a cell on the concerned non serving frequency. If absent, the UE acquires the information from the target cell on the concerned frequency. See TS 36.304 [4, 11.4].

**discInterFreqList**
Indicates the neighbouring frequencies on which sidelink discovery announcement is supported. May also provide further information i.e. reception resource pool and/ or transmission resource pool, or an indication how resources could be obtained.

**discRxPool**
Indicates the resources by which the UE is allowed to receive non-PS related sidelink discovery announcements while in RRC_IDLE and while in RRC_CONNECTED.

**discRxPoolPS**
Indicates the resources by which the UE is allowed to receive PS related sidelink discovery announcements while in RRC_IDLE and while in RRC_CONNECTED.

**discRxResourcesInterFreq**
Indicates the resource pool configuration for receiving discovery announcements on a carrier frequency.

**discSyncConfig**
Indicates the configuration by which the UE is allowed to receive and transmit synchronisation information. E-UTRAN configures `discSyncConfig` including `txParameters` when configuring UEs by dedicated signalling to transmit synchronisation information.

**discTxPoolCommon**
Indicates the resources by which the UE is allowed to transmit non-PS related sidelink discovery announcements while in RRC_IDLE.

**discTxPoolPS-Common**
Indicates the resources by which the UE is allowed to transmit PS related sidelink discovery announcements while in RRC_IDLE.

**discTxResourcesInterFreq**
For the concerned frequency, either provides the UE with a pool of sidelink discovery announcement transmission resources the UE is allowed to use while in RRC_IDLE, or indicates whether such transmission is allowed, and if so how the UE may obtain the required resources. Value `noTxOnCarrier` indicates that the UE is not allowed to transmit sidelink discovery announcements on the concerned frequency. Value `acquireSI-FromCarrier` indicates that the required resources are to be obtained by autonomously acquiring SIB19 and other relevant SIBs from the concerned frequency. Value `requestDedicated` indicates, that for the concerned carrier, the required sidelink discovery resources are to be obtained by means of a dedicated resource request using the `SidelinkUEInformation` message.

**plmn-IdentityList**
List of PLMN identities for the neighbouring frequency indicated by `carrierFreq`. Absence of the field indicates the same PLMN identities as listed across the `plmn-IdentityList` fields (without suffix) in `SystemInformationBlockType1`. 

**plmn-Index**
Index of the corresponding entry across the `plmn-IdentityList` fields (without suffix) within `SystemInformationBlockType1`.

**refCarrierCommon**
Indicates if the PCell (RRC_CONNECTED)/ serving cell (RRC_IDLE) is to be used as reference for DL measurements and synchronization, instead of the DL frequency paired with the one used to transmit sidelink discovery announcements on, see TS 36.213 [23, 14.3.1].

**reselectionInfoIC**
Includes the parameters used by the UE when selecting/ reselecting a sidelink relay UE.

**SL-CarrierFreqInfoList-v1310**
If included, the UE shall include the same number of entries, and listed in the same order, as in `SL-CarrierFreqInfoList-r12`.

**threshHigh, threshLow (relayUE)**
Indicates when a sidelink remote UE or sidelink relay UE that is in network coverage may use the broadcast PS related sidelink discovery Tx resource pool, if broadcast, or request Tx resources by dedicated signalling otherwise. For remote UEs, this parameter is used similarly for relay related sidelink communication.
Conditional presence | Explanation
---|---
**ThreshHigh** | The field is mandatory present if *threshHigh* is included in the corresponding IE. Otherwise the field is not present and UE shall delete any existing value for this field.

**ThreshLow** | The field is mandatory present if *threshLow* is included. Otherwise the field is not present UE shall delete any existing value for this field.

**Tx** | The field is mandatory present if *discTxPoolCommon* is included. Otherwise the field is optional present, need OR.

---

**SystemInformationBlockType20**

The IE *SystemInformationBlockType20* contains the information required to acquire the control information associated transmission of MBMS using SC-PTM.

**SystemInformationBlockType20** information element

```asn1
-- ASN1START
SystemInformationBlockType20-r13 ::= SEQUENCE {
  sc-mcch-RepetitionPeriod-r13 ENUMERATED {rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256},
  sc-mcch-Offset-r13 INTEGER (0..10),
  sc-mcch-FirstSubframe-r13 INTEGER (0..9),
  sc-mcch-duration-r13 INTEGER (2..9) OPTIONAL,
  sc-mcch-ModificationPeriod-r13 ENUMERATED {rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024, rf2048, rf4096, rf8192, rf16384, rf32768, rf65536},
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  ...,
  [[ br-BCCH-Config-r14 SEQUENCE {
    dummy ENUMERATED {rf1},
    dummy2 OCTET STRING ],
    mpdcch-Narrowband-SC-MCCH-r14 INTEGER (1..maxAvailNarrowBands-r13),
    mpdcch-NumRepetition-SC-MCCH-r14 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256},
    mpdcch-StartSF-SC-MCCH-r14 CHOICE {
      fdd-r14 OCTET STRING,
      tdd-r14 OCTET STRING
    },
    mpdcch-PDSCH-HoppingConfig-SC-MCCH-r14 ENUMERATED {off, ce-ModeA, ce-ModeB},
    sc-mcch-CarrierFreq-r14 \(ARFCN\)-ValueEUTRA-r9,
    sc-mcch-Offset-BR-r14 INTEGER (0..10),
    sc-mcch-RepetitionPeriod-BR-r13 ENUMERATED {rf32, rf128, rf512, rf1024, rf2048, rf4096, rf8192, rf16384},
    sc-mcch-ModificationPeriod-BR-r13 ENUMERATED {rf32, rf128, rf256, rf512, rf1024, rf2048, rf4096, rf8192, rf16384, rf32768, rf65536, rf131072, rf262144, rf524288, rf1048576} ]],

  sc-mcch-CarrierFreq-r14 \(ARFCN\)-ValueEUTRA-r9,
  sc-mcch-Offset-BR-r14 INTEGER (0..10),
  sc-mcch-RepetitionPeriod-BR-r13 ENUMERATED {rf32, rf128, rf512, rf1024, rf2048, rf4096, rf8192, rf16384},
  sc-mcch-ModificationPeriod-BR-r13 ENUMERATED {rf32, rf128, rf256, rf512, rf1024, rf2048, rf4096, rf8192, rf16384, rf32768, rf65536, rf131072, rf262144, rf524288, rf1048576} ]],

  sc-mcch-RepetitionPeriod-v1470 ENUMERATED {r16, r32 } OPTIONAL, -- Need OR
  sc-mcch-ModificationPeriod-v1470 ENUMERATED {rf1} OPTIONAL, -- Need OR
}

SystemInformationBlockType20-r14 ::= SEQUENCE {
  onDurationTimerSCPTM-r14 ENUMERATED {psf10, psf20, psf100, psf300, psf500, psf1000, psf1200, psf1600},
  drx-InactivityTimerSCPTM-r14 ENUMERATED {psf0, psf1, psf2, psf4, psf8, psf16, psf32, psf64, psf128, psf256, psf512, psf1024, psf2048, psf4096, psf8192, psf16384},
  schedulingPeriodStartOffsetSCPTM-r14 CHOICE {
    sf10 OCTET STRING,
    sf20 OCTET STRING,
    sf32 OCTET STRING,
    sf40 OCTET STRING,
    sf64 OCTET STRING,
    sf80 OCTET STRING
  }
}

-- ASN1END
```
sf128         INTEGER(0..127),
sf160         INTEGER(0..159),
sf256         INTEGER(0..255),
sf320         INTEGER(0..319),
sf512         INTEGER(0..511),
sf640         INTEGER(0..639),
sf1024        INTEGER(0..1023),
sf2048        INTEGER(0..2047),
sf4096        INTEGER(0..4095),
sf8192        INTEGER(0..8191)
};

-- ASN1STOP
SystemInformationBlockType20 field descriptions

**br-BCCH-Config-r14**
The field is present if SystemInformationBlockType20 is sent on BR-BCCH. Otherwise the field is absent.

**dummy**
This field is not used in the specification. If received it shall be ignored by the UE.

**drx-InactivityTimerSCPTM**
Timer for listening to SC-MCCH scheduling in TS 36.321 [6]. Value in number of MPDCCH sub-frames. Value psf0 corresponds to 0 MPDCCH sub-frame, psf1 corresponds to 1 MPDCCH sub-frame and so on.

**mpdcch-Narrowband-SC-MCCH**
Narrowband for MPDCCH for SC-MCCH, see TS 36.213 [23].

**mpdcch-NumRepetitions-SC-MCCH**
The maximum number of MPDCCH repetitions the UE needs to monitor for SC-MCCH, see TS 36.213 [23].

**mpdcch-StartSF-SC-MCCH**
Configuration of the starting subframes of the MPDCCH search space for SC-MCCH, see TS 36.213 [23].

**mpdcch-PDSCH-HoppingConfig-SC-MCCH**
Frequency hopping configuration for MPDCCH/PDSCH for SC-MCCH, see TS 36.213 [23].

**onDurationTimerSCPTM**
Indicates the duration in subframes during which SC-MCCH may be scheduled in MPDCCH sub-frames, see TS 36.321 [6].

**pdsch-maxNumRepitionCEmodeA-SC-MTCH**
Maximum value to indicate the set of PDSCH repetition numbers for SC-MTCH to UEs in CE mode A, see TS 36.213 [23].

**pdsch-maxNumRepitionCEmodeB-SC-MTCH**
Maximum value to indicate the set of PDSCH repetition numbers for SC-MTCH CE to UEs in mode B, see TS 36.213 [23].

**schedulingPeriodStartOffsetSCPTM**
SCPTM-SchedulingCycle and SCPTM-SchedulingOffset in TS 36.321 [6]. The value of SCPTM-SchedulingCycle is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of SCPTM-SchedulingOffset is in number of sub-frames.

**sc-mcch-CarrierFreq**
Downlink carrier used for all multicast SC-MCCH transmissions.

**sc-mcch-ModificationPeriod**
Defines periodically appearing boundaries, i.e. radio frames for which SFN mod sc-mcch-ModificationPeriod = 0. The contents of different transmissions of SC-MCCH information can only be different if there is at least one such boundary in-between them. Value rf2 corresponds to 2 radio frames, value rf4 corresponds to 4 radio frames and so on. In case sc-mcch-ModificationPeriod-v1470 is configured, the UE shall ignore the configuration of sc-mcch-ModificationPeriod-r13.

**sc-mcch-ModificationPeriod-BR**
Defines periodically appearing boundaries for BL UE or UE in CE, i.e. radio frames for which ((H-SFN*1024 + SFN) mod sc-mcch-ModificationPeriod-BR = 0 if hyperSFN is present in SystemInformationBlockType1-BR or radio frames for which SFN mod sc-mcchModificationPeriod-BR = 0 otherwise. The contents of different transmissions of SC-MCCH information can only be different if there is at least one such boundary in-between them. Value rf32 corresponds to 32 radio frames, value rf128 corresponds to 128 radio frames and so on.

**sc-mcch-FirstSubframe**
Indicates the first subframe in which SC-MCCH is scheduled.

**sc-mcch-Offset**
Indicates, together with the sc-mcch-RepititionPeriod, the radio frames in which SC-MCCH is scheduled i.e. SC-MCCH is scheduled in radio frames for which: SFN mod sc-mcch-RepititionPeriod = sc-mcch-Offset.

**sc-mcch-Offset-BR**
Indicates, together with the sc-mcch-RepititionPeriod-BR, the boundary of the SC-MCCH repetition period for BL UE or UE in CE: (H-SFN*1024 + SFN) mod sc-mcch-RepititionPeriod-BR = sc-mcch-Offset-BR if hyperSFN is present in SystemInformationBlockType1-BR or radio frames for which (SFN mod mod sc-mcch-RepititionPeriod-BR) = sc-mcch-Offset-BR otherwise.

**sc-mcch-RepititionPeriod**
Defines the interval between transmissions of SC-MCCH information, in radio frames. Value rf2 corresponds to 2 radio frames, rf4 corresponds to 4 radio frames and so on. In case sc-mcch-RepititionPeriod-v1470 is configured, the UE shall ignore the configuration of sc-mcch-RepititionPeriod-r13.

**sc-mcch-RepititionPeriod-BR**
Defines the interval between transmissions of SC-MCCH information for BL UE or UE in CE, in radio frames. Value rf32 corresponds to 32 radio frames, rf128 corresponds to 128 radio frames and so on.

**sc-mcch-SchedulingInfo**
DRX information for the SC-MCCH. If this field is absent, DRX is not used for SC-MCCH reception.
The IE `SystemInformationBlockType21` contains V2X sidelink communication configuration.

**SystemInformationBlockType21**

```asciidoc
-- ASN1START
SystemInformationBlockType21-r14 ::= SEQUENCE {
  sl-V2X-ConfigCommon-r14    SL-V2X-ConfigCommon-r14    OPTIONAL, -- Need OR
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  ...
}

SL-V2X-ConfigCommon-r14 ::=  SEQUENCE {
  v2x-CommRxPool-r14     SL-CommRxPoolListV2X-r14   OPTIONAL, -- Need OR
  v2x-CommTxPoolNormalCommon-r14  SL-CommTxPoolListV2X-r14   OPTIONAL, -- Need OR
  v2x-CommTxPoolExceptional-r14  SL-CommResourcePoolV2X-r14   OPTIONAL, -- Need OR
  v2x-SyncConfig-r14     SL-SyncConfigListV2X-r14   OPTIONAL, -- Need OR
  v2x-InterFreqInfoList-r14   SL-InterFreqInfoListV2X-r14 OPTIONAL, -- Need OR
  v2x-ResourceSelectionConfig-r14  SL-CommRxPoolSensingConfig-r14 OPTIONAL, -- Need OR
  zoneConfig-r14      SL-ZoneConfig-r14     OPTIONAL, -- Need OR
  typeTxSync-r14      SL-TypeTxSync-r14     OPTIONAL, -- Need OR
  thresSL-TxPrioritization-r14  SL-Priority-r13      OPTIONAL, -- Need OR
  anchorCarrierFreqList-r14   SL-AnchorCarrierFreqList-V2X-r14 OPTIONAL, -- Need OR
  offsetDFN-r14      INTEGER (0..1000)     OPTIONAL, -- Need OR
  cbr-CommonTxConfigList-r14   SL-CBR-CommonTxConfigList-r14 OPTIONAL -- Need OR
}
-- ASN1STOP
```
**SystemInformationBlockType21 field descriptions**

**anchorCarrierFreqList**
Indicates carrier frequencies which may include inter-carrier resource configuration for V2X sidelink communication.

**cbr-CommonTxConfigList**
Indicates the common list of CBR ranges and the list of PSSCH transmissions parameter configurations available to configure congestion control to the UE for V2X sidelink communication.

**offsetDFN**
Indicates the timing offset for the UE to determine DFN timing when GNSS is used for timing reference for the PCell. Value 0 corresponds to 0 milliseconds, value 1 corresponds to 0.001 milliseconds, value 2 corresponds to 0.002 milliseconds, and so on.

**p2x-CommTxPoolNormalCommon**
Indicates the resources by which the UE is allowed to transmit P2X related V2X sidelink communication. zoneID is not configured in the pools in this field.

**thresSL-TxPrioritization**
Indicates the threshold used to determine whether SL V2X transmission is prioritized over uplink transmission if they overlap in time (see TS 36.321 [6]). This value shall overwrite thresSL-TxPrioritization configured in SL-V2X-Preconfiguration if any.

**typeTxSync**
Indicates the prioritized synchronization type (i.e. eNB or GNSS) for performing V2X sidelink communication on the carrier frequency on which this field is broadcast.

**v2x-CommRxPool**
Indicates the resources by which the UE is allowed to receive V2X sidelink communication while in RRC_IDLE and in RRC_CONNECTED.

**v2x-CommTxPoolExceptional**
Indicates the resources by which the UE is allowed to transmit V2X sidelink communication in exceptional conditions, as specified in 5.10.13.

**v2x-CommTxPoolNormalCommon**
Indicates the resources by which the UE is allowed to transmit non-P2X related V2X sidelink communication when in RRC_IDLE or when in RRC_CONNECTED while transmitting V2X sidelink communication via a frequency other than the primary. E-UTRAN configures one resource pool per zone.

**v2x-InterFreqInfoList**
Indicates synchronization and resource allocation configurations of neighboring frequencies for V2X sidelink communication.

**v2x-ResourceSelectionConfig**
Indicates V2X sidelink communication configurations used for UE autonomous resource selection.

**v2x-SyncConfig**
Indicates the configuration by which the UE is allowed to receive and transmit synchronisation information for V2X sidelink communication. E-UTRAN configures v2x-SyncConfig including txParameters when configuring UEs to transmit synchronisation information.

**zoneConfig**
Indicates zone configurations used for V2X sidelink communication in 5.10.13.2.

---

**SystemInformationBlockType24**

The IE **SystemInformationBlockType24** contains information relevant only for inter-RAT cell re-selection i.e. information about NR frequencies and NR neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency.

**SystemInformationBlockType24 information element**

```
-- ASN1START
SystemInformationBlockType24-r15 ::= SEQUENCE {
    carrierFreqListNR-r15 OPTIONAL,   -- Need OR
    t-ReselectionNR-r15 T-Reselection,   -- Need OR
    t-ReselectionNR-SF-r15 SpeedStateScaleFactors OPTIONAL, -- Need OR
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    ...
}
CarrierFreqListNR-r15 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-r15
CarrierFreqNR-r15 ::= SEQUENCE {
    carrierFreq-r15 ARFCN-ValueNR-r15,
    multiBandInfoList-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR
    multiBandInfoListSUL-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR
    measTimingConfig-r15 MTC-SSB-NR-r15 OPTIONAL, -- Need OR
    subcarrierSpacingSSB-r15 ENUMERATED {kHz15, kHz30, kHz120, kHz240},
-- ASN1END
```
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ss-RSSI-Measurement-r15</td>
<td>SS-RSSI-Measurement-r15</td>
<td>OPTIONAL</td>
<td>-- Cond RSRQ2</td>
</tr>
<tr>
<td>cellReselectionPriority-r15</td>
<td>CellReselectionPriority</td>
<td>OPTIONAL</td>
<td>-- Need OP</td>
</tr>
<tr>
<td>cellReselectionSubPriority-r13</td>
<td>CellReselectionSubPriority-r13</td>
<td>OPTIONAL</td>
<td>-- Need OR</td>
</tr>
<tr>
<td>threshX-High-r15</td>
<td>ReselectionThreshold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>threshX-Low-r15</td>
<td>ReselectionThreshold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>threshX-Q-r15</td>
<td>Sequence</td>
<td>threshX-HighQ-r15</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>threshX-LowQ-r15</td>
<td></td>
</tr>
<tr>
<td>q-RxLevMin-r15</td>
<td>INTEGER (-70..-22)</td>
<td>OPTIONAL</td>
<td>-- Cond RSRQ</td>
</tr>
<tr>
<td>q-RxLevMinSUL-r15</td>
<td>INTEGER (-70..-22)</td>
<td>OPTIONAL</td>
<td>-- Need OR</td>
</tr>
<tr>
<td>p-MaxNR-r15</td>
<td>P-MaxNR-r15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ns-PmaxListNR-r15</td>
<td>NS-PmaxListNR-r15</td>
<td>OPTIONAL</td>
<td>-- Need OR</td>
</tr>
<tr>
<td>q-QualMin-r15</td>
<td>Q-QualMin-r9</td>
<td>OPTIONAL</td>
<td>-- Need OP</td>
</tr>
<tr>
<td>deriveSSB-IndexFromCell-r15</td>
<td>BOOLEAN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>maxRS-IndexCellQual-r15</td>
<td>MaxRS-IndexCellQualNR-r15</td>
<td>OPTIONAL</td>
<td>-- Need OR</td>
</tr>
<tr>
<td>threshRS-Index-r15</td>
<td>ThresholdListNR-r15</td>
<td>OPTIONAL</td>
<td>-- Need OR</td>
</tr>
</tbody>
</table>

...
SystemInformationBlockType24 field descriptions

**carrierFreqListNR**
List of carrier frequencies of NR.

**cellReselectionPriority**
The field concerns the absolute priority of the concerned carrier frequency as used by the cell reselection procedure. Corresponds with parameter "priority" in TS 36.304 [4].

**deriveSSB-IndexFromCell**
The field indicates whether the UE may use, to derive the SSB index of a cell on the indicated SSB frequency and subcarrier spacing, the timing of any detected cell with the same SSB frequency and subcarrier spacing. If this field is set to TRUE, the UE assumes SFN and frame boundary alignment across cells on the same NR carrier frequency as specified in 36.133 [16].

**endSymbol**
Within a slot that is configured for RSSI measurements (see measurementSlots) the UE measures the RSSI from symbol 0 to symbol endSymbol. This field identifies the entry in Table 5.1.33-1 in TS 36.214 which determines the actual end symbol.

**maxRS-IndexCellQual**
Number of SS blocks to average for cell measurement derivation. Corresponds to the parameter nrofSS-ResourcesToAverage in 38.304 [92].

**measTimingConfig**
Used to configure measurement timing configurations, i.e., timing occasions at which the UE measures SSBs. If the field is absent, the UE assumes that SSB periodicity is 5ms in this frequency.

**measurementSlots**
Indicates the slots in which the UE can perform NR RSSI measurements. The length of the BIT STRING is equal to the number of slots in the configured SMTC window (determined by the ssb-duration and by the subcarrierSpacingSSB). The first (left-most / most significant) bit in the bitmap corresponds to the first slot in the SMTC window, the second bit in the bitmap corresponds to the second slot in the SMTC window, and so on. The UE measures in slots for which the corresponding bit in the bitmap is set to 1.

**multiBandInfoList**
Indicates the list of frequency bands for which the NR cell reselection parameters apply.

**p-maxNR**
Indicates the maximum power for NR (see TS 38.104 [91]) the UE can use in NR SCG.

**q-QualMin**
Parameter "Qqualmin" in TS 36.304 [4], applicable for NR neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin.

**q-RxLevMin**
Parameter "Qlevmin" in TS 36.304 [4], applicable for NR neighbour cells.

**q-RxLevMinSUL**
Parameter "QlevminSUL" in TS 38.304 [92], applicable for NR neighbouring cells.

**threshRS-Index**
Threshold for consolidation of L1 measurements per RS index. Corresponds to the parameter absThreshSS-Consolidation in 38.304 [92].

**threshX-High**
Parameter "Threshx>Hignp" in TS 36.304 [4].

**threshX-HighQ**
Parameter "Threshx>Hignq" in TS 36.304 [4].

**threshX-Low**
Parameter "Threshx>Lowlp" in TS 36.304 [4].

**threshX-LowQ**
Parameter "Threshx>Lowlq" in TS 36.304 [4].

**t-ReselectionNR**
Parameter "TreselectionNR" in TS 36.304 [4].

**t-ReselectionNR-SF**
Parameter "Speed dependent ScalingFactor for TreselectionNR" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSRQ</td>
<td>The field is mandatory present if the threshServingLowQ is present in systemInformationBlockType3; otherwise it is not present.</td>
</tr>
<tr>
<td>RSRQ2</td>
<td>The field is optional OP if the threshServingLowQ is present in systemInformationBlockType3; otherwise it is not present.</td>
</tr>
</tbody>
</table>

**SystemInformationBlockType25**
The IE SystemInformationBlockType25 contains the UAC parameters.
SystemInformationBlockType25 information element

```plaintext
-- ASN1START

SystemInformationBlockType25-r15 ::= SEQUENCE {
  uac-BarringForCommon-r15    UAC-BarringPerCatList-r15    OPTIONAL,
  uac-BarringPerPLMN-List-r15  UAC-BarringPerPLMN-List-r15    OPTIONAL,
  uac-AC1-SelectAssistInfo-r15  UAC-BarringInfoSetList-r15,
  plmnCommon-r15               UAC-AC1-SelectAssistInfo-r15,
  individualPLMNList-r15      SEQUENCE (SIZE (1..maxPLMN-r11)) OF UAC-AC1-SelectAssistInfo-r15
                                    OPTIONAL,
  lateNonCriticalExtension    OCTET STRING        OPTIONAL,
  ...                         
}

UAC-BarringPerPLMN-List-r15 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF UAC-BarringPerPLMN-r15

UAC-BarringPerPLMN-r15 ::= SEQUENCE {
  plmn-IdentityIndex-r15  INTEGER (1..maxPLMN-r11),
  uac-AC-BarringListType-r15  CHOICE{
    uac-ImplicitAC-BarringList-r15  SEQUENCE (SIZE(maxAccessCat-1-r15)) OF UAC-BarringInfoSetIndex-r15,
    uac-ExplicitAC-BarringList-r15  UAC-BarringPerCatList-r15
  }     OPTIONAL
}

UAC-BarringPerCatList-r15 ::= SEQUENCE (SIZE (1..maxAccessCat-1-r15)) OF UAC-BarringPerCat-r15

UAC-BarringPerCat-r15 ::= SEQUENCE {
  accessCategory-r15     INTEGER (1..maxAccessCat-1-r15),
  uac-barringInfoSetIndex-r15  UAC-BarringInfoSetIndex-r15
}

UAC-BarringInfoSetIndex-r15 ::= INTEGER (1..maxBarringInfoSet-r15)

UAC-BarringInfoSetList-r15 ::= SEQUENCE (SIZE (1..maxBarringInfoSet-r15)) OF UAC-BarringInfoSet-r15

UAC-BarringInfoSet-r15 ::= SEQUENCE {
  uac-BarringFactor-r15  ENUMERATED {
    p00, p05, p10, p15, p20, p25, p30, p40,
    p50, p60, p70, p75, p80, p85, p90, p95),
  uac-BarringTime-r15    ENUMERATED {s4, s8, s16, s32, s64, s128, s256, s512},
  uac-BarringForAccessIdentity-r15  BIT STRING (SIZE(?))
}

UAC-AC1-SelectAssistInfo-r15 ::= ENUMERATED {a, b, c}

-- ASN1STOP
```
**SystemInformationBlockType25 field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>accessCategory</td>
<td>The Access Category according to TS 22.261 [96].</td>
</tr>
<tr>
<td>uac-BarringFactor</td>
<td>Represents the probability that access attempt would be allowed during access barring check.</td>
</tr>
<tr>
<td>uac-BarringForCommon</td>
<td>Common access control parameters for each access category. Common values are used for all PLMNs, unless overwritten by the PLMN specific configuration provided in uac-BarringForPLMN-List. The parameters are specified by providing an index to the set of configurations (uac-BarringInfoSetList). UE behaviour upon absence of this field is specified in section 5.3.16.2.</td>
</tr>
<tr>
<td>uac-BarringPerPLMN-List</td>
<td>Access control parameters for each access category valid only for a specific PLMN.</td>
</tr>
<tr>
<td>uac-BarringInfoSetIndex</td>
<td>Index of the entry in field uac-BarringInfoSetList. Value 1 corresponds to the first entry in uac-BarringInfoSetList, value 2 corresponds to the second entry in this list and so on. An index value not included in uac-BarringInfoSetList indicates no barring.</td>
</tr>
<tr>
<td>uac-BarringInfoSetList</td>
<td>List of access control parameter sets. Each access category can be configured with access parameters corresponding to a particular set.</td>
</tr>
<tr>
<td>uac-BarringForAccessIdentity</td>
<td>Indicates whether access attempt is allowed for each Access Identity. The leftmost bit, bit 0 in the bit string corresponds to Access Identity 1, bit 1 in the bit string corresponds to Access Identity 2, bit 2 in the bit string corresponds to Access Identity 11, bit 3 in the bit string corresponds to Access Identity 12 and so on. Value 0 means that access attempt is allowed for the corresponding access identity.</td>
</tr>
<tr>
<td>uac-BarringTime</td>
<td>The minimum time before a new access attempt is to be performed after an access attempt was barred at access barring check for the same access category.</td>
</tr>
<tr>
<td>uac-AccessCategory1-SelectionAssistanceInfo</td>
<td>Information used to determine whether Access Category 1 applies to the UE, as defined in [96]. A UE compliant with this version of the specification shall ignore this field.</td>
</tr>
</tbody>
</table>

---

**SystemInformationBlockType26**

The IE **SystemInformationBlockType26** contains V2X sidelink communication configurations which can be used jointly with those included in **SystemInformationBlockType21**.

**SystemInformationBlockType26 information element**

```asn1
-- ASN1START

SystemInformationBlockType26-r15  ::= SEQUENCE {
    v2x-InterFreqInfoList-r15  SL-InterFreqInfoListV2X-r14 OPTIONAL, -- Need OR
    cbr-ppsch-TxConfigList-r15 SL-CBR-PPPP-TxConfigList-r15 OPTIONAL, -- Need OR
    v2x-PacketDuplicationConfig-r15 SL-V2X-PacketDuplicationConfig-r15 OPTIONAL, -- Need OR
    syncFreqList-r15           SL-V2X-SyncFreqList-r15     OPTIONAL, -- Need OR
    slss-TxMultiFreq-r15       ENUMERATED{true}     OPTIONAL, -- Need OR
    v2x-FreqSelectionConfigList-r15 SL-V2X-FreqSelectionConfigList-r15 OPTIONAL, -- Need OR
    threshS-RSSI-CBR-r14       INTEGER (0..45)     OPTIONAL, -- Need OR

    ...                        -- ASN1STOP
```

---
SystemInformationBlockType26 field descriptions

cbr-ppach-TxConfigList
Indicates the mapping between PPPPs, CBR ranges by using indexes of the entry in cbr-RangeCommonConfigList included in SIB21, and PSSCH transmission parameters and CR limit by using indexes of the entry in sl-CBR-PSSCH-TxConfigList included in SIB21. The configurations in this field apply to all the resource pools on all the carrier frequencies included in SIB26 for V2X sidelink communication transmission. The mcs-PSSCH-RangeList-r15 included in this field also applies to all the resource pools on all the carrier frequencies included in SIB21 for V2X sidelink communication transmission.

slls-TxMultiFreq
Value TRUE indicates the UE transmits SLSS on multiple carrier frequencies for V2X sidelink communication. If this field is absent, the UE transmits SLSS only on the synchronisation carrier frequency.

syncFreqList
Indicates a list of candidate carrier frequencies that can be used for the synchronisation of V2X sidelink communication.

threshS-RSSI-CBR
Indicates the S-RSSI threshold for determining the contribution of a sub-channel to the CBR measurement, as specified in TS 36.214 [48]. Value 0 corresponds to -112 dBm, value 1 to -110 dBm, value n to (-112 + n*2) dBm, and so on. If included, the threshS-RSSI-CBR in SL-CommResourcePoolV2X in SIB26 is absent.

v2x-FreqSelectionConfigList
Indicates the configuration information for the carrier selection for V2X sidelink communication transmission on the carrier frequency where the field is broadcast.

v2x-PacketDuplicationConfig
Indicates the configuration information for sidelink packet duplication for V2X sidelink communication.

v2x-InterFreqInfoList
If this field includes a carrier frequency which is included in SIB21 and some configuration(s) for that carrier are already included in SIB21, the corresponding configuration(s) for that carrier frequency are not included in this field.

6.3.2 Radio resource control information elements

AntennaInfo

The IE AntennaInfoCommon and the AntennaInfoDedicated are used to specify the common and the UE specific antenna configuration respectively.

AntennaInfo information elements

```asn1
-- ASN1START

AntennaInfoCommon ::= SEQUENCE {
    antennaPortsCount   ENUMERATED {an1, an2, an4, spare1}
}

AntennaInfoDedicated ::= SEQUENCE {
    transmissionMode     ENUMERATED {
        tm1, tm2, tm3, tm4, tm5, tm6,
        tm7, tm8-v920
    },
    codebookSubsetRestriction CHOICE {
        n2TxAntenna-tm3     BIT STRING (SIZE (2)),
        n4TxAntenna-tm3     BIT STRING (SIZE (4)),
        n2TxAntenna-tm4     BIT STRING (SIZE (6)),
        n4TxAntenna-tm4     BIT STRING (SIZE (64)),
        n2TxAntenna-tm5     BIT STRING (SIZE (4)),
        n4TxAntenna-tm5     BIT STRING (SIZE (16)),
        n2TxAntenna-tm6     BIT STRING (SIZE (4)),
        n4TxAntenna-tm6     BIT STRING (SIZE (16))
    },
    ue-TransmitAntennaSelection CHOICE {
        release       NULL,
        setup        ENUMERATED {closedLoop, openLoop}
    },
    -- Cond TM
    -- ASN1END
```
AntennaInfoDedicated-v10i0 ::= SEQUENCE {
  maxLayersMIMO-r10 ENUMERATED {twoLayers, fourLayers, eightLayers} OPTIONAL -- Need OR
}

AntennaInfoDedicated-v1250 ::= SEQUENCE {
  alternativeCodebookEnabledFor4TX-r12 BOOLEAN
}

AntennaInfoDedicated-v1430 ::= SEQUENCE {
  ce-UE-TxAntennaSelection-config-r14 ENUMERATED {on} OPTIONAL -- Need OR
}

AntennaInfoDedicatedSTTI-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    transmissionModeDL-MBSFN-r15 ENUMERATED {tm9, tm10} OPTIONAL, -- Need OR
    transmissionModeDL-nonMBSFN-r15 ENUMERATED {tm1, tm2, tm3, tm4, tm6, tm8, tm9, tm10} OPTIONAL, -- Need OR
    codebookSubsetRestriction CHOICE {
      n2TxAntenna-tm3-r15 BIT STRING (SIZE (2)),
      n4TxAntenna-tm3-r15 BIT STRING (SIZE (4)),
      n2TxAntenna-tm4-r15 BIT STRING (SIZE (6)),
      n4TxAntenna-tm4-r15 BIT STRING (SIZE (12)),
      n2TxAntenna-tm5-r15 BIT STRING (SIZE (4)),
      n4TxAntenna-tm5-r15 BIT STRING (SIZE (8)),
      n2TxAntenna-tm6-r15 BIT STRING (SIZE (4)),
      n4TxAntenna-tm6-r15 BIT STRING (SIZE (8)),
      n2TxAntenna-tm8-r15 BIT STRING (SIZE (6)),
      n4TxAntenna-tm8-r15 BIT STRING (SIZE (16)),
      n2TxAntenna-tm9and10-r15 BIT STRING (SIZE (6)),
      n4TxAntenna-tm9and10-r15 BIT STRING (SIZE (14)),
      n8TxAntenna-tm9and10-r15 BIT STRING (SIZE (14)) OPTIONAL, -- Cond TM
    } OPTIONAL, -- Cond TM
    maxLayersMIMO-STTI-r15 ENUMERATED {twoLayers, fourLayers} OPTIONAL, -- Need OR
    slotSubslotPDSCH-TxDiv-2Layer-r15 BOOLEAN,
    slotSubslotPDSCH-TxDiv-4Layer-r15 BOOLEAN
  }
}

AntennaInfoDedicated-v1530 ::= CHOICE {
  release NULL,
  setup CHOICE {
    ue-TxAntennaSelection-SRS-1T4R-Config-r15 NULL,
    ue-TxAntennaSelection-SRS-2T4R-NrOfPairs-r15 ENUMERATED {two, three}
  }
}

-- ASN1STOP
### AntennaInfo field descriptions

**alternativeCodebookEnabledFor4TX**
Indicates whether code book in TS 36.213 [23] Table 7.2.4-0A to Table 7.2.4-0D is being used for deriving CSI feedback and reporting. E-UTRAN only configures the field if the UE is configured with a) \(tm8\) with 4 CRS ports, \(tm9\) or \(tm10\) with 4 CSI-RS ports and b) PMI/RI reporting.

**antennaPortsCount**
Parameter represents the number of cell specific antenna ports where \(an1\) corresponds to 1, \(an2\) to 2 antenna ports etc. see TS 36.211 [21, 6.2.1].

**ce-ue-TxAntennaSelection-config**
Configuration of UL closed-loop transmit antenna selection for non-BL UE in CE Mode A, see TS 36.212 [22].

**codebookSubsetRestriction**
Parameter: codebookSubsetRestriction, see TS 36.213 [23, 7.2] and TS 36.211 [21, 6.3.4.2.3]. The number of bits in the codebookSubsetRestriction for applicable transmission modes is defined in TS 36.213 [23, Table 7.2-1b]. If the UE is configured with transmissionMode \(tm8\), E-UTRAN configures the field codebookSubsetRestriction if PMI/RI reporting is configured. If the UE is configured with transmissionMode \(tm9\), E-UTRAN configures the field codebookSubsetRestriction if PMI/RI reporting is configured and if the number of CSI-RS ports is greater than 1. E-UTRAN does not configure the field codebookSubsetRestriction in other cases where the UE is configured with transmissionMode \(tm8\) or \(tm9\). Furthermore, E-UTRAN does not configure the field codebookSubsetRestriction if the UE is configured with eMIMO-Type unless it is set to beamformed, alternativeCodebookEnabledBeamformed is set to FALSE and csi-RS-ConfigNZPIdListExt is not configured.

**maxLayersMIMO**
Indicates the maximum number of layers for spatial multiplexing used to determine the rank indication bit width and \(K_c\) determination of the soft buffer size for the corresponding serving cell according to TS 36.212 [22]. E-UTRAN configures this field only when transmissionMode is set to \(tm3\), \(tm4\), \(tm9\) or \(tm10\) for the corresponding serving cell. When configuring the field for a serving cell which transmissionMode is set to \(tm3\) or \(tm4\), E-UTRAN only configures value fourLayers: For a serving cell which transmissionMode is set to \(tm9\) or \(tm10\), E-UTRAN only configures the field only if intraBandContiguousCC-InfoList is indicated for the band and the band combination of the corresponding serving cell or the UE supports maxLayersMIMO-Indication.

**maxLayersMIMO-STTI**
Indicates the maximum number of layers, for each serving cell, to be used when determining if the shifted DMRS pattern is applicable TS 36.211 [21], section 6.10.3.2.

**slotSubslotPDSCH-TxDiv-2Layer, slotSubslotPDSCH-TxDiv-4Layer**
Indicates the table to be used in case of dynamic TX diversity fallback for TM9 and 10 for up to 2-layer/4-layer slot or subslot PDSCH operation, see TS 36.212 [22], section 5.3.3.1.22.

**transmissionMode**
Points to one of Transmission modes defined in TS 36.213 [23], section 7.1, where \(tm1\) refers to transmission mode 1, \(tm2\) to transmission mode 2 etc.

**transmissionModeDL-MBSFN**
Indicates, for MBSFN, the transmission mode as defined in TS 36.213 [23], section 7.1, where \(tm1\) refers to transmission mode 1, \(tm2\) to transmission mode 2 etc for slot or subslot operation. In case of FDD, \(TM8\) is not applicable.

**transmissionModeDL-nonMBSFN**
Indicates, for non-MBSFN, the transmission mode as defined in TS 36.213 [23], section 7.1, where \(tm1\) refers to transmission mode 1, \(tm2\) to transmission mode 2 etc. for slot or subslot operation. In case of FDD, \(TM8\) is not applicable.

**ue-TransmitAntennaSelection**
For value setup, the field indicates whether UE transmit antenna selection control is closed-loop or open-loop as described in TS 36.213 [23], section 8.7.

**ue-TxAntennaSelection-SRS-1T4R-Config**
Configuration of UL closed-loop transmit antenna selection for UE to select one antenna among four antennas to transmit SRS for the corresponding serving cell as described in TS 36.213 [23]. When \(ue-TxAntennaSelection-SRS-1T4R-Config\) and \(ue-TransmitAntennaSelection\) are configured simultaneously for a given serving cell, the UE selects one of the first two antennas for PUSCH transmission and selects one antenna among four antennas at each SRS instance for SRS transmission for the corresponding serving cell as described in TS 36.213 [23].

**ue-TxAntennaSelection-SRS-2T4R-NonPairs**
Presence of the field indicates configuration of UL closed-loop transmit antenna selection for UE to select two antennas among four antennas to transmit SRS simultaneously for the corresponding serving cell as described in TS 36.213 [23]. Further, the field indicates the number of antenna pairs to select from for SRS transmission for a given serving cell as described in TS 36.213 [23]. Value two indicates the UE to select one antenna pair between two antenna pairs to transmit SRS simultaneously at each SRS instance for the corresponding serving cell. Value three indicates the UE to select one antenna pair among three antenna pairs to transmit SRS simultaneously at each SRS instance for the corresponding serving cell. E-UTRAN does not simultaneously configure \(ue-TransmitAntennaSelection\) and \(ue-TxAntennaSelection-SRS-2T4R-NonPairs\) for a given serving cell.
### Conditional presence

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TM</strong></td>
<td>The field is mandatory present if the <em>transmissionMode</em> is set to tm3, tm4, tm5 or tm6. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td><strong>TM8</strong></td>
<td>The field is optional present, need OR, if AntennaInfoDedicated is included and <em>transmissionMode</em> is set to tm8. If AntennaInfoDedicated is included and <em>transmissionMode</em> is set to a value other than tm8, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>TMX</strong></td>
<td>The field is mandatory present if the <em>transmissionMode-r10</em> is set to tm3, tm4, tm5 or tm6. The field is optionally present, need OR, if the <em>transmissionMode-r10</em> is set to tm8 or tm9. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

### AntennaInfoUL

The IE *AntennaInfoUL* is used to specify the UL antenna configuration.

#### AntennaInfoUL information elements

---

### AntennaInfoUL field descriptions

- **fourAntennaPortActivated**
  Parameter indicates if four antenna ports are used. See TS 36.213 [23, 8.2]. E-UTRAN optionally configures *fourAntennaPortActivated* only if *transmissionModeUL* is set to tm2.

- **transmissionModeUL**
  Points to one of UL Transmission modes defined in TS 36.213 [23, 8.0] where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.

- **transmissionModeUL-STTI**
  Indicates the UL transmission mode as defined in TS 36.213 [23], section 8.0, where tm1 refers to transmission mode 1 and tm2 to transmission mode 2 for slot or subslot operation.

---

### AUL-Config

The IE *AUL-Config* is used to specify the autonomous uplink configuration.

#### AUL-Config information element

---

ETSI
**AUL-Config field descriptions**

- **aul-CRNTI**
  AUL C-RNTI, see TS 36.321 [6].

- **aul-HARQ-Processes**
  This field indicates which HARQ process IDs are configured for AUL operation as described in TS 36.321 [6]. In case tm1 is configured for the `transmissionModeUL-AUL` the number of configured HARQ processes equals to field value. In case tm2 is configured for the `transmissionModeUL-AUL` the number of configured HARQ processes equals to double of the field value. The largest value of the HARQ process ID is equal to the number of configured HARQ processes.

- **aul-RetransmissionTimer**
  This timer is used to restrict both new transmission and retransmission for the same HARQ process for AUL operation as described in TS 36.321 [6]. Value psf4 corresponds to 4 PDCCH subframes etc.

- **aul-StartingFullBW-InsideCOT**
  This field indicates the AUL-specific set of PUSCH starting offset values for the AUL transmission inside of eNB obtained MCOT when a UE configured with AUL configuration is allocated to occupy the full channel bandwidth as described in TS 36.213 [23, 8.0]. The left most bit corresponds to value 34, second bit corresponds to value 43, third bit corresponds to value 52, fourth bit corresponds to value 61 and last bit corresponds to value OS#1.

- **aul-StartingFullBW-OutsideCOT**
  This field indicates the AUL-specific set of PUSCH starting offset values for the AUL transmission outside of eNB obtained MCOT when a UE configured with AUL configuration is allocated to occupy the full channel bandwidth as described in TS 36.213 [23, 8.0]. The left most bit corresponds to value 16, second bit corresponds to value 25, third bit corresponds to value 34, fourth bit corresponds to value 43, fifth bit corresponds to value 52, sixth bit corresponds to value 61 and last bit corresponds to value OS#1.

- **aul-StartingPartialBW-InsideCOT**
  This field indicates the exact AUL-specific PUSCH starting offset value for the AUL transmission inside of eNB obtained MCOT when a UE configured with AUL configuration is allocated to occupy partial channel bandwidth as described in TS 36.213 [23, 8.0]. The value o34 corresponds to 34 and the value o43 corresponds to 43 and so on.

- **aul-StartingPartialBW-OutsideCOT**
  This field indicates the exact AUL-specific PUSCH starting offset value for the AUL transmission outside of eNB obtained MCOT when a UE configured with AUL configuration is allocated to occupy partial channel bandwidth as described in TS 36.213 [23, 8.0]. The value o16 corresponds to 16 and the value o25 corresponds to 25 and so on.

- **aul-Subframes**
  This field indicates which subframes are allowed for AUL operation as described in TS 36.321 [6]. The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod 4 = 0. Value 0 in the bitmap indicates that the corresponding subframe not allowed for AUL. Value 1 in the bitmap indicates that the corresponding subframe is allowed for AUL.

- **contentionWindowSizeTimer**
  This field indicates contention window size adjustment timer as described in TS 37.213 [94], section 4.2.2. The value n0 corresponds to 0ms, value n5 corresponds to 5ms, value 10 corresponds to 10ms.

- **endingSymbolAUL**
  This field indicates PUSCH ending symbol of the last AUL subframe in an AUL burst as described in TS 36.211 [21, 4.1.3].

- **subframeOffsetCOT-Sharing**
  This field is COT sharing indication parameter X indicating if subframe n+X is an applicable subframe for UL to DL sharing as described in TS 37.213 [94], section 4.1.3.

- **transmissionModeUL-AUL**
  This field indicates which UL transmission mode is used for AUL as described in TS 36.213 [23, 8.0], where tm1 refers to transmission mode 1, tm2 to transmission mode 2.

---

**CQI-ReportAperiodic**

The IE `CQI-ReportAperiodic` is used to specify the aperiodic CQI reporting configuration.

---

**CQI-ReportAperiodic information elements**

---

```asn1
CQI-ReportAperiodic-r10 ::= CHOICE {
  release        NULL,
  setup        SEQUENCE {
    cqi-ReportModeAperiodic-r10 CQI-ReportModeAperiodic,
    aperiodicCSI-Trigger-r10 SEQUENCE {
      trigger1-r10 BIT STRING {SIZE (8)},
    }}
}
```
CQI-ReportAperiodic-v1250 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    aperiodicCSI-Trigger-v1250
      SEQUENCE {
        trigger1-r12 ENUMERATED {s1, s2},
        trigger1-SubframeSetIndicator-r12 BIT STRING (SIZE (8)),
        trigger2-SubframeSetIndicator-r12 BIT STRING (SIZE (8))
      }
  }
}

CQI-ReportAperiodic-v1310 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    aperiodicCSI-Trigger-v1310
      SEQUENCE {
        trigger1-r13 BIT STRING (SIZE (32)),
        trigger2-r13 BIT STRING (SIZE (32)),
        trigger3-r13 BIT STRING (SIZE (32)),
        trigger4-r13 BIT STRING (SIZE (32)),
        trigger5-r13 BIT STRING (SIZE (32)),
        trigger6-r13 BIT STRING (SIZE (32))
      }
    aperiodicCSI-Trigger2-r13
      CHOICE {
        release NULL,
        setup SEQUENCE {
          trigger1-SubframeSetIndicator-r13 BIT STRING (SIZE (32)),
          trigger2-SubframeSetIndicator-r13 BIT STRING (SIZE (32)),
          trigger3-SubframeSetIndicator-r13 BIT STRING (SIZE (32)),
          trigger4-SubframeSetIndicator-r13 BIT STRING (SIZE (32)),
          trigger5-SubframeSetIndicator-r13 BIT STRING (SIZE (32)),
          trigger6-SubframeSetIndicator-r13 BIT STRING (SIZE (32))
        }
      }
  }
}

CQI-ReportAperiodicProc-r11 ::= SEQUENCE {
  cqi-ReportModeAperiodic-r11 CQI-ReportModeAperiodic,
  trigger01-r11 BOOLEAN,
  trigger10-r11 BOOLEAN,
  trigger11-r11 BOOLEAN
}

CQI-ReportAperiodicProc-v1310 ::= SEQUENCE {
  trigger001-r13 BOOLEAN,
  trigger010-r13 BOOLEAN,
  trigger011-r13 BOOLEAN,
  trigger100-r13 BOOLEAN,
  trigger101-r13 BOOLEAN,
  trigger110-r13 BOOLEAN,
  trigger111-r13 BOOLEAN
}

CQI-ReportAperiodicHybrid-r14 ::= SEQUENCE {
  triggers-r14
    CHOICE {
      oneBit-r14
        SEQUENCE {
          trigger1-Indicator-r14 BIT STRING (SIZE (8))
        }
      ,
      twoBit-r14
        SEQUENCE {
          trigger01-Indicator-r14 BIT STRING (SIZE (8)),
          trigger10-Indicator-r14 BIT STRING (SIZE (8)),
          trigger11-Indicator-r14 BIT STRING (SIZE (8))
        }
      ,
      threeBit-r14
        SEQUENCE {
          trigger001-Indicator-r14 BIT STRING (SIZE (32)),
          trigger010-Indicator-r14 BIT STRING (SIZE (32)),
          trigger011-Indicator-r14 BIT STRING (SIZE (32)),
          trigger100-Indicator-r14 BIT STRING (SIZE (32)),
          trigger101-Indicator-r14 BIT STRING (SIZE (32)),
          trigger110-Indicator-r14 BIT STRING (SIZE (32)),
          trigger111-Indicator-r14 BIT STRING (SIZE (32))
        }
    }
}

CQI-ReportAperiodic-v1250 ::= CHOICE {
  trigger2-r10
    BIT STRING (SIZE (8)),
  }
}
CQI-ReportModeAperiodic ::= ENUMERATED {
    rm12, rm20, rm22, rm30, rm31,
    rm32-v1250, rm10-v1310, rm11-v1310
}
CQI-ReportAperiodic field descriptions

aperiodicCSI-Trigger
Indicates for which serving cell(s) the aperiodic CSI report is triggered when one or more SCells are configured. trigger1 corresponds to the CSI request field 10 or 010, trigger2 corresponds to the CSI request field 11 or 011, trigger3 corresponds to the CSI request field 100, see TS 36.213 [23, table 7.2.1-1A], and so on. The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex=1 etc. Each bit has either value 0 (means no aperiodic CSI report is triggered) or value 1 (means the aperiodic CSI report is triggered). At most 5 bits can be set to value 1 in the bit string in aperiodicCSI-Trigger-v10 and in aperiodicCSI-Trigger-v1250 and at most 32 bits can be set to value 1 in the bit string in aperiodicCSI-Trigger-v1310. E-UTRAN configures value 1 only for cells configured with transmissionMode set in range tm1 to tm9. One value applies for all serving cells configured with transmissionMode set in range tm1 to tm9 (the associated functionality is common i.e. not performed independently for each cell).

trigger-SubframeSetIndicator
For a serving cell configured with csi-MeasSubframeSets-r12, indicates for which CSI subframe set the aperiodic CSI report is triggered for the serving cell if the aperiodic CSI is triggered by the CSI request field 01 or 001, see TS 36.213 [23, table 7.2.1-1C or table 7.2.1.-1E]. Value s1 corresponds to CSI subframe set 1 and value s2 corresponds to CSI subframe set 2.

trigger001
Indicates whether or not reporting for this CSI-process or reporting for this CSI-process corresponding to a CSI subframe set is triggered by CSI request field set to 001, for a CSI request applicable for the serving cell on the same frequency as the CSI process, see TS 36.213 [23, table 7.2.1-1D and 7.2.1-1E].

trigger001-Indicator
Indicates for which eMIMO-Type the aperiodic CSI report is triggered (the corresponding CSI process, CSI subframe set)-pair(s) and/or a serving cell) as applicable, See TS 36.213 [23, table 7.2.1-1A, 7.2.1-1B, and 7.2.1-1C].

trigger01
Indicates whether or not reporting for this CSI-process or reporting for this CSI-process corresponding to a CSI subframe set is triggered by CSI request field set to 01, for a CSI request applicable for the serving cell on the same frequency as the CSI process, see TS 36.213 [23, table 7.2.1-1D and 7.2.1-1E].

trigger010, trigger011, trigger100, trigger101, Trigger110, Trigger111
Indicates whether or not reporting for this CSI-process or reporting for this CSI-process corresponding to a CSI subframe set is triggered by CSI request field set to 010, 011, 100, 101, 110 or 111, see TS 36.213 [23, table 7.2.1-1D and 7.2.1-1E].

trigger1, trigger11
Indicates whether or not reporting for this CSI-process or reporting for this CSI-process corresponding to a CSI subframe set is triggered by CSI request field set to 10 or 11, see TS 36.213 [23, table 7.2.1-1B]. EUTRAN configures at most 5 CSI processes, across all serving frequencies within each CG, to be triggered by a CSI request field set to value 10. The same restriction applies for value 11. In case E-UTRAN simultaneously triggers CSI requests for more than 5 CSI processes some limitations apply, see TS 36.213 [23].

trigger1-SubframeSetIndicator
If signalled in the aperiodicCSI-Trigger-v1250, indicates for which CSI subframe set the aperiodic CSI report is triggered when aperiodic CSI is triggered by the CSI request field 10, see TS 36.213 [23, table 7.2.1-1C] or by the CSI request field 010, see TS 36.213 [23, table 7.2.1-1E].The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex=1 etc. Each bit has either value 0 (means that aperiodic CSI report is triggered for CSI subframe set 1) or value 1 (means that aperiodic CSI report is triggered for CSI subframe set 2).

trigger2-SubframeSetIndicator
If signalled in the aperiodicCSI-Trigger-v1250, indicates for which CSI subframe set the aperiodic CSI report is triggered when aperiodic CSI is triggered by the CSI request field 11, see TS 36.213 [23, table 7.2.1-1C] or by the CSI request field 011, see TS 36.213 [23, table 7.2.1-1E].The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex=1 etc. Each bit has either value 0 (means that aperiodic CSI report is triggered for CSI subframe set 1) or value 1 (means that aperiodic CSI report is triggered for CSI subframe set 2).

trigger3-SubframeSetIndicator
Indicates for which CSI subframe set the aperiodic CSI report is triggered when aperiodic CSI is triggered by the CSI request field100, see TS 36.213 [23, table 7.2.1-1E].The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex=1 etc. Each bit has either value 0 (means that aperiodic CSI report is triggered for CSI subframe set 1) or value 1 (means that aperiodic CSI report is triggered for CSI subframe set 2).

trigger4-SubframeSetIndicator
Indicates for which CSI subframe set the aperiodic CSI report is triggered when aperiodic CSI is triggered by the CSI request field 101, see TS 36.213 [23, table 7.2.1-1E].The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex=1 etc. Each bit has either value 0 (means that aperiodic CSI report is triggered for CSI subframe set 1) or value 1 (means that aperiodic CSI report is triggered for CSI subframe set 2).
CQI-ReportAperiodic field descriptions

trigger5-SubframeSetIndicator
Indicates for which CSI subframe set the aperiodic CSI report is triggered when aperiodic CSI is triggered by the CSI request field 110, see TS 36.213 [23, table 7.2.1-1E]. The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex =1 etc. Each bit has either value 0 (means that aperiodic CSI report is triggered for CSI subframe set 1) or value 1 (means that aperiodic CSI report is triggered for CSI subframe set 2).

trigger6-SubframeSetIndicator
Indicates for which CSI subframe set the aperiodic CSI report is triggered when aperiodic CSI is triggered by the CSI request field 111, see TS 36.213 [23, table 7.2.1-1E]. The leftmost bit, bit 0 in the bit string corresponds to the cell with ServCellIndex=0 and bit 1 in the bit string corresponds to the cell with ServCellIndex =1 etc. Each bit has either value 0 (means that aperiodic CSI report is triggered for CSI subframe set 1) or value 1 (means that aperiodic CSI report is triggered for CSI subframe set 2).

-- CQI-ReportBoth

The IE CQI-ReportBoth is used to specify the CQI reporting configuration common to both periodic and aperiodic configurations.

CQI-ReportBoth information elements

```asn1
CQI-ReportBoth-r11 ::= SEQUENCE {
    csi-IM-ConfigToReleaseList-r11  CSI-IM-ConfigToReleaseList-r11 OPTIONAL, -- Need ON
    csi-IM-ConfigToAddModList-r11  CSI-IM-ConfigToAddModList-r11 OPTIONAL, -- Need ON
    csi-ProcessToReleaseList-r11   CSI-ProcessToReleaseList-r11 OPTIONAL, -- Need ON
    csi-ProcessToAddModList-r11   CSI-ProcessToAddModList-r11 OPTIONAL -- Need ON
}

CQI-ReportBoth-v1250 ::= SEQUENCE {
    csi-IM-ConfigToReleaseListExt-r12 CSI-IM-ConfigId-v1250 OPTIONAL, -- Need ON
    csi-IM-ConfigToAddModListExt-r12 CSI-IM-ConfigExt-r12 OPTIONAL -- Need ON
}

CQI-ReportBoth-v1310 ::= SEQUENCE {
    csi-IM-ConfigToReleaseListExt-r13 CSI-IM-ConfigToReleaseListExt-r13 OPTIONAL, -- Need ON
    csi-IM-ConfigToAddModListExt-r13 CSI-IM-ConfigToAddModListExt-r13 OPTIONAL -- Need ON
}

CSI-IM-ConfigToAddModList-r11 ::= SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF CSI-IM-Config-r11

CSI-IM-ConfigToAddModListExt-r13 ::= SEQUENCE (SIZE (1..maxCSI-IM-v1310)) OF CSI-IM-ConfigExt-r12

CSI-IM-ConfigToReleaseList-r11 ::= SEQUENCE (SIZE (1..maxCSI-IM-r11)) OF CSI-IM-ConfigId-r11

CSI-IM-ConfigToReleaseListExt-r13 ::= SEQUENCE (SIZE (1..maxCSI-IM-v1310)) OF CSI-IM-ConfigId-v1310

CSI-ProcessToAddModList-r11 ::= SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF CSI-Process-r11

CSI-ProcessToReleaseList-r11 ::= SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF CSI-ProcessId-r11

CQI-ReportBothProc-r11 ::= SEQUENCE {
    ri-Ref-CSI-ProcessId-r11   CSI-ProcessId-r11 OPTIONAL, -- Need OR
    pmi-R1-Report-r11 ENUMERATED {setup} OPTIONAL -- Need OR
}
```

-- ASN1STOP
For a serving frequency E-UTRAN configures one or more CSI-IM-Config only when transmission mode 10 is configured for the serving cell on this carrier frequency.

For a serving frequency E-UTRAN configures one or more CSI-Process only when transmission mode 10 is configured for the serving cell on this carrier frequency.

Parameter: reporting mode. Value rm12 corresponds to Mode 1-2, rm20 corresponds to Mode 2-0, rm22 corresponds to Mode 2-2 etc. PUSCH reporting modes are described in TS 36.213 [23, 7.2.1]. The UE shall ignore cqi-ReportModeAperiodic-r10 when transmission mode 10 is configured for the serving cell on this carrier frequency. The UE shall ignore cqi-ReportModeAperiodic-r10 configured for the PCell/ PSCell when the transmission bandwidth of the PCell/PSCell in downlink is 6 resource blocks.

The presence of this field means PMI/RI reporting is configured; otherwise the PMI/RI reporting is not configured. EUTRAN configures this field only when transmissionMode is set to tm8, tm9 or tm10. The UE shall ignore pmi-RI-Report-r9/ pmi-RI-Report-r10 when transmission mode 10 is configured for the serving cell on this carrier frequency.

CSI process whose RI value the UE inherits when reporting RI, in the same subframe, for CSI reporting. E-UTRAN ensures that the CSI process that inherits the RI value is configured in accordance with the conditions specified in TS 36.213 [23, 7.2.1, 7.2.2].

---

**CQI-ReportConfig**

The IE CQI-ReportConfig is used to specify the CQI reporting configuration.

**CQI-ReportConfig** information elements

```asn1
-- ASN1START
CQI-ReportConfig ::= SEQUENCE {
  cqi-ReportModeAperiodic CQI-ReportModeAperiodic OPTIONAL, -- Need OR
  nomPDSCH-RS-EPRE-Offset INTEGER (-1..6),
  cqi-ReportPeriodic CQI-ReportPeriodic OPTIONAL -- Need ON
}

CQI-ReportConfig-v920 ::= SEQUENCE {
  cqi-Mask-r9 ENUMERATED (setup) OPTIONAL, -- Cond cqi-Setup
  pmi-RJ-Report-r9 ENUMERATED (setup) OPTIONAL -- Cond PMIRI
}

CQI-ReportConfig-r10 ::= SEQUENCE {
  cqi-ReportAperiodic-r10 CQI-ReportAperiodic-r10 OPTIONAL, -- Need ON
  nomPDSCH-RS-EPRE-Offset INTEGER (-1..6),
  cqi-ReportPeriodic-r10 CQI-ReportPeriodic-r10 OPTIONAL, -- Need ON
  pmi-RJ-Report-r9 ENUMERATED (setup) OPTIONAL, -- Cond

PMIRIPCell
  csi-SubframePatternConfig-r10 CHOICE {
    release NULL,
    setup SEQUENCE {
      csi-MeasSubframeSet1-r10 MeasSubframePattern-r10,
      csi-MeasSubframeSet2-r10 MeasSubframePattern-r10
    } OPTIONAL -- Need ON
  }
}

CQI-ReportConfig-v1130 ::= SEQUENCE {
  cqi-ReportPeriodic-v1130 CQI-ReportPeriodic-v1130,
  cqi-ReportBoth-r11 CQI-ReportBoth-r11
}

CQI-ReportConfig-v1250 ::= SEQUENCE {
  cqi-ReportAperiodic-v1250 CQI-ReportAperiodic-v1250 OPTIONAL, -- Need ON
  release NULL,
  setup SEQUENCE {
    csi-MeasSubframeSets-r12 BIT STRING (SIZE (10))
  } OPTIONAL, -- Need ON
}
CQI-ReportBoth-v1250 CQI-ReportBoth-v1250 OPTIONAL, -- Need ON
CQI-ReportAperiodic-v1250 CQI-ReportAperiodic-v1250 OPTIONAL, -- Need ON
altCQI-Table-r12 ENUMERATED [ allSubframes, csi-SubframeSet1,
-- ASN1END
```
CQI-ReportConfig-v1310 ::= SEQUENCE {
cqi-ReportBoth-v1310 CQI-ReportBoth-v1310 OPTIONAL, -- Need ON
  cqi-ReportAperiodic-v1310 CQI-ReportAperiodic-v1310 OPTIONAL, -- Need ON
  cqi-ReportPeriodic-v1310 CQI-ReportPeriodic-v1310 OPTIONAL -- Need ON
}

CQI-ReportConfig-v1320 ::= SEQUENCE {
cqi-ReportPeriodic-v1320 CQI-ReportPeriodic-v1320 OPTIONAL -- Need ON
}

CQI-ReportConfig-v1430 ::= SEQUENCE {
cqi-ReportAperiodicHybrid-r14 CQI-ReportAperiodicHybrid-r14 OPTIONAL -- Need ON
}

CQI-ReportConfig-v1530 ::= SEQUENCE {
  altCQI-Table-1024QAM-r15 ENUMERATED {
    allSubframes, csi-SubframeSet1, csi-SubframeSet2, spare1} OPTIONAL -- Need OP
}

CQI-ReportConfig-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    cqi-ReportConfig-r10 CQI-ReportConfig-r10 OPTIONAL, -- Need ON
    cqi-ReportConfig-v1130 CQI-ReportConfig-v1130 OPTIONAL, -- Need ON
    cqi-ReportConfigPCell-v1250 CQI-ReportConfig-v1250 OPTIONAL, -- Need ON
    cqi-ReportConfig-v1310 CQI-ReportConfig-v1310 OPTIONAL, -- Need ON
    cqi-ReportConfig-v1320 CQI-ReportConfig-v1320 OPTIONAL, -- Need ON
    cqi-ReportConfig-v1430 CQI-ReportConfig-v1430 OPTIONAL, -- Need ON
    altCQI-Table-1024QAM-r15 ENUMERATED {allSubframes, csi-SubframeSet1, csi-SubframeSet2, spare1} OPTIONAL -- Need OP
  }
}

CQI-ReportConfigSCell-r10 ::= SEQUENCE {
  cqi-ReportModeAperiodic-r10 CQI-ReportModeAperiodic OPTIONAL, -- Need OR
  nomPDSCH-RS-EPRE-Offset-r10 INTEGER (-1..6),
  cqi-ReportPeriodicSCell-r10 CQI-ReportPeriodic-r10 OPTIONAL, -- Need ON
  pmi-RI-Report-r10 ENUMERATED {setup} OPTIONAL -- Cond
}

CQI-ReportConfigSCell-r15 ::= SEQUENCE {
  cqi-ReportPeriodicSCell-r15 CQI-ReportPeriodicSCell-r15 OPTIONAL, -- Need ON
  altCQI-Table-1024QAM-r15 ENUMERATED {allSubframes, csi-SubframeSet1, csi-SubframeSet2, spare1} OPTIONAL -- Need OP
}

-- ASN1STOP
**CQI-ReportConfig field descriptions**

**altCQI-Table, altCQI-Table-1024QAM**
Indicates the applicability of the alternative CQI table (i.e. Table 7.2.3-2 and Table 7.2.3-4 in TS 36.213 [23]) for both aperiodic and periodic CSI reporting for the concerned serving cell. Value allSubframes means the alternative CQI table applies to all the subframes and CSI processes, if configured, and value csi-SubframeSet1 means the alternative CQI table applies to CSI subframe set1, and value csi-SubframeSet2 means the alternative CQI table applies to CSI subframe set2. E-UTRAN sets the value to csi-SubframeSet1 or csi-SubframeSet2 only if transmissionMode is set in range tm1 to tm9 and csi-SubframePatternConfig-r10 is configured for the concerned serving cell and different CQI tables apply to the two CSI subframe sets; otherwise E-UTRAN sets the value to allSubframes. E-UTRAN does not configure altCQI-Table-r12 in CQI-ReportConfig-v1250 and altCQI-Table-1024QAM-r15 in CQI-ReportConfig-v1530 simultaneously. If altCQI-Table-r12 and altCQI-Table-1024QAM-r15 are absent, the UE shall use Table 7.2.3-1 in TS 36.213 [23] for all subframes and CSI processes, if configured.

cqi-Mask
Limits CQI/PMI/PTI/RI reports to the on-duration period of the DRX cycle, see TS 36.321 [6]. One value applies for all CSI processes and all serving cells (the associated functionality is common i.e. not performed independently for each cell).

cqi-ReportAperiodic
E-UTRAN does not configure CQI-ReportAperiodic when transmission mode 10 is configured for all serving cells. E-UTRAN configures cqi-ReportAperiodic-v1250 only if cqi-ReportAperiodic-r10 and csi-MeasSubframeSets-r12 are configured. E-UTRAN configures cqi-ReportAperiodic-v1310 only if cqi-ReportAperiodic-r10 is configured.

cqi-ReportModeAperiodic
Parameter: reporting mode. Value rm12 corresponds to Mode 1-2, rm20 corresponds to Mode 2-0, rm22 corresponds to Mode 2-2 etc. PUSCH reporting modes are described in TS 36.213 [23, 7.2.1]. The UE shall ignore cqi-ReportModeAperiodic-r10 when transmission mode 10 is configured for the serving cell on this carrier frequency. The UE shall ignore cqi-ReportModeAperiodic-r10 configured for the PCell/PSCell when the transmission bandwidth of the PCell/PSCell in downlink is 6 resource blocks.

cqi-ReportPeriodic
E-UTRAN does not configure CQI-ReportPeriodic for sTTI within CSI-Config-r15.

csi-MeasSubframeSets
Indicates the two CSI subframe sets. Value 0 means the subframe belongs to CSI subframe set 1 and value 1 means the subframe belongs to CSI subframe set 2. CSI subframe set 1 refers to CCSI,0 in TS 36.213 [23, 7.2] and CSI subframe set 2 refers to CCSI,1 in TS 36.213 [23, 7.2]. E-UTRAN does not configure csi-MeasSubframeSet1-r10 and csi-MeasSubframeSet2-r10 if either csi-MeasSubframeSets-r12 for PCell or eimta-MainConfigPCell-r12 is configured.

csi-MeasSubframeSet1, csi-MeasSubframeSet2
Indicates the CSI measurement subframe sets. csi-MeasSubframeSet1 refers to CCSI,0 in TS 36.213 [23, 7.2] and csi-MeasSubframeSet2 refers to CCSI,1 in TS 36.213 [23, 7.2]. E-UTRAN only configures the two CSI measurement subframe sets for the PCell.

nomPDSCH-RS-EPRE-Offset
Parameter: \( \Delta_{offset} \) see TS 36.213 [23, 7.2.3]. Actual value = field value * 2 [dB].

pmi-RI-Report
See TS 36.213 [23, 7.2]. The presence of this field means PMI/RI reporting is configured; otherwise the PMI/RI reporting is not configured. E-UTRAN configures this field only when transmissionMode is set to tm8, tm9 or tm10. The UE shall ignore pmi-RI-Report-r9 pmi-RI-Report-r10 when transmission mode 10 is configured for the serving cell on this carrier frequency.
Conditional presence | Explanation
--- | ---
cqi-Setup | This field is not present for an Scell except for the PSCell, while it is conditionally present for the PCell and the PSCell according to the following. The field is optional present, need OR, if the cqi-ReportPeriodic in the cqi-ReportConfig is set to setup. If the field cqi-ReportPeriodic is present and set to release, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present.

PMIRI | The field is optional present, need OR, if cqi-ReportPeriodic is included and set to setup, or cqi-ReportModeAperiodic is included. If the field cqi-ReportPeriodic is present and set to release and cqi-ReportModeAperiodic is absent, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present.

PMIRiPCell | The field is optional present, need OR, if cqi-ReportPeriodic is included in the CQI-ReportConfig-r10 and set to setup. If the field cqi-ReportPeriodic is present in the CQI-ReportConfig-r10 and set to release and cqi-ReportAperiodic is included in the CQI-ReportConfig-r10 and set to release, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present.

PMIRiSCell | The field is optional present, need OR, if cqi-ReportPeriodicSCell is included and set to setup, or cqi-ReportModeAperiodic-r10 is included in the CQI-ReportConfigSCell. If the field cqi-ReportPeriodicSCell is present and set to release and cqi-ReportModeAperiodic-r10 is absent in the CQI-ReportConfigSCell, the field is not present and the UE shall delete any existing value for this field. Otherwise the field is not present.

---

**CQI-ReportPeriodic**

The IE *CQI-ReportPeriodic* is used to specify the periodic CQI reporting configuration elements.

**CQI-ReportPeriodic** information elements

```asn1
-- ASN1START

CQI-ReportPeriodic ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    cqi-PUCCH-ResourceIndex INTEGER (0..1185),
    cqi-pmi-ConfigIndex INTEGER (0..1023),
    cqi-FormatIndicatorPeriodic CHOICE {
      widebandCQI NULL,
      subbandCQI SEQUENCE {
        k INTEGER (1..4)
      }
    },
    ri-ConfigIndex INTEGER (0..1023) OPTIONAL, -- Need OR
    simultaneousAckNackAndCQI BOOLEAN
  }
}

CQI-ReportPeriodic-r10 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    cqi-PUCCH-ResourceIndex-r10 INTEGER (0..1184),
    cqi-PUCCH-ResourceIndexP1-r10 INTEGER (0..1184) OPTIONAL, -- Need OR
    cqi-pmi-ConfigIndex INTEGER (0..1023),
    cqi-FormatIndicatorPeriodic-r10 CHOICE {
      widebandCQI-r10 SEQUENCE {
        csi-ReportMode-r10 ENUMERATED {submode1, submode2} OPTIONAL -- Need OR
      },
      subbandCQI-r10 SEQUENCE {
        k INTEGER (1..4),
        periodicityFactor-r10 ENUMERATED {n2, n4}
      }
    },
    ri-ConfigIndex INTEGER (0..1023) OPTIONAL, -- Need OR
    simultaneousAckNackAndCQI BOOLEAN,
    cqi-Mask-r9 ENUMERATED {setup} OPTIONAL, -- Need OR
    csi-ConfigIndex-r10 CHOICE {
      release NULL,
      setup SEQUENCE {
        cqi-pmi-ConfigIndex2-r10 INTEGER (0..1023),
        ri-ConfigIndex2-r10 INTEGER (0..1023) OPTIONAL -- Need OR
      }
    } OPTIONAL
  }
} -- ASN1END
```
CQI-ReportPeriodic-v1310 ::= SEQUENCE {
  simultaneousAckNackAndCQI-Format3-r11  ENUMERATED {setup}  OPTIONAL, -- Need OR
  cqi-ReportPeriodicProcExtToReleaseList-r11 CQI-ReportPeriodicProcExtToReleaseList-r11 OPTIONAL, -- Need ON
  cqi-ReportPeriodicProcExtToAddModList-r11 CQI-ReportPeriodicProcExtToAddModList-r11 OPTIONAL -- Need ON
}

CQI-ReportPeriodic-v1310 ::= SEQUENCE {
  cri-ReportConfig-r13  CRI-ReportConfig-r13 OPTIONAL, -- Need OR
  simultaneousAckNackAndCQI-Format4-Format5-r13 ENUMERATED {setup}  OPTIONAL  -- Need OR
}

CQI-ReportPeriodic-v1320 ::= SEQUENCE {
  periodicityFactorWB-r13 ENUMERATED (n2, n4) OPTIONAL  -- Need OR
}

CQI-ReportPeriodicSCell-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    cqi-ConfigIndexDormant-r15 INTEGER (0..1023),
    csi-SubframePatternDormant-r15 INTEGER (0..1023) OPTIONAL, -- Need OR
    cqi-FormatIndicatorDormant-r15 CHOICE {
      widebandCQI-r15 SEQUENCE {
        csi-ReportMode-r15 ENUMERATED {submode1, submode2} OPTIONAL -- Need OR
      },
      subbandCQI-r15 SEQUENCE {
        k-r15 INTEGER (1..4),
        periodicityFactor-r15 ENUMERATED {n2, n4}
      }
    } OPTIONAL, -- Need OR
    ri-ConfigIndex-r15 INTEGER (0..1023) OPTIONAL, -- Need OR
    cqi-ConfigIndex-r15 CHOICE {
      release NULL,
      setup SEQUENCE {
        cqi-ConfigIndex2-r15 INTEGER (0..1023),
        ri-ConfigIndex2-r15 INTEGER (0..1023) OPTIONAL -- Need OR
      } OPTIONAL, -- Need ON
    }
  }
}

CQI-ReportPeriodicProcExtToAddModList-r11 ::= SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF CQI-ReportPeriodicProcExt-r11

CQI-ReportPeriodicProcExtToReleaseList-r11 ::= SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF CQI-ReportPeriodicProcExtId-r11

CQI-ReportPeriodicProcExt-r11 ::= SEQUENCE {
  cqi-ReportPeriodicProcExtId-r11 CQI-ReportPeriodicProcExtId-r11,
  cqi-FormatIndicatorPeriodic-r11 CHOICE {
    widebandCQI-r11 SEQUENCE {
      csi-ReportMode-r11 ENUMERATED {submode1, submode2} OPTIONAL -- Need OR
    },
    subbandCQI-r11 SEQUENCE {
      k-r15 INTEGER (1..4),
      periodicityFactor-r11 ENUMERATED {n2, n4}
    }
  },
  ri-ConfigIndex-r11 INTEGER (0..1023) OPTIONAL, -- Need OR
  cqi-ConfigIndex-r11 CHOICE {
    release NULL,
    setup SEQUENCE {
      cqi-ConfigIndex2-r11 INTEGER (0..1023),
      ri-ConfigIndex2-r11 INTEGER (0..1023) OPTIONAL -- Need OR
    } OPTIONAL, -- Need ON
  }
}

CQI-ReportPeriodicProcExtToReleaseList-r11 ::= SEQUENCE (SIZE (1..maxCQI-ProcExt-r11)) OF CQI-ReportPeriodicProcExtId-r11

CQI-ReportPeriodicProcExtId-r11 ::= SEQUENCE {
  cri-ReportConfig-r13  CRI-ReportConfig-r13 OPTIONAL -- Need ON
},

CQI-ShortConfigSCell-r15 ::= CHOICE {
  release NULL,
setup
    SEQUENCE {
        cqi-pmi-ConfigIndexShort-r15 INTEGER (0..1023),
        ri-ConfigIndexShort-r15 INTEGER (0..1023) OPTIONAL, -- Need OR
        cqi-FormatIndicatorShort-r15 CHOICE {
            widebandCQI-Short-r15 SEQUENCE {
                csi-ReportModeShort-r15 ENUMERATED {submode1, submode2} OPTIONAL -- Need OR
            },
            subbandCQI-Short-r15 SEQUENCE {
                k-r15 INTEGER (1..4),
                periodicityFactor-r15 ENUMERATED {n2, n4}
            }
        }
    }
CRI-ReportConfig-r13 ::= CHOICE {
    release NULL,
    setup SEQUENCE {
        cri-ConfigIndex-r13 CRI-ConfigIndex-r13,
        cri-ConfigIndex2-r13 CRI-ConfigIndex-r13 OPTIONAL -- Need OR
    }
}
CRI-ConfigIndex-r13 ::= INTEGER (0..1023)
-- ASN1STOP
**CQI-ReportPeriodic field descriptions**

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cqi-FormatIndicatorPeriodic</strong></td>
<td>Parameter: PUCCH CQI Feedback Type, see TS 36.213 [23, table 7.2.2-1]. Depending on transmissionMode, reporting mode is implicitly given from the table.</td>
</tr>
<tr>
<td><strong>cqi-Mask</strong></td>
<td>Limits CQI/PMI/PTI/RI reports to the on-duration period of the DRX cycle, see TS 36.321 [6]. One value applies for all CSI processes and all serving cells (the associated functionality is common i.e. not performed independently for each cell).</td>
</tr>
<tr>
<td><strong>cqi-pmi-ConfigIndex</strong></td>
<td>Parameter: CQI/PMI Periodicity and Offset Configuration Index ICQI/PMI, see TS 36.213 [23, tables 7.2.2-1A and 7.2.2-1C]. If subframe patterns for CSI (CQI/PMI/PTI/RI) reporting are configured (i.e. csi-SubframePatternConfig is configured), the parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet1 or corresponding to the CSI subframe set 1 indicated by csi-MeasSubframeSets-r12.</td>
</tr>
<tr>
<td><strong>cqi-pmi-ConfigIndex2</strong></td>
<td>Parameter: CQI/PMI Periodicity and Offset Configuration Index ICQI/PMI, see TS 36.213 [23, tables 7.2.2-1A and 7.2.2-1C]. The parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet2 or corresponding to the CSI subframe set 2 indicated by csi-MeasSubframeSets-r12.</td>
</tr>
<tr>
<td><strong>cqi-PUCCH-ResourceIndex</strong>, <strong>cqi-PUCCH-ResourceIndexP1</strong></td>
<td>Parameter: PUCCH CQI Feedback Type, see TS 36.213 [23, 7.2]. E-UTRAN does not apply value 1185. One value applies for all CSI processes.</td>
</tr>
<tr>
<td><strong>cqi-ReportModeAperiodic</strong></td>
<td>Parameter: reporting mode. Value rm12 corresponds to Mode 1-2, rm20 corresponds to Mode 2-0, rm22 corresponds to Mode 2-2 etc. PUSCH reporting modes are described in TS 36.213 [23, 7.2.1]. The UE shall ignore cqi-ReportModeAperiodic-r10 when transmission mode 10 is configured for the serving cell on this carrier frequency. The UE shall ignore cqi-ReportModeAperiodic-r10 configured for the PCell/ PSCell when the transmission bandwidth of the PCell/PSCell in downlink is 6 resource blocks.</td>
</tr>
<tr>
<td><strong>CQI-ReportPeriodicProcExt</strong></td>
<td>A set of periodic CQI related parameters for which E-UTRAN may configure different values for each CSI process. For a serving frequency E-UTRAN configures one or more CQI-ReportPeriodicProcExt only when transmission mode 10 is configured for the serving cell on this carrier frequency.</td>
</tr>
<tr>
<td><strong>cri-ConfigIndex</strong></td>
<td>Parameter: cri-ConfigIndex ICRI, see TS 36.213 [23]. The parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet1. EUTRAN configures the field if subframe patterns for CSI (CQI/PMI/PTI/RI/CRI) reporting are configured (i.e. csi-SubframePatternConfig is configured).</td>
</tr>
<tr>
<td><strong>cri-ConfigIndex2</strong></td>
<td>Parameter: cri-ConfigIndex ICRI, see TS 36.213 [23]. The parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet2 or corresponding to the CSI subframe set 2 indicated by csi-MeasSubframeSets. E-UTRAN configures cri-ConfigIndex2 only if cri-ConfigIndex is configured.</td>
</tr>
<tr>
<td><strong>cri-ReportConfig</strong></td>
<td>E-UTRAN configures the field only if the UE is configured with eMIMO-Type set to &quot;beamformed&quot; and if multiple references to RS configuration using non-zero power transmission are configured (i.e. if csi-RS-ConfigNZPIdListExt is configured).</td>
</tr>
<tr>
<td><strong>csi-ConfigIndex</strong></td>
<td>E-UTRAN configures csi-ConfigIndex only for PCell and only if csi-SubframePatternConfig is configured. The UE shall release csi-ConfigIndex if csi-SubframePatternConfig is released.</td>
</tr>
<tr>
<td><strong>csi-ProcessToAddModList</strong></td>
<td>For a serving frequency E-UTRAN configures one or more CSI-Process only when transmission mode 10 is configured for the serving cell on this carrier frequency.</td>
</tr>
<tr>
<td><strong>csi-ReportMode</strong></td>
<td>Parameter: PUCCH_format1-1_CSI_reporting_mode, see TS 36.213 [23, 7.2.2].</td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>Parameter: K, see TS 36.213 [23, 7.2.2].</td>
</tr>
<tr>
<td><strong>nomPDSCH-RS-EPRE-Offset</strong></td>
<td>Parameter: Δ offset, see TS 36.213 [23, 7.2.3]. Actual value = field value * 2 [dB].</td>
</tr>
<tr>
<td><strong>periodicityFactor, periodicityFactorWB</strong></td>
<td>Parameter: If <strong>I</strong>**, see TS 36.213 [23, 7.2.2]. EUTRAN configures field periodicityFactorWB only when the UE is configured with eMIMO-Type set to nonPrecoded and with cqi-FormatIndicatorPeriodic set to widebandCQI.</td>
</tr>
<tr>
<td><strong>ri-ConfigIndex</strong></td>
<td>Parameter: RI Config Index IR, see TS 36.213 [23, 7.2.2-1B]. If subframe patterns for CSI (CQI/PMI/PTI/RI/CRI) reporting are configured (i.e. csi-SubframePatternConfig is configured), the parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet1.</td>
</tr>
</tbody>
</table>
### CQI-ReportPeriodic field descriptions

#### ri-ConfigIndex2
Parameter: RI Config Index \(I_{RI}\), see TS 36.213 [23, 7.2.2-1B]. The parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet2 or corresponding to the CSI subframe set 2 indicated by csi-MeasSubframeSets-r12. E-UTRAN configures ri-ConfigIndex2 only if ri-ConfigIndex is configured.

#### simultaneousAckNackAndCQI
Parameter: Simultaneous-AN-and-CQI, see TS 36.213 [23, 10.1]. TRUE indicates that simultaneous transmission of ACK/NACK and CQI is allowed. One value applies for all CSI processes. For SCells except for the PCell and PUCCH SCell this field is not applicable and the UE shall ignore the value.

#### simultaneousAckNackAndCQI-Format3
Indicates that the UE shall perform simultaneous transmission of HARQ A/N and periodic CQI report multiplexing on PUCCH format 3, see TS 36.213 [23, 7.2, 10.1.1]. E-UTRAN configures this information only when pucch-Format is set to format3. One value applies for all CSI processes. For SCells except for the PCell and PUCCH SCell this field is not applicable and the UE shall ignore the value.

#### simultaneousAckNackAndCQI-Format4-Format5
Indicates that the UE shall perform simultaneous transmission of HARQ A/N and periodic CSI report multiplexing on PUCCH format 4 and format 5, see TS 36.213 [23, 10.1.1]. E-UTRAN configures this information only when pucch-Format is set to format4 or format5. One value applies for all CSI processes. For SCells except for the PCell and PUCCH SCell this field is not applicable and the UE shall ignore the value.

---

### CQI-ReportPeriodicProcExtId

The IE CQI-ReportPeriodicProcExtId is used to identify a periodic CQI reporting configuration that E-UTRAN may configure in addition to the configuration specified by the IE CQI-ReportPeriodic-r10. These additional configurations are specified by the IE CQI-ReportPeriodicProcExt-r11. The identity is unique within the scope of a carrier frequency.

#### CQI-ReportPeriodicProcExtId information elements

```asn1
CQI-ReportPeriodicProcExtId-r11 ::= INTEGER (1..maxCQI-ProcExt-r11)
```

---

### CrossCarrierSchedulingConfig

The IE CrossCarrierSchedulingConfig is used to specify the configuration when the cross carrier scheduling is used in a cell.

#### CrossCarrierSchedulingConfig information elements

```asn1
CQI-ReportPeriodicProcExtId-r11 ::= INTEGER (1..maxCQI-ProcExt-r11)
```
CrossCarrierSchedulingConfigLAA-UL-r14 ::= SEQUENCE {
  schedulingCellId-r14       ServCellIndex-r13,
  cif-InSchedulingCell-r14      INTEGER (1..7)
}  -- ASN1STOP

**CrossCarrierSchedulingConfig field descriptions**

cif-Presence
The field is used to indicate whether carrier indicator field is present (value TRUE) or not (value FALSE) in PDCCH/EPDCCH DCI formats, see TS 36.212 [22, 5.3.3.1].

cif-InSchedulingCell
The field indicates the CIF value used in the scheduling cell to indicate this cell, see TS 36.212 [22, 5.3.3.1]. In case of carrier indicator field is present, the CIF value is 0.

dlsch-Start
The starting OFDM symbol of PDSCH for the concerned SCell, see TS 36.213 [23. 7.1.6.4]. Values 1, 2, 3 are applicable when dl-Bandwidth for the concerned SCell is greater than 10 resource blocks, values 2, 3, 4 are applicable when dl-Bandwidth for the concerned SCell is less than or equal to 10 resource blocks, see TS 36.211 [21, Table 6.7-1].

schedulingCellId
Indicates which cell signals the downlink allocations and uplink grants, if applicable, for the concerned SCell. In case the UE is configured with DC, the scheduling cell is part of the same cell group (i.e. MCG or SCG) as the scheduled cell. In case the UE is configured with crossCarrierSchedulingConfigLAA-UL, schedulingCellId indicated in crossCarrierSchedulingConfigLAA-UL only indicates which cell signals the uplink grants.

---

**CSI-IM-Config**

The IE CSI-IM-Config is the CSI Interference Measurement (IM) configuration that E-UTRAN may configure on a serving frequency, see TS 36.213 [23, 7.2.6].

**CSI-IM-Config information elements**

---

**CSI-IM-Config field descriptions**

resourceConfig
Parameter: CSI reference signal configuration, see TS 36.213 [23, 7.2.6] and TS 36.211 [21, table 6.10.5.2-1 and 6.10.5.2-2] for 4 REs.

subframeConfig
Parameter: \( I_{CSI-RS} \), see TS 36.213 [23, 7.2.6] and TS 36.211 [21, table 6.10.5.3-1].

---

**CSI-IM-ConfigId**

The IE CSI-IM-ConfigId is used to identify a CSI-IM configuration that is configured by the IE CSI-IM-Config. The identity is unique within the scope of a carrier frequency.
CSI-IM-ConfigId information elements

-- ASN1START

CSI-IM-ConfigId-r11 ::= INTEGER (1..maxCSI-IM-r11)
CSI-IM-ConfigId-r12 ::= INTEGER (1..maxCSI-IM-r12)
CSI-IM-ConfigId-v1250 ::= INTEGER (maxCSI-IM-r12)
CSI-IM-ConfigId-v1310 ::= INTEGER (minCSI-IM-r13..maxCSI-IM-r13)
CSI-IM-ConfigId-r13 ::= INTEGER (1..maxCSI-IM-r13)

-- ASN1STOP

CSI-Process

The IE CSI-Process is the CSI process configuration that E-UTRAN may configure on a serving frequency.

CSI-Process information elements

-- ASN1START

CSI-Process-r11 ::= SEQUENCE {
  csi-ProcessId-r11  CSI-ProcessId-r11,
  csi-RS-ConfigNZPId-r11  CSI-RS-ConfigNZPId-r11,
  csi-IM-ConfigId-r11  CSI-IM-ConfigId-r11,
  p-C-AndCBSRList-r11  P-C-AndCBSR-Pair-r13a,
  cqi-ReportBothProc-r11  CQI-ReportBothProc-r11 OPTIONAL, -- Need OR
  cqi-ReportPeriodicProcId-r11 INTEGER (0..maxCQI-ProcExt-r11) OPTIONAL, -- Need OR
  ...
  [alternativeCodebookEnabledFor4TXProc-r12 ENUMERATED {true} OPTIONAL, -- Need ON
    release
    NULL,
    setup
    SEQUENCE (SIZE (1..2)) OF CSI-IM-ConfigId-r12
  ] OPTIONAL, -- Need ON
  cqi-ReportAperiodicProc2-r12  CQI-ReportAperiodicProc-r11 OPTIONAL, -- Need ON
  eMIMO-Type-r13  CSI-RS-ConfigEMIMO-r13 OPTIONAL  -- Need ON
}

-- ASN1STOP
CSI-Process field descriptions

advancedCodebookEnabled
Value TRUE indicates that the UE should use the advanced codebook defined in TS 36.213 [23]. EUTRAN does not configure the field when the UE is configured with eMIMO-Type set to beamformed, when the UE is configured with eMIMO-Hybrid or when the UE is configured with semiOpenLoop.

alternativeCodebookEnabledFor4TXProc
Indicates whether code book in TS 36.213 [23] Table 7.2.4-0A to Table 7.2.4-0D is being used for deriving CSI feedback and reporting for a CSI process. EUTRAN may configure the field only if the number of CSI-RS ports for non-zero power transmission CSI-RS configuration is 4.

cqi-ReportAperiodicProc
If CSI-MeasSubframeSets-r12 is configured for the same frequency as the CSI process, cqi-ReportAperiodicProc applies for CSI subframe set 1. If CSI-MeasSubframeSet1-r10 or CSI-MeasSubframeSet2-r10 are configured for the same frequency as the CSI process, cqi-ReportAperiodicProc applies for CSI subframe set 1 or CSI subframe set 2. Otherwise, cqi-ReportAperiodicProc applies for all subframes. E-UTRAN configures cqi-ReportAperiodicProc-v1310 only if cqi-ReportAperiodicProc-r11 is configured.

cqi-ReportAperiodicProc2

cqi-ReportBothProc
Includes CQI configuration parameters applicable for both aperiodic and periodic CSI reporting, for which CSI process specific values may be configured. E-UTRAN configures the field if and only if cqi-ReportPeriodicProcId is included and/or if cqi-ReportAperiodicProc is included.

cqi-ReportPeriodicProcId
Refers to a periodic CQI reporting configuration that is configured for the same frequency as the CSI process. Value 0 refers to the set of parameters defined by the REL-10 CQI reporting configuration fields, while the other values refer to the additional configurations E-UTRAN assigns by CQI-ReportPeriodicProcExt-r11 (and as covered by CQI-ReportPeriodicProcExtId).

csi-IM-ConfigId
Refers to a CSI-IM configuration that is configured for the same frequency as the CSI process. If csi-IM-ConfigId-v1250 or csi-IM-ConfigId-v1310 is configured, the UE only considers this extension (i.e., UE ignores csi-IM-ConfigId-r11 and csi-IM-ConfigId-r12).

csi-IM-ConfigIdList
Refers to one or two CSI-IM configurations that are configured for the same frequency as the CSI process. csi-IM-ConfigIdList can include 2 entries only if CSI-MeasSubframeSets-r12 is configured for the same frequency as the CSI process.

csi-RS-ConfigNZPId
Refers to a CSI RS configuration using non-zero power transmission that is configured for the same frequency as the CSI process.

dummy
This field is not used in the specification. If received it shall be ignored by the UE.

eMIMO-Type
Parameter: eMIMO-Type, see TS 36.213 [23], TS 36.211 [21]. If eMIMO-Type is set to nonPrecoded, the codebooks used for deriving CSI feedback are in TS 36.213 [23, Table 7.2.4-10 to Table 7.2.4-17]. Choice values nonPrecoded and beamformed correspond to 'CLASS A' and 'CLASS B' respectively, see TS 36.212 [22] and TS 36.213 [23].

feCOMP-CSI-Enabled
Parameter: FeCoMPCSIEnabled, see TS 36.213 [23], section 7.1.10. Refers to CSI feedback based on FeCoMP. E-UTRAN only configures the field when the UE is configured with eMIMO-Type-r13 set to beamformed with two NZP CSI-RS resources using the IE CSI-RS-ConfigBeamformed-r13 which contains the two NZP CSI-RS resources configured with csi-RS-ConfigNZPIdExt-r13.

p-C-AndCBSRList
The UE shall ignore p-C-AndCBSRList-r11 if configured with eMIMO-Type unless it is set to beamformed, alternativeCodebookEnabledBeamformed (in CSI-RS-ConfigBeamformed) is set to FALSE and csi-RS-ConfigNZPIdExt-r13 is not configured.

---

CSI-ProcessId

The IE CSI-ProcessId is used to identify a CSI process that is configured by the IE CSI-Process. The identity is unique within the scope of a carrier frequency.

CSI-ProcessId information elements

-- ASN1START

CSI-ProcessId-r11 ::= INTEGER (1..maxCSI-Proc-r11)
CSI-RS-Config

The IE CSI-RS-Config is used to specify the CSI (Channel-State Information) reference signal configuration.

CSI-RS-Config information elements

CSI-RS-Config-r10 ::= SEQUENCE {
    csi-RS-r10             CHOICE {
        release      NULL,
        setup       SEQUENCE {
            antennaPortsCount-r10   ENUMERATED {an1, an2, an4, an8},
            resourceConfig-r10     INTEGER (0..31),
            subframeConfig-r10     INTEGER (0..154),
            p-C-r10                INTEGER (-8..15)
        }                OPTIONAL,   -- Need ON
        zeroTxPowerCSI-RS-r10  ZeroTxPowerCSI-RS-Conf-r12   OPTIONAL   -- Need ON
    }
}

CSI-RS-Config-v1250 ::= SEQUENCE {
    zeroTxPowerCSI-RS2-r12  ZeroTxPowerCSI-RS-Conf-r12   OPTIONAL,   -- Need ON
    ds-ZeroTxPowerCSI-RS-r12  CHOICE {
        release       NULL,
        setup       SEQUENCE {
            zeroTxPowerCSI-RS-List-r12  SEQUENCE (SIZE (1..maxDS-ZTP-CSI-RS-r12)) OF
            ZeroTxPowerCSI-RS-r12
        }                OPTIONAL    -- Need ON
    }
}

CSI-RS-Config-v1310 ::= SEQUENCE {
    eMIMO-Type-r13    CSI-RS-ConfigEMIMO-r13   OPTIONAL -- Need ON
}

CSI-RS-Config-v1430 ::= SEQUENCE {
    dummy    CSI-RS-ConfigEMIMO-v1430   OPTIONAL, -- Need ON
    eMIMO-Hybrid-r14    CSI-RS-ConfigEMIMO-Hybrid-r14  OPTIONAL, -- Need ON
    advancedCodebookEnabled-r14  BOOLEAN        OPTIONAL -- Need ON
}

CSI-RS-Config-v1480 ::= SEQUENCE {
    eMIMO-Type-v1480  CSI-RS-ConfigEMIMO-v1480   OPTIONAL -- Need ON
}

CSI-RS-Config-v1530 ::= SEQUENCE {
    eMIMO-Type-v1530  CSI-RS-ConfigEMIMO-v1530   OPTIONAL -- Need ON
}

CSI-RS-Config-r15 ::= CHOICE {
    release      NULL,
    setup       SEQUENCE {
        csi-RS-Config-r10    CSI-RS-Config-r10    OPTIONAL,   -- Need ON
        csi-RS-Config-v1250  CSI-RS-Config-v1250   OPTIONAL,   -- Need ON
        csi-RS-Config-v1310  CSI-RS-Config-v1310   OPTIONAL,   -- Need ON
        csi-RS-Config-v1430  CSI-RS-Config-v1430   OPTIONAL,   -- Need ON
    }
}

ZeroTxPowerCSI-RS-Conf-r12 ::= CHOICE {
    release      NULL,
    setup       ZeroTxPowerCSI-RS-r12
}

ZeroTxPowerCSI-RS-r12 ::= SEQUENCE {
    zeroTxPowerResourceConfigList-r12  BIT STRING (SIZE (16)),
    zeroTxPowerSubframeConfig-r12     INTEGER (0..154)
}

-- ASN1STOP
CSI-RS-Config field descriptions

- **advancedCodebookEnabled**
  Value TRUE indicates that the UE should use the advanced code book defined in TS 36.213 [23]; EUTRAN does not configure the field when the UE is configured with eMIMO-Type is set to beamformed, when the UE is configured with eMIMO-Hybrid or when the UE is configured with semiOpenLoop.

- **antennaPortsCount**
  Parameter represents the number of antenna ports used for transmission of CSI reference signals where value an1 corresponds to 1 antenna port, an2 to 2 antenna ports and so on, see TS 36.211 [21], clause 6.10.5.

- **ds-ZeroTxPowerCSI-RS**
  Parameter for additional zeroTxPowerCSI-RS for a serving cell, concerning the CSI-RS included in discovery signals.

- **dummy**
  This field is not used in the specification. If received it shall be ignored by the UE.

- **eMIMO-Type**
  Parameter: eMIMO-Type, see TS 36.213 [23], TS 36.211 [21]. If eMIMO-Type is set to nonPrecoded, the codebooks used for deriving CSI feedback are in TS 36.213 [23, Table 7.2.4-10 to Table 7.2.4-17]. Choice values nonPrecoded and beamformed correspond to 'CLASS A' and 'CLASS B' respectively, see TS 36.212 [22] and TS 36.213 [23].

- **p-C**
  Parameter: $P_c$, see TS 36.213 [23, 7.2.5]. The UE shall ignore p-C-r10 if configured with eMIMO-Type unless it is set to beamformed, alternativeCodebookEnabledBeamformed (in CSI-RS-ConfigBeamformed) is set to FALSE and csi-RS-ConfigNZPIdListExt is not configured.

- **resourceConfig**
  Parameter: CSI reference signal configuration, see TS 36.211 [21, table 6.10.5.2-1 and 6.10.5.2-2].

- **subframeConfig**
  Parameter: $I_{CSI-RS}$, see TS 36.211 [21, table 6.10.5.3-1].

- **zeroTxPowerCSI-RS**
  Parameter for additional zeroTxPowerCSI-RS for a serving cell. E-UTRAN configures the field only if csi-MeasSubframeSets-r12 and TM 1 – 9 are configured for the serving cell.

- **zeroTxPowerResourceConfigList**
  Parameter: ZeroPowerCSI-RS, see TS 36.213 [23, 7.2.7].

- **zeroTxPowerSubframeConfig**
  Parameter: $I_{CSI-RS}$, see TS 36.211 [21, table 6.10.5.3-1].

---

CSI-RS-Config information elements

```
CSI-RS-ConfigBeamformed-r13 ::= SEQUENCE {
  csi-RS-ConfigNZPIdListExt-r13  SEQUENCE (SIZE (1..7)) OF CSI-RS-ConfigNZPId-r13 OPTIONAL, -- Need OR
  csi-IM-ConfigIdList-r13  SEQUENCE (SIZE (1..8)) OF CSI-IM-ConfigId-r13 OPTIONAL, -- Need OR
  p-C-AndCBSR-PerResourceConfigList-r13  SEQUENCE (SIZE (1..8)) OF P-C-AndCBSR-Pair-r13 OPTIONAL, -- Need OR
  ace-For4Tx-PerResourceConfigList-r13  SEQUENCE (SIZE (1..7)) OF BOOLEAN OPTIONAL, -- Need OR
  alternativeCodebookEnabledBeamformed-r13  ENUMERATED {true} OPTIONAL, -- Need OR
  channelMeasRestriction-r13  ENUMERATED {on} OPTIONAL -- Need OR
}

CSI-RS-ConfigBeamformed-r14 ::= SEQUENCE {
  csi-RS-ConfigNZPIdListExt-r14  SEQUENCE (SIZE (1..7)) OF CSI-RS-ConfigNZPId-r13 OPTIONAL, -- Need OR
  csi-IM-ConfigIdList-r14  SEQUENCE (SIZE (1..8)) OF CSI-IM-ConfigId-r13 OPTIONAL, -- Need OR
  p-C-AndCBSR-PerResourceConfigList-r14  SEQUENCE (SIZE (1..8)) OF P-C-AndCBSR-Pair-r13 OPTIONAL, -- Need OR
  ace-For4Tx-PerResourceConfigList-r14  SEQUENCE (SIZE (1..7)) OF BOOLEAN OPTIONAL, -- Need OR
  alternativeCodebookEnabledBeamformed-r14  ENUMERATED {true} OPTIONAL, -- Need OR
  channelMeasRestriction-r14  ENUMERATED {on} OPTIONAL -- Need OR
  csi-RS-ConfigNZP-ApList-r14  SEQUENCE (SIZE (1..8)) OF CSI-RS-ConfigNZP-r11 OPTIONAL, -- Need OR
  nzp-ResourceConfigOriginal-v1430  CSI-RS-ConfigNZP-v1430 OPTIONAL, -- Need OR
  csi-RS-ConfigNZP-Activation-r14  CSI-RS-ConfigNZP-Activation-r14 OPTIONAL -- Need OR
}
```
CSI-RS-ConfigBeamformed field descriptions

ace-For4Tx-PerResourceConfigList
The field indicates the alternativeCodeBookEnabledFor4TX-r12 per CSI-RS resource. E-UTRAN configures the field only if csi-RS-ConfigNZPIdListExt-r13 is configured.

activatedResources
The number of activated CSI-RS resources, which concerns a subset of the aperiodic CSI-RS resources (for both semi-persistent and aperiodic mode). E-UTRAN configures at most the minimum between nMaxResource and the number of resources as configured by csi-RS-ConfigNZP-ApList-r14.

alternativeCodebookEnabledBeamformed
The field indicates whether code book in TS 36.213 [23, Table 7.2.4-18 to Table 7.2.4-20] is being used for deriving CSI feedback and reporting for a CSI process. E-UTRAN configures the field only for a process referring to a single RS configuration using non-zero power transmission (i.e., a process for which csi-RS-ConfigNZPIdListExt-r13 is not configured). Field alternativeCodebookEnabledBeamformed corresponds to parameter alternativeCodebookEnabledCLASSB_K1 in TS 36.212 [22] and TS 36.213 [23].

csi-IM-ConfigIdList
E-UTRAN configures the field csi-IM-ConfigIdList-r13 only if the IE is included in CSI-Process is configured (i.e., when TM10 is configured for the serving cell).

CSI-RS-ConfigBeamformed
If csi-RS-ConfigNZPIdListExt-r13 is configured, E-UTRAN configures the same total number of entries for NZP, csi-IM-ConfigIdList-r13 and p-C-AndCBSR-PerResourceConfigList-r13.

csi-RS-ConfigNZP-ApList
The field is used to configure NZP configurations for aperiodic or semi-persistent CSI RS reporting for which MAC controls activation. EUTRAN configures this field only when the UE is configured to use 2, 4, or 8 ports CSI-RS, in which case EUTRAN configures the number of entries to be the same as the number of NZP resource configurations. For all these entries the UE shall ignore field subframeConfig. EUTRAN always configures this field together with csi-RS-NZP-Activation. Furthermore, for a given process, E-UTRAN does not simultaneously configure the periodic NZP configuration(s) and NZP CSI RS configurations for aperiodic or semi-persistent reporting.

csi-RS-ConfigNZP-EMIMO
The field is used to configure NZP configurations additional to the one defined by the original NZP configuration as included in CSI-RS-ConfigId CSI-Process when using 12 and 16 ports CSI-RS.

csi-RS-ConfigNZPIdListExt (in CSI-RS-ConfigBeamformed)
Indicates the NZP configuration(s) in addition to the original NZP configuration, as defined by csi-RS-Config-r10 (TM9) or csi-RS-ConfigNZPId-r11 (TM10). I.e. extends the size of the NZP configuration list (originally a single entry i.e. list of size 1) using the general principles specified in 5.1.2.

p-C-AndCBSR-PerResourceConfigList
E-UTRAN does not configure the field p-C-AndCBSR-PerResourceConfigList if the UE is configured with eMIMO-Type set to beamformed, alternativeCodebookEnabledBeamformed is set to FALSE and csi-RS-ConfigNZPIdListExt-r13 is not configured.

CSI-RS-ConfigEMIMO
The IE CSI-RS-ConfigEMIMO is used to specify the CSI (Channel-State Information) reference signal configuration for EBF/ FD-MIMO.
CSI-RS-ConfigEMIMO information elements

CSI-RS-ConfigEMIMO-r13 ::= CHOICE {
    release      NULL,
    setup      CHOICE {
        nonPrecoded-r13    CSI-RS-ConfigNonPrecoded-r13,
        beamformed-r13    CSI-RS-ConfigBeamformed-r13
    }
}

CSI-RS-ConfigEMIMO-v1430 ::= CHOICE {
    release      NULL,
    setup      CHOICE {
        nonPrecoded-v1430    CSI-RS-ConfigNonPrecoded-v1430,
        beamformed-v1430    CSI-RS-ConfigBeamformed-v1430
    }
}

CSI-RS-ConfigEMIMO-v1480 ::= CHOICE {
    release      NULL,
    setup      CHOICE {
        nonPrecoded-v1480    CSI-RS-ConfigNonPrecoded-v1480,
        beamformed-v1480    CSI-RS-ConfigBeamformed-v1480
    }
}

CSI-RS-ConfigEMIMO-v1530 ::= CHOICE {
    release      NULL,
    setup      CHOICE {
        nonPrecoded-v1530    CSI-RS-ConfigNonPrecoded-v1530
    }
}

CSI-RS-ConfigEMIMO2-r14 ::= CHOICE {
    release      NULL,
    setup      CSI-RS-ConfigBeamformed-r14
}

CSI-RS-ConfigEMIMO-Hybrid-r14 ::= CHOICE {
    release      NULL,
    setup      SEQUENCE {
        periodicityOffsetIndex-r14   INTEGER (0..1023)    OPTIONAL, -- Need OR
        eMIMO-Type2-r14      CSI-RS-ConfigEMIMO2-r14  OPTIONAL -- Need ON
    }
}

CSI-RS-ConfigEMIMO field descriptions

periodicityOffsetIndex
This parameter is associated with the first EMIMO configuration of the hybrid eMIMO configuration.

CSI-RS-ConfigNonPrecoded

The IE CSI-RS-ConfigNonPrecoded is used to specify the non-preceded EBF/ FD-MIMO configuration.

CSI-RS-ConfigEMIMO2-r14 ::= SEQUENCE {
    p-C-AndCBSRList-r13     P-C-AndCBSR-Pair-r13   OPTIONAL, -- Need OR
    codebookConfigN1-r13     ENUMERATED {n1, n2, n3, n4, n8},
    codebookConfigN2-r13     ENUMERATED {n1, n2, n3, n4, n8},
    codebookOverSamplingRateConfig-O1-r13 ENUMERATED {n4, n8}    OPTIONAL, -- Need OR
    codebookOverSamplingRateConfig-O2-r13 ENUMERATED {n4, n8}    OPTIONAL, -- Need OR
    csi-Config-r13         INTEGER (1..4),
    csi-IM-ConfigIdList-r13    SEQUENCE (SIZE (1..2)) OF CSI-IM-ConfigId-r13
    OPTIONAL, -- Need OR
    csi-RS-ConfigNZP-EMIMO-r13    CSI-RS-ConfigNZP-EMIMO-r13  OPTIONAL -- Need ON
}
CSI-RS-ConfigNonPrecoded-v1430 ::= SEQUENCE {
    csi-RS-ConfigNZP-EMIMO-v1430  \[CSI-RS-ConfigNZP-EMIMO-v1430 \] OPTIONAL, -- Need ON
    codebookConfigN1-v1430   ENUMERATED \[n5, n6, n7, n10, n12, n14, n16\],
    codebookConfigN2-v1430   ENUMERATED \[n5, n6, n7\],
    nzp-ResourceConfigTM9-Original-v1430 CSI-RS-Config-NZP-v1430
}

CSI-RS-ConfigNonPrecoded-v1480 ::= SEQUENCE {
    csi-RS-ConfigNZP-EMIMO-v1480  \[CSI-RS-ConfigNZP-EMIMO-v1430 \] OPTIONAL, -- Need ON
    codebookConfigN1-v1480     ENUMERATED \[n5, n6, n7, n10, n12, n14, n16\] OPTIONAL, -- Need OR
    codebookConfigN2-r1480     ENUMERATED \[n5, n6, n7\] OPTIONAL, -- Need OR
    nzp-ResourceConfigTM9-Original-v1480 CSI-RS-Config-NZP-v1430
}

CSI-RS-ConfigNonPrecoded-v1530 ::= SEQUENCE {
    p-C-AndCBSRList-r15      P-C-AndCBSR-Pair-r15   OPTIONAL  -- Need OR
}

CSI-RS-ConfigNonPrecoded field descriptions

**codebookConfig**
Indicates a sub-set of the codebook entry, see TS 36.213 [23].

**codebookConfigNx**
Indicates the number of antenna ports per polarization in dimension x as used for transmission of CSI reference signals. Value n1 corresponds to 1, value n2 corresponds to 2 and so on, see TS 36.213 [23]. E-UTRAN configures the field in accordance with the restrictions as specified in TS 36.213 [23]. If codebookConfigNx in CSI-RS-ConfigNonPrecoded-v1480 is configured, the UE shall ignore the field codebookConfigNx in CSI-RS-ConfigNonPrecoded-r13.

**codebookOverSamplingRateConfig-Ox**
Indicates the spatial over-sampling rate in dimension x as used for transmission of CSI reference signals. Value n4 corresponds to 4 and value n8 corresponds to 8, see TS 36.213 [23].

**csi-IM-ConfigId(List)**
E-UTRAN configures the field csi-IM-ConfigIdList only if the IE is included in CSI-Process is configured (i.e. when TM10 is configured for the serving cell).

**csi-RS-ConfigNZP-EMIMO**
The field is used to configure NZP configurations additional to the one defined by the original NZP configuration as included in CSI-RS-Config CSI-Process when using 12 and 16 ports CSI-RS.

-- ASUS1STOP

CSI-RS-ConfigNZP

The IE CSI-RS-ConfigNZP is the CSI-RS resource configuration using non-zero power transmission that E-UTRAN may configure on a serving frequency.

CSI-RS-ConfigNZP information elements

-- ASUS1START

CSI-RS-ConfigNZP-r11 ::= SEQUENCE {
    csi-RS-ConfigNZPId-r11   CSI-RS-ConfigNZPId-r11,
    antennaPortsCount-r11   ENUMERATED \[an1, an2, an4, an8\],
    resourceConfig-r11      INTEGER \[0..31\],
    subframeConfig-r11      INTEGER \[0..154\],
    scramblingIdentity-r11  INTEGER \[0..503\],
    qcl-CRS-Info-r11        SEQUENCE {
        qcl-ScramblingIdentity-r11  INTEGER \[0..503\],
        crs-PortsCount-r11    ENUMERATED \[n1, n2, n4, spare1\],
        mbsfn-SubframeConfigList-r11  CHOICE {
            release                NULL,
            setup                  SEQUENCE {
                subframeConfigList  MBSFN-SubframeConfigList
            } \[OPTIONAL \]
        } \[OPTIONAL \]
    } \[OPTIONAL \]
}

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CSI-RS-ConfigNZP field descriptions

antennaPortsCount
Parameter represents the number of antenna ports used for transmission of CSI reference signals where \(a_n\) corresponds to 1, \(a_{n2}\) to 2 antenna ports etc. see TS 36.211 [21, 6.10.5].

cdmType
Parameter: CDMType, see TS 36.211 [21, 6.10.5.2].

csi-RS-ConfigNZPId
Refers to a CSI RS configuration using non-zero power transmission that is configured using the same frequency as the CSI process. UE shall ignore csi-RS-ConfigNZPId-r11 if csi-RS-ConfigNZPId-v1310 is signalled.

frequencyDensity
Indicates the frequency-domain density reduction. E-UTRAN configures the values in accordance with the restrictions specified in TS 36.213 [23].

mbasf-SubframeConfigList
Indicates the MBSFN configuration for the CSI-RS resources. If qcl-CRS-Info-r11 is absent, the field is released.

nzp-resourceConfigList
Indicate a list of non-zero power transmission CSI-RS resources using parameter resourceConfig.

qcl-CRS-Info
Indicates CRS antenna ports that is quasi co-located with the CSI-RS antenna ports, see TS 36.213 [23, 7.2.5]. EUTRAN configures this field if and only if the UE is configured with qcl-Operation set to typeB.

resourceConfig
Parameter: CSI reference signal configuration, see TS 36.211 [21, table 6.10.5.2-1 and 6.10.5.2-2].

subframeConfig
Parameter: \(I_{CSI-RS}\), see TS 36.211 [21, table 6.10.5.3-1].

scramblingIdentity
Parameter: Pseudo-random sequence generator parameter, \(n_{ID}\), see TS 36.213 [23, 7.2.5].

transmissionComb
Indicates the transmission combining offset. E-UTRAN configures the values in accordance with the restrictions specified in TS 36.213 [23].
CSI-RS-ConfigNZPlId

The IE CSI-RS-ConfigNZPlId is used to identify a CSI-RS resource configuration using non-zero transmission power, as configured by the IE CSI-RS-ConfigNZP. The identity is unique within the scope of a carrier frequency.

**CSI-RS-ConfigNZPlId information elements**

```plaintext
-- ASN1START
CSI-RS-ConfigNZPlId-r11 ::= INTEGER (1..maxCSI-RS-NZP-r11)
CSI-RS-ConfigNZPlId-v1310 ::= INTEGER (minCSI-RS-NZP-r13..maxCSI-RS-NZP-r13)
CSI-RS-ConfigNZPlId-r13 ::= INTEGER (1..maxCSI-RS-NZP-r13)
-- ASN1STOP
```

CSI-RS-ConfigZP

The IE CSI-RS-ConfigZP is the CSI-RS resource configuration, for which UE assumes zero transmission power, that E-UTRAN may configure on a serving frequency.

**CSI-RS-ConfigZP information elements**

```plaintext
-- ASN1START
CSI-RS-ConfigZP-r11 ::= SEQUENCE {
  csi-RS-ConfigZPId-r11  CSI-RS-ConfigZPId-r11,
  resourceConfigList-r11  BIT STRING (SIZE (16)),
  subframeConfig-r11   INTEGER (0..154),
  ... }
CSI-RS-ConfigZP-ApList-r14 ::= CHOICE {
  release       NULL,
  setup       SEQUENCE (SIZE (1.. maxCSI-RS-ZP-r11)) OF CSI-RS-ConfigZP-r11
}
-- ASN1STOP
```

**CSI-RS-ConfigZP field descriptions**

**CSI-RS-ConfigZP-ApList**
Indicates the aperiodic zero power CSI-RS present in a given subframe. See 36.213 [23, Table 7.1.9-2]. First entry in the list corresponds to aperiodic trigger 00, second entry in the list corresponds to aperiodic trigger 01 and so on.

**resourceConfigList**
Parameter: ZeroPowerCSI-RS, see TS 36.213 [23, 7.2.7].

**subframeConfig**
Parameter: ICSI−RS, see TS 36.211 [21, table 6.10.5.3-1].

CSI-RS-ConfigZPlId

The IE CSI-RS-ConfigZPlId is used to identify a CSI-RS resource configuration for which UE assumes zero transmission power, as configured by the IE CSI-RS-ConfigZP. The identity is unique within the scope of a carrier frequency.

**CSI-RS-ConfigZPlId information elements**

```plaintext
-- ASN1START
CSI-RS-ConfigZPlId-r11 ::= INTEGER (1..maxCSI-RS-ZP-r11)
-- ASN1STOP
```

DataInactivityTimer

The IE DataInactivityTimer is used to control Data inactivity operation. Corresponds to the timer for data inactivity monitoring in TS 36.321 [6]. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on.
DataInactivityTimer information element

---

DataInactivityTimer-r14 ::=  ENUMERATED {
  s1, s2, s3, s5, s7, s10, s15, s20, s40, s50, s60,
  s80, s100, s120, s150, s180}

---

DMRS-Config

The IE DMRS-Config is the DMRS configuration that E-UTRAN may configure on a serving frequency.

DMRS-Config information elements

---

DMRS-Config-r11 ::=  CHOICE {
  release        NULL,
  setup          SEQUENCE {
    scramblingIdentity-r11  INTEGER (0..503),
    scramblingIdentity2-r11 INTEGER (0..503)
  }
}

DMRS-Config-v1310 ::=   SEQUENCE {
  dmrs-tableAlt-r13    ENUMERATED {true}   OPTIONAL -- Need OR
}

---

DMRS-Config field descriptions

scramblingIdentity, scramblingIdentity2
Parameter: \(h_{DP}\), see TS 36.211 [21, 6.10.3.1].

dmrs-tableAlt
The field indicates whether to use an alternative table for DMRS upon PDSCH transmission, see TS 36.213 [23].

DRB-Identity

The IE DRB-Identity is used to identify a DRB used by a UE.

DRB-Identity information elements

---

DRB-Identity ::=  INTEGER (1..32)

---

EPDCCH-Config

The IE EPDCCH-Config specifies the subframes and resource blocks for EPDCCH monitoring that E-UTRAN may configure for a serving cell.

EPDCCH-Config information element

---

EPDCCH-Config-r11 ::=  SEQUENCE{
  config-r11     CHOICE {
    release       NULL, 
    setup         SEQUENCE {
      subframePatternConfig-r11  CHOICE ( 
        release       NULL, 
        setup         SEQUENCE {
          subframePattern-r11 MeasSubframePattern-r10
        }
      )
    }
  }
}
startSymbol-r11 INTEGER (1..4) OPTIONAL, -- Need OP
setConfigToReleaseList-r11 EPDCCH-SetConfigToReleaseList-r11 OPTIONAL, -- Need ON
setConfigToAddModList-r11 EPDCCH-SetConfigToAddModList-r11 OPTIONAL -- Need ON
}
}

EPDCCH-SetConfigToAddModList-r11 ::= SEQUENCE (SIZE(1..maxEPDCCH-Set-r11)) OF EPDCCH-SetConfig-r11

EPDCCH-SetConfigToReleaseList-r11 ::= SEQUENCE (SIZE(1..maxEPDCCH-Set-r11)) OF EPDCCH-SetConfigId-r11

EPDCCH-SetConfig-r11 ::= SEQUENCE {
  setConfigId-r11   EPDCCH-SetConfigId-r11,
  transmissionType-r11 ENUMERATED (localised, distributed),
  resourceBlockAssignment-r11 SEQUENCE {
    numberPRB-Pairs-r11 ENUMERATED {n2, n4, n8},
    resourceBlockAssignment-r11 BIT STRING (SIZE(4..38))
  },
  dmrs-ScramblingSequenceInt-r11 INTEGER (0..503),
  pucch-ResourceStartOffset-r11 INTEGER (0..2047),
  re-MappingQCL-ConfigId-r11 PDSCH-RE-MappingQCL-ConfigId-r11 OPTIONAL, -- Need OR ...
}
]
[[
  csi-RS-ConfigZPId2-r12 CHOICE {
    release NULL,
    setup CSI-RS-ConfigZPId-r11
  } OPTIONAL -- Need ON
},
[[
  numberPRB-Pairs-v1310 CHOICE {
    release NULL,
    setup ENUMERATED {n6}
  } OPTIONAL, -- Need ON
}
mpdcch-config-r13 CHOICE {
  release NULL,
  setup SEQUENCE {
    csi-NumRepetitionCE-r13 ENUMERATED {sf1, sf2, sf4, sf8, sf16, sf32},
    mpdcch-pdsch-HoppingConfig-r13 ENUMERATED {on,off},
    mpdcch-StartSF-UESS-r13 CHOICE {
      fdd-r13 ENUMERATED {v1, v1dot5, v2, v2dot5, v4, v5, v8, v10},
      tdd-r13 ENUMERATED {v1, v2, v4, v5, v8, v10, v20, spare1}
    },
    mpdcch-NumRepetition-r13 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256},
    mpdcch-Narrowband-r13 INTEGER (1.. maxAvailNarrowBand-r13)
  }
} OPTIONAL -- Need ON
]

EPDCCH-SetConfigId-r11 ::= INTEGER (0..1)

-- ASN1STOP
**EPDCCH-Config field descriptions**

**csi-NumRepetitionCE**
Number of subframes for CSI reference resource, see TS 36.213 [23]. Value sf1 corresponds to 1 subframe, sf2 corresponds to 2 subframes and so on.

**csi-RS-Config2Plid2**
Indicates the rate matching parameters in addition to those indicated by re-MappingQCL-ConfigId. E-UTRAN configures this field only when tm10 is configured.

**dmrs-ScramblingSequenceInt**
The DMRS scrambling sequence initialization parameter $n_{ID}^{EPDCCH}$ or $n_{ID}^{MPDCCH}$ defined in TS 36.211 [21, 6.10.3A.1].

**EPDCCH-SetConfig**
Provides EPDCCH configuration set. See TS 36.213 [23, 9.1.4]. E-UTRAN configures at least one EPDCCH-SetConfig when EPDCCH-Config is configured. For BL UEs or UEs in CE, EUTRAN does not configure more than one EPDCCH-SetConfig.

**mpdcch-Narrowband**
Parameter: $n_{max}^{MPDCCH}$, see TS 36.211 [21, 6.8B.5]. Field values (1..maxAvailNarrowBands-r13) correspond to narrowband indices $0..(maxAvailNarrowBands-r13-1)$ as specified in TS 36.211 [21].

**mpdcch-NumRepetition**
Maximum numbers of repetitions for UE-SS for MPDCCH, see TS 36.211 [21].

**mpdcch-NumOfPDCCH-PCFICH**
Frequency hopping activation/deactivation for unicast MPDCCH/PDSCH, see TS 36.211 [21]. E-UTRAN does not configure the value if freqHoppingParametersDL is not present in SystemInformationBlockType1.

**mpdcch-StartSF-UESS**
Starting subframe configuration for an MPDCCH UE-specific search space, see TS 36.211 [21]. Value v1 corresponds to 1, value v1dot5 corresponds to 1.5, and so on.

**numberPRB-Pairs**
Indicates the number of physical resource-block pairs used for the EPDCCH set. Value n2 corresponds to 2 physical resource-block pairs; n4 corresponds to 4 physical resource-block pairs and so on. Value n8 is not supported if dl-Bandwidth is set to 6 resource blocks. EUTRAN configures value up to n6 only for BL UEs or UEs in CE. Value n6 is only applicable to BL UEs or UEs in CE.

**pusch-ResourceStartOffset**
PUCCH format 1a, 1b and 3 resource starting offset for the EPDCCH set. See TS 36.213 [23, 10.1].

**re-MappingQCL-ConfigId**
Indicates the starting OFDM symbol, the related rate matching parameters and quasi co-location assumption for EPDCCH when the UE is configured with tm10. This field provides the identity of a configured PDSCH-RE-MappingQCL-Config. E-UTRAN configures this field only when tm10 is configured.

**resourceBlockAssignment**
Indicates the index to a specific combination of physical resource-block pair for EPDCCH set. See TS 36.213 [23, 9.1.4.4]. The size of resourceBlockAssignment is specified in TS 36.213 [23, 9.1.4.4] and based on numberPRB-Pairs and the signalled value of dl-Bandwidth. If numberPRB-Pairs-v1310 field is present, the total number of physical resource-block pairs is 6 and it is composed of one subset of 2 physical resource-block pairs and another subset of 4 physical resource-block pairs, and the resourceBlockAssignment field defines the subset of 2 physical resource-block pairs.

**setConfigId**
Indicates the identity of the EPDCCH configuration set.

**startSymbol**
Indicates the OFDM starting symbol for any EPDCCH and PDSCH scheduled by EPDCCH on the same cell, see TS 36.213 [23, 9.1.4.1]. If not present, the UE shall release the configuration and shall derive the starting OFDM symbol of EPDCCH and PDSCH from PCFICH. Values 1, 2, and 3 are applicable for dl-Bandwidth greater than 10 resource blocks. Values 2, 3, and 4 are applicable otherwise. E-UTRAN does not configure the field for UEs configured with tm10.

**subframePatternConfig**
Configures the subframes which the UE shall monitor the UE-specific search space on EPDCCH, except for pre-defined rules in TS 36.213 [23, 9.1.4]. If the field is not configured when EPDCCH is configured, the UE shall monitor the UE-specific search space on EPDCCH in all subframes except for pre-defined rules in TS 36.213 [23, 9.1.4].

**transmissionType**
Indicates whether distributed or localized EPDCCH transmission mode is used as defined in TS 36.211 [21, 6.8A.1].

---

**EIMTA-MainConfig**

The IE EIMTA-MainConfig is used to specify the eIMTA-RNTI used for eIMTA and the subframes used for monitoring PDCCH with eIMTA-RNTI. The IE EIMTA-MainConfigServCell is used to specify the eIMTA related parameters applicable for the concerned serving cell.
**EIMTA-MainConfig information element**

```asn1
EIMTA-MainConfig-r12 ::= CHOICE {
  release       NULL,
  setup         SEQUENCE {
    eimta-RNTI-r12    C-RNTI,
    eimta-CommandPeriodicity-r12  ENUMERATED {sf10, sf20, sf40, sf80},
    eimta-CommandSubframeSet-r12  BIT STRING (SIZE(10))
  }
}

EIMTA-MainConfigServCell-r12 ::= CHOICE {
  release        NULL,
  setup          SEQUENCE {
    eimta-UL-DL-ConfigIndex-r12    INTEGER (1..5),
    eimta-HARQ-ReferenceConfig-r12  ENUMERATED {sa2, sa4, sa5},
    mbsfn-SubframeConfigList-v1250  CHOICE {
      release        NULL,
      setup          SEQUENCE {
        subframeConfigList-r12    MBSFN-SubframeConfigList
      }
    }
  }
}
```

---

**EIMTA-MainConfig field descriptions**

**eimta-CommandPeriodicity**
Configures the periodicity to monitor PDCCH with eIMTA-RNTI, see TS 36.213 [23, 13.1]. Value sf10 corresponds to 10 subframes, sf20 corresponds to 20 subframes and so on.

**eimta-CommandSubframeSet**
Configures the subframe(s) to monitor PDCCH with eIMTA-RNTI within the periodicity configured by `eimta-CommandPeriodicity`. The 10 bits correspond to all subframes in the last radio frame within each periodicity. The left most bit is for subframe 0 and so on. Each bit can be of value 0 or 1. The value of 1 means that the corresponding subframe is configured for monitoring PDCCH with eIMTA-RNTI, and the value of 0 means otherwise. In case of TDD as PCell, only the downlink and the special subframes indicated by the UL/DL configuration in SIB1 can be configured for monitoring PDCCH with eIMTA-RNTI. In case of FDD as PCell, any of the ten subframes can be configured for monitoring PDCCH with eIMTA-RNTI.

**eimta-HARQ-ReferenceConfig**
Indicates UL/DL configuration used as the DL HARQ reference configuration for this serving cell. Value sa2 corresponds to Configuration2, sa4 to Configuration4 etc, as specified in TS 36.211 [21, table 4.2-2]. E-UTRAN configures the same value for all serving cells residing on same frequency band.

**eimta-UL-DL-ConfigIndex**
Index of $l$, see TS 36.212 [22, 5.3.3.1.4]. E-UTRAN configures the same value for all serving cells residing on same frequency band.

**mbsfn-SubframeConfigList**
Configure the MBSFN subframes for the UE on this serving cell. An uplink subframe indicated by the DL/UL subframe configuration in SIB1 can be configured as MBSFN subframe.

---

**LogicalChannelConfig**

The IE `LogicalChannelConfig` is used to configure the logical channel parameters.

**LogicalChannelConfig information element**

```asn1
LogicalChannelConfig ::= SEQUENCE {
  ul-SpecificParameters    SEQUENCE {
    priority       INTEGER (1..16),
    prioritisedBitRate     ENUMERATED {
      kBps0, kBps8, kBps16, kBps32, kBps64, kBps128,
      kBps256, infinity, kBps512-v1020, kBps1024-v1020,
      kBps2048-v1020, spare5, spare4, spare3, spare2, spare1},
    bucketSizeDuration     ENUMERATED {
      ms50, ms100, ms150, ms300, ms500, ms1000, spare2, spare1},
  }
}
```
logicalChannelGroup INTEGER (0..3) OPTIONAL -- Need OR
} OPTIONAL, -- Cond UL
....
[[ logicalChannelSR-Mask-r9 ENUMERATED {setup} OPTIONAL -- Cond SRmask ]],
[[ logicalChannelSR-Prohibit-r12 BOOLEAN OPTIONAL -- Need ON ]],
[[ laa-UL-Allowed-r14 BOOLEAN OPTIONAL, -- Need ON
bitRateQueryProhibitTimer-r14 ENUMERATED {s0, s0dot4, s0dot8, s1dot6, s3, s6, s12, s30} OPTIONAL --Need OR
]],
[[ allowedTTI-Lengths-r15 CHOICE {
    release NULL,
    setup SEQUENCE {
        shortTTI-r15 BOOLEAN,
        subframeTTI-r15 BOOLEAN
    }
} OPTIONAL, -- Need ON
logicalChannelSR-Restriction-r15 CHOICE {
    release NULL,
    setup ENUMERATED {spucch, pucch}
} OPTIONAL, -- Need ON
channelAccessPriority-r15 CHOICE {
    release NULL,
    setup INTEGER (1..4)
} OPTIONAL, -- Need ON
lch-CellRestriction-r15 BIT STRING (SIZE (maxServCell-r13)) OPTIONAL -- Need ON
]]

-- ASN1STOP
### LogicalChannelConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>allowedTTI-Lengths</td>
<td>Indicates the allowed TTI lengths for the logical channel. If not configured, the UE is allowed to transmit the logical channel using any TTI length.</td>
</tr>
<tr>
<td>bitRateQueryProhibitTimer</td>
<td>The timer is used for bit rate recommendation query in TS 36.321 [6, 5.x], in seconds. Value s0 means 0s, s0dot4 means 0.4s and so on.</td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>Bucket Size Duration for logical channel prioritization in TS 36.321 [6]. Value in milliseconds. Value ms50 corresponds to 50 ms. ms100 corresponds to 100 ms and so on.</td>
</tr>
<tr>
<td>channelAccessPriority</td>
<td>Indicates the channel access priority class for the logical channel. UE shall select the lowest channel access priority class (i.e. highest signalled value) of the logical channel with MAC SDU multiplexed into the MAC PDU. MAC CEs except padding BSR apply the highest channel access priority class (i.e. lowest signalled value), as defined in TS 36.300 [9].</td>
</tr>
<tr>
<td>laa-UL-Allowed</td>
<td>Indicates whether the data of a logical channel is allowed to be transmitted via UL of LAA SCells. Value TRUE indicates that the logical channel is allowed to be sent via UL of LAA SCells. Value FALSE indicates that the logical channel is not allowed to be sent via UL of LAA SCells.</td>
</tr>
<tr>
<td>Ich-CellRestriction</td>
<td>Indicates cells which are restricted for the logical channel. The bit is set to 1 if the cell is restricted and to 0 if the cell is not restricted, for each cell. The least significant bit corresponds to the serving cell with index 0, the next bit corresponds to the serving cell with index 1, and so on. If the cell is restricted for the logical channel, then data for the logical channel is not allowed to be sent using that cell. If the field is not included, no cells are restricted. See also TS 36.321 [6], section 5.4.3.1. The restriction is only active when PDCH duplication using CA is activated.</td>
</tr>
<tr>
<td>logicalChannelGroup</td>
<td>Mapping of logical channel to logical channel group for BSR reporting in TS 36.321 [6].</td>
</tr>
<tr>
<td>logicalChannelSR-Mask</td>
<td>Controlling SR triggering on a logical channel basis when an uplink grant is configured. See TS 36.321 [6].</td>
</tr>
<tr>
<td>logicalChannelSR-Prohibit</td>
<td>Value TRUE indicates that the logicalChannelSR-ProhibitTimer is enabled for the logical channel. E-UTRAN only (optionally) configures the field (i.e. indicates value TRUE) if logicalChannelSR-ProhibitTimer is configured. See TS 36.321 [6].</td>
</tr>
<tr>
<td>logicalChannelSR-Restriction</td>
<td>Defines the restricted SR configuration for the logical channel. Value spucch indicates that the SR cannot be sent on SPUCCH and value pucch indicates that the SR cannot be sent on PUCCH. If not configured, the UE is allowed to transmit the SR on any SR resource.</td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>Prioritised Bit Rate for logical channel prioritization in TS 36.321 [6]. Value in kilobytes/second. Value kBps0 corresponds to 0 kB/second, kBps8 corresponds to 8 kB/second, kBps16 corresponds to 16 kB/second and so on. Infinity is the only applicable value for SRB1 and SRB2.</td>
</tr>
<tr>
<td>priority</td>
<td>Logical channel priority in TS 36.321 [6]. Value is an integer.</td>
</tr>
<tr>
<td>shortTTI, subframeTTI</td>
<td>For short TTIs and subframe TTIs respectively: Value TRUE indicates that the UE is allowed to transmit using this TTI length for the logical channel and the value FALSE indicates that the UE is not allowed to transmit using this TTI length for the logical channel. If not configured for a TTI length, then the UE is allowed to transmit this logical channel using this TTI length.</td>
</tr>
</tbody>
</table>

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRmask</td>
<td>The field is optionally present if ul-SpecificParameters is present, need OR; otherwise it is not present.</td>
</tr>
<tr>
<td>UL</td>
<td>The field is mandatory present for UL logical channels; otherwise it is not present.</td>
</tr>
</tbody>
</table>

---

### LWA-Configuration

The IE LWA-Configuration is used to setup/modify/release LTE-WLAN Aggregation.
LWA-Configuration field descriptions

lwa-MobilityConfig
Indicates the parameters used for WLAN mobility.

lwa-WT-Counter
Indicates the parameter used by UE for WLAN authentication.

wt-MAC-Address
Indicates the WT MAC address of the WT handling the LWA operation for the UE. The UE uses this MAC address in uplink transmissions to enable routing of LWA uplink data from the AP to the WT. E-UTRAN configures the field only if ul-LWA-Config-r14 is configured for at least one LWA bearer.

—

LWIP-Configuration

The IE LWIP-Configuration is used to add, modify or release DRBs that are using LWIP Tunnel.

LWIP-Configuration field descriptions

lwip-MobilityConfig
Indicates the WLAN mobility set for LWIP.

tunnelConfigLWIP
Indicates the parameters used for establishing the LWIP tunnel.

—

MAC-MainConfig

The IE MAC-MainConfig is used to specify the MAC main configuration for signalling and data radio bearers. All MAC main configuration parameters can be configured independently per Cell Group (i.e. MCG or SCG), unless explicitly specified otherwise.

MAC-MainConfig information element
timeAlignmentTimerDedicated

phr-Config

release

setup

periodicPHR-Timer

ENUMERATED {sf10, sf20, sf50, sf100, sf200, sf500, sf1000, infinity},

prohibitPHR-Timer

ENUMERATED {sf0, sf10, sf20, sf50, sf100, sf200, sf500, sf1000},

dl-PathlossChange

ENUMERATED {db1, db3, db6, infinity},

TimeAlignmentTimer,

CHOICE {

release

NULL,

setup

SEQUENCE {

periodicPHR-Timer

ENUMERATED {sf10, sf20, sf50, sf100, sf200, sf500, sf1000, infinity},

prohibitPHR-Timer

ENUMERATED {sf0, sf10, sf20, sf50, sf100, sf200, sf500, sf1000},

dl-PathlossChange

ENUMERATED {db1, db3, db6, infinity},

} } OPTIONAL, -- Need ON

sr-ProhibitTimer-r9

INTEGER (0..7) OPTIONAL -- Need ON

mac-MainConfig-v1020

SEQUENCE {

sCellDeactivationTimer-r10

ENUMERATED {

rf2, rf4, rf8, rf16, rf32, rf64, rf128,

spare

} OPTIONAL, -- Need OP

extendedBSR-Sizes-r10

ENUMERATED {setup} OPTIONAL -- Need OR

extendedPHR-r10

ENUMERATED {setup} OPTIONAL -- Need OR

} OPTIONAL -- Need ON

drug-ToReleaseList-r11

STAG-ToReleaseList-r11 OPTIONAL, -- Need ON

drug-ToAddModList-r11

OPTIONAL -- Need ON

drug-Config-v1130

DRX-Config-v1130 OPTIONAL -- Need ON

e-HARQ-Pattern-r12

BOOLEAN OPTIONAL, -- Need ON

dualConnectivityPHR

CHOICE {

release

NULL,

setup

SEQUENCE {

phr-ModeOtherCG-r12

ENUMERATED {real, virtual}

} }

logicalChannelSR-Config-r12

CHOICE {

release

NULL,

setup

SEQUENCE {

logicalChannelSR-ProhibitTimer-r12

ENUMERATED {sf20, sf40, sf64, sf128, sf512,

sf1024, sf2560, spare1}

} }

OPTIONAL, -- Need ON

drug-Config-v1310

DRX-Config-v1310 OPTIONAL, -- Need ON

extendedPHR2-r13

BOOLEAN OPTIONAL, -- Need ON

eDRX-Config-CycleStartOffset-r13

CHOICE {

release

NULL,

setup

SEQUENCE {

sf5120

INTEGER(0..1),

sf10240

INTEGER(0..3)

} }

OPTIONAL -- Need ON

drug-Config-r13

DRX-Config-r13 OPTIONAL, -- Need ON

skipUplinkTx-r14

CHOICE {

release

NULL,

setup

SEQUENCE {

skipUplinkTxSPS-r14

ENUMERATED {true} OPTIONAL, -- Need OR

skipUplinkTxDynamic-r14

ENUMERATED {true} OPTIONAL, -- Need OR

} }

OPTIONAL, -- Need ON

dataInactivityTimerConfig-r14

CHOICE {

release

NULL,

setup

SEQUENCE {

dataInactivityTimer-r14

DataInactivityTimer-r14

} }

OPTIONAL -- Need ON

rai-Activation-r14

ENUMERATED {true} OPTIONAL -- Need OR

shortTTI-AndSPT-r15

CHOICE {

release

NULL,

setup

SEQUENCE {

drug-Config-r15

DRX-Config-r15 OPTIONAL, -- Need ON

periodicBSR-Timer-r15

ENUMERATED {black, white}

} }
MAC-MainConfigSCell-r11 ::= SEQUENCE {
  stag-Id-r11           STAG-Id-r11  OPTIONAL, -- Need OP
  ...
}

DRX-Config ::= CHOICE {
  release              NULL,
  setup                SEQUENCE {
    onDurationTimer      ENUMERATED {
      psf1, psf2, psf3, psf4, psf5, psf6,
      psf8, psf10, psf20, psf30, psf40, 
      psf50, psf60, psf80, psf100, 
      psf200},
    drx-InactivityTimer     ENUMERATED {
      psf1, psf2, psf3, psf4, psf5, psf6,
      psf8, psf10, psf20, psf30, psf40, 
      psf50, psf60, psf80, psf100, 
      psf200, psf300, psf500, psf750, 
      psf1280, psf1920, psf2560, psf0-v1020, 
      spare9, spare8, spare7, spare6, 
      spare5, spare4, spare3, spare2, 
      spare1},
    drx-RetransmissionTimer ENUMERATED {
      psf1, psf2, psf4, psf6, psf8, psf16, 
      psf24, psf33},
    longDRX-CycleStartOffset CHOICE {
      sf10          INTEGER(0..9),
      sf20          INTEGER(0..19),
      sf32          INTEGER(0..31),
      sf40          INTEGER(0..39),
      sf64          INTEGER(0..63),
      sf80          INTEGER(0..79),
      sf128         INTEGER(0..127),
      sf160         INTEGER(0..159),
      sf256         INTEGER(0..255),
      sf320         INTEGER(0..319),
      sf512         INTEGER(0..511),
      sf640         INTEGER(0..639),
      sf1024        INTEGER(0..1023),
      sf1280        INTEGER(0..1279),
      sf2048        INTEGER(0..2047),
      sf2560        INTEGER(0..2559) 
    },
    shortDRX       SEQUENCE {
      shortDRX-Cycle      ENUMERATED {
        sf2, sf5, sf8, sf10, sf16, sf20, 
        sf32, sf40, sf64, sf80, sf128, sf160, 
        sf256, sf320, sf512, sf640},
      drxShortCycleTimer     INTEGER (1..16)  -- Need OR
    }  OPTIONAL -- Need OR
  }
}

DRX-Config-v1130 ::= SEQUENCE {
  proc-Timeline-r15      ENUMERATED {nplus4set1, nplus6set1, 
                                      nplus6set2, nplus8set2}  OPTIONAL, -- Need ON
  ssr-ProhibitTimer-r15   INTEGER (0..7)   OPTIONAL  -- Need ON
}

mpdcch-UL-HARQ-ACK-FeedbackConfig-r15 BOOLEAN OPTIONAL, -- Need ON

dormantStateTimers-r15  CHOICE {
  release        NULL,
  setup        SEQUENCE {
    sCellHibernationTimer-r15 ENUMERATED {
      rf2, rf4, rf8, rf16, rf32, rf64, rf128, spare}  OPTIONAL, -- Need OR
    dormantSCellDeactivationTimer-r15 ENUMERATED {
      rf2, rf4, rf8, rf16, rf32, rf64, 
      rf128, rf320, rf640, rf1280, rf2560, 
      rf5120, rf10240, spare3, spare2, spare1}  OPTIONAL, -- Need OR
  }
}  OPTIONAL -- Need ON
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drx-RetransmissionTimer-v1130 ENumerated {psf0-v1130} Optional, --Need OR
longDRX-CycleStartOffset-v1130 Choice {
  sf60-v1130 INTEGER(0..59),
  sf70-v1130 INTEGER(0..69)
} Optional, --Need OR
shortDRX-Cycle-v1130 ENumerated {sf4-v1130} Optional --Need OR

DRX-Config-v1310 ::= SEQUENCE {
  longDRX-CycleStartOffset-v1310 SEQUENCE {
    sf60-v1310 INTEGER(0..59)
  } Optional --Need OR
}

DRX-Config-r13 ::= SEQUENCE {
  onDurationTimer-v1310 ENumerated {psf300, psf400, psf500, psf600, psf800, psf1000, psf1200, psf1600} Optional, --Need OR
  drx-RetransmissionTimer-v1310 ENumerated {psf40, psf64, psf80, psf96, psf112, psf128, psf160, psf320} Optional, --Need OR
  drx-ULRetransmissionTimer-r13 ENumerated {psf0, psf1, psf2, psf4, psf6, psf8, psf16, psf24, psf33, psf40, psf64, psf80, psf96, psf112, psf128, psf160, psf320} Optional --Need OR
}

DRX-Config-r15 ::= SEQUENCE {
  drx-RetransmissionTimerShortTTI-r15 ENumerated {
    tti10, tti20, tti40, tti64, tti80, tti96, tti128, tti160, tti320} Optional, --Need OR
  drx-UL-RetransmissionTimerShortTTI-r15 ENumerated {
    tti0, tti1, tti2, tti4, tti6, tti8, tti16, tti24, tti32, tti40, tti64, tti80, tti96, tti128, tti160, tti320} Optional --Need OR
}

PeriodicBSR-Timer-r12 ::= ENumerated {
  sf5, sf10, sf16, sf20, sf32, sf40, sf64, sf80, sf128, sf160, sf320, sf640, sf1280, sf2560, infinity, spare1
}

RetxBSR-Timer-r12 ::= ENumerated {
  sf320, sf640, sf1280, sf2560, sf5120, sf10240, spare2, spare1
}

STAG-ToReleaseList-r11 ::= SEQUENCE (Size (1..maxSTAG-r11)) Of STAG-Id-r11

STAG-ToAddModList-r11 ::= SEQUENCE (Size (1..maxSTAG-r11)) Of STAG-ToAddMod-r11

STAG-ToAddMod-r11 ::= SEQUENCE {
  stag-id-r11 STAG-Id-r11,
  timeAlignmentTimerSTAG-r11 TimeAlignmentTimer,
  ...
}

STAG-Id-r11::= INTEGER (1..maxSTAG-r11)

-- ASN1STOP
MAC-MainConfig field descriptions

**dl-PathlossChange**
DL Pathloss Change and the change of the required power backoff due to power management (as allowed by P-MPRc [42]) for PHR reporting in TS 36.321 [6]. Value in dB. Value dB1 corresponds to 1 dB, dB3 corresponds to 3 dB and so on. The same value applies for each serving cell (although the associated functionality is performed independently for each cell).

**dormantSCellDeactivationTimer**
SCell deactivation timer for UEs supporting dormant state as specified in TS 36.321 [6]. Value in number of radio frames. Value rf4 corresponds to 4 radio frames, value rf8 corresponds to 8 radio frames and so on. E-UTRAN only configures the field if the UE is configured with one or more SCells other than the PSCell and PUCCH SCell. The same value applies for each SCell of a Cell Group (i.e. MCG or SCG) (although the associated functionality is performed independently for each SCell). Field dormantSCellDeactivationTimer does not apply for the PUCCH SCell.

**drx-Config**
Used to configure DRX as specified in TS 36.321 [6]. E-UTRAN configures the values in DRX-Config-v1130 only if the UE indicates support for IDC indication. E-UTRAN configures drx-Config-v1130, drx-Config-v1310 and drx-Config-r13 only if drx-Config (without suffix) is configured. E-UTRAN configures drx-Config-r13 only if UE supports CE or if the UE is configured with uplink of an LAA SCell.

**drx-InactivityTimer**
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf0 corresponds to 0 PDCCH sub-frame and behaviour as specified in 7.3.2 applies, value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.

**drx-RetransmissionTimer**
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf0 corresponds to 0 PDCCH sub-frame and behaviour as specified in 7.3.2 applies, value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on. In case drx-RetransmissionTimer-v1130 or drx-RetransmissionTimer-v1310 is signalled, the UE shall ignore drx-RetransmissionTimer (i.e. without suffix).

**drx-RetransmissionTimerShortTTI**
Timer for DRX in TS 36.321 [6]. Value in number of short TTIs when short TTI is configured. Valuetti0 corresponds to 10 TTIs, valuetti20 corresponds to 20 TTIs and so on.

**drx-ULRetransmissionTimer**
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf0 corresponds to 0 PDCCH sub-frame and behaviour as specified in 7.3.2 applies, value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.

**drx-UL-RetransmissionTimerShortTTI**
Timer for DRX in TS 36.321 [6]. Value in number of short TTIs when short TTI is configured. Valuetti0 corresponds to 10 TTIs and behaviour as specified in 7.3.2 applies, valuetti1 corresponds to 1 TTI and so on.

**drxShortCycleTimer**

**dualConnectivityPHR**
Indicates if power headroom shall be reported using Dual Connectivity Power Headroom Report MAC Control Element defined in TS 36.321 [6] (value setup). For both LTE DC and EN-DC, if PHR functionality is configured, E-UTRAN always configures the value setup for this field and configures phr-Config and dualConnectivityPHR. For LTE DC, E-UTRAN configures the field for both CGs while for EN-DC, E-UTRAN configures the field only for MCG.

**e-HARQ-Pattern**
TRUE indicates that enhanced HARQ pattern for TTI bundling is enabled for FDD. E-UTRAN enables this field only when ttiBundling is set to TRUE.

**eDRX-Config-CycleStartOffset**
Indicates longDRX-Cycle and drrStartOffset in TS 36.321 [6]. The value of longDRX-Cycle is in number of sub-frames. The value of drrStartOffset, in number of subframes, is indicated by the value of eDRX-Config-CycleStartOffset multiplied by 2560 plus the offset value configured in longDRX-CycleStartOffset. E-UTRAN only configures value setup when the value in longDRX-CycleStartOffset is sf2560.

**extendedBSR-Sizes**
If value setup is configured, the BSR index indicates extended BSR size levels as defined in TS 36.321 [6, Table 6.1.3.1-1].

**extendedPHR**
Indicates if power headroom shall be reported using the Extended Power Headroom Report MAC Control element defined in TS 36.321 [6] (value setup). E-UTRAN always configures the value setup if more than one and up to eight Serving Cell(s) with uplink is configured and none of the serving cells with uplink configured has a servingCellIndex higher than seven and if PUCCH on SCell is not configured and if dual connectivity is not configured. E-UTRAN configures extendedPHR only if phr-Config is configured. The UE shall release extendedPHR if phr-Config is released.

**extendedPHR2**
Indicates if power headroom shall be reported using the Extended Power Headeroom Report MAC Control Element defined in TS 36.321 [6] (value setup). E-UTRAN always configures the value setup if any of the serving cells with uplink configured has a servingCellIndex higher than seven in case dual connectivity is not configured or if PUCCH SCell (with any number of serving cells with uplink configured) is configured. E-UTRAN configures extendedPHR2 only if phr-Config is configured. The UE shall release extendedPHR2 if phr-Config is released.
**MAC-MainConfig field descriptions**

**logicalChannelSR-ProhibitTimer**
Timer used to delay the transmission of an SR for logical channels enabled by logicalChannelSR-Prohibit. Value sf20 corresponds to 20 subframes, sf40 corresponds to 40 subframes, and so on. See TS 36.321 [6].

**longDRX-CycleStartOffset**
longDRX-Cycle and drxStartOffset in TS 36.321 [6] unless eDRX-Config-CycleStartOffset is configured. The value of longDRX-Cycle is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. If shortDRX-Cycle is configured, the value of longDRX-Cycle shall be a multiple of the shortDRX-Cycle value. The value of drxStartOffset value is in number of sub-frames. In case longDRX-CycleStartOffset-v1130 is signalled, the UE shall ignore longDRX-CycleStartOffset (i.e. without suffix). In case longDRX-CycleStartOffset-v1310 is signalled, the UE shall ignore longDRX-CycleStartOffset (i.e. without suffix).

**maxHARQ-Tx**
Maximum number of transmissions for UL HARQ in TS 36.321 [6].

**mpdcch-UL-HARQ-ACK-FeedbackConfig**
TRUE indicates E-UTRAN may send UL HARQ-ACK feedback or new UL grant for early termination of PUSCH transmission or positive acknowledgement of completed PUSCH transmissions as specified in TS 36.321 [6] and TS 36.212 [22]. In case of acknowledgement of RRC Connection Release, MPDCCH monitoring is terminated.

**onDurationTimer**
Timer for DRX in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on. In case onDurationTimer-v1310 is signalled, the UE shall ignore onDurationTimer (i.e. without suffix).

**periodicBSR-Timer**
Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on.

**periodicPHR-Timer**
Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 subframes, sf20 corresponds to 20 subframes and so on.

**phr-ModeOtherCG**
Indicates the mode (i.e. real or virtual) used for the PHR of the activated cells that are part of the other Cell Group (i.e. MCG or SCG), when DC is configured.

**proc-Timeline**
Minimum processing timeline for short TTI with subslot operation. Value nplus4set1 indicates processing time n+4 for set 1, value nplus6set1 indicates processing time n+6 for set 1, value nplus6set2 indicates processing time n+6 for set and value nplus8set2 indicates processing time n+8 for set 2. See also UE capability min-Proc-TimelineSubslot for sTTI.

**prohibitPHR-Timer**
Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf0 corresponds to 0 subframes and behaviour as specified in 7.3.2 applies, sf100 corresponds to 100 subframes and so on.

**rai-Activation**

**retxBSR-Timer**
Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf640 corresponds to 640 subframes, sf1280 corresponds to 1280 subframes and so on.

**sCellDeactivationTimer**
SCell deactivation timer in TS 36.321 [6]. Value in number of radio frames. Value r4 corresponds to 4 radio frames, value r8 corresponds to 8 radio frames and so on. E-UTRAN only configures the field if the UE is configured with one or more SCells other than the PSCell and PUCCH SCell. If the field is absent, the UE shall delete any existing value for this field and assume the value to be set to infinity. The same value applies for each SCell of a Cell Group (i.e. MCG or SCG) (although the associated functionality is performed independently for each SCell). Field sCellDeactivationTimer does not apply for the PUCCH SCell.

**sCellHibernationTimer**
SCell hibernation timer for UEs supporting dormant SCell state as specified in TS 36.321 [6]. Value in number of radio frames. Value r4 corresponds to 4 radio frames, value r8 corresponds to 8 radio frames and so on. E-UTRAN only configures the field if the UE is configured with one or more SCells other than the PSCell and PUCCH SCell. The same value applies for each SCell of a Cell Group (i.e. MCG or SCG) (although the associated functionality is performed independently for each SCell). Field sCellHibernationTimer does not apply for the PUCCH SCell.

**shortDRX-Cycle**
Short DRX cycle in TS 36.321 [6]. Value in number of sub-frames. Value sf2 corresponds to 2 sub-frames, sf5 corresponds to 5 subframes and so on. In case shortDRX-Cycle-v1130 is signalled, the UE shall ignore shortDRX-Cycle (i.e. without suffix). Short DRX cycle is not configured for UEs in CE.

**skipUplinkTxDynamic**
If configured, the UE skips UL transmissions for an uplink grant other than a configured uplink grant if no data is available for transmission in the UE buffer as described in TS 36.321 [6].

**skipUplinkTxSPS**
If configured, the UE skips UL transmissions for a configured uplink grant if no data is available for transmission in the UE buffer as described in TS 36.321 [6]. E-UTRAN always configures skipUplinkTxSPS when semiPersistSchedIntervalUL is shorter than sf10.
**MAC-MainConfig field descriptions**

**sr-ProhibitTimer**  
Timer for SR transmission on PUCCH in TS 36.321 [6]. Value in number of SR period(s) of shortest SR period of any serving cell with PUCCH. Value 0 means that behaviour as specified in 7.3.2 applies. Value 1 corresponds to one SR period, Value 2 corresponds to 2*SR periods and so on. SR period is defined in TS 36.213 [23, table 10.1.5-1].

**ssr-ProhibitTimer**  
Timer for prohibiting SR transmission on SPUCCH in TS 36.321 [6]. Value in number of SR period(s) of shortest SR period of any serving cell with SPUCCH. Value 0 means that behaviour as specified in 7.3.2 applies. Value 1 corresponds to one SR period, Value 2 corresponds to 2 SR periods and so on. SR period is defined in TS 36.213 [23], table 10.1.5-1.

**stag-id**  
Indicates the TAG of an SCell, see TS 36.321 [6]. Uniquely identifies the TAG within the scope of a Cell Group (i.e. MCG or SCG). If the field is not configured for an SCell (e.g. absent in MAC-MainConfigSCell), the SCell is part of the PTAG.

**stag-ToAddModList, stag-ToReleaseList**  
Used to configure one or more STAGs. E-UTRAN ensures that a STAG contains at least one SCell with configured uplink. If, due to SCell release a reconfiguration would result in an ‘empty’ TAG, E-UTRAN includes release of the concerned TAG.

**timeAlignmentTimerSTAG**  
Indicates the value of the time alignment timer for an STAG, see TS 36.321 [6].

**ttiBundling**  
TRUE indicates that TTI bundling TS 36.321 [6] is enabled while FALSE indicates that TTI bundling is disabled. TTI bundling can be enabled for FDD and for TDD for configurations 0, 1 and 6 and additionally for configurations 2 and 3 when symPUSCH-UpPTS-r14 is configured. The functionality is performed independently per Cell Group (i.e. MCG or SCG), but E-UTRAN does not configure TTI bundling for the SCG. For a TDD PCell, E-UTRAN does not simultaneously enable TTI bundling and semi-persistent scheduling in this release of specification. Furthermore, for a Cell Group, E-UTRAN does not simultaneously configure TTI bundling and SCells with configured uplink, and E-UTRAN does not simultaneously configure TTI bundling and eIMTA.

-- P-C-AndCBSR

The IE P-C-AndCBSR is used to specify the power control and codebook subset restriction configuration.

**P-C-AndCBSR information elements**

```
-- ASN1START
P-C-AndCBSR-r11 ::= SEQUENCE {
P-C-r11 INTEGER (-8..15),
codebookSubsetRestriction-r11 BIT STRING }
P-C-AndCBSR-r13 ::= SEQUENCE {
P-C-r13 INTEGER (-8..15),
cbsr-Selection-r13 CHOICE{
  nonPrecoded-r13 SEQUENCE {
    codebookSubsetRestriction1-r13 BIT STRING,
codebookSubsetRestriction2-r13 BIT STRING,}
  beamformedK1a-r13 SEQUENCE {
    codebookSubsetRestriction3-r13 BIT STRING,
  },
  beamformedKN-r13 SEQUENCE {
    codebookSubsetRestriction4-r13 BIT STRING }
},
},
P-C-AndCBSR-r15 ::= SEQUENCE {
P-C-r15 INTEGER (-8..15),
codebookSubsetRestriction4-r15 BIT STRING }
P-C-AndCBSR-Pair-r13a ::= SEQUENCE (SIZE (1..2)) OF P-C-AndCBSR-r11
P-C-AndCBSR-Pair-r13 ::= SEQUENCE (SIZE (1..2)) OF P-C-AndCBSR-r13
P-C-AndCBSR-Pair-r15 ::= SEQUENCE (SIZE (1..2)) OF P-C-AndCBSR-r15

-- ASN1END
```
**P-C-AndCBRS field descriptions**

**cbsr-Selection**
Indicates which codebook subset restriction parameter(s) are to be used. E-UTRAN applies values nonPrecoded when eMIMO-Type is set to nonPrecoded. E-UTRAN applies value beamformedK1a when eMIMO-Type is set to beamformed. alternativeCodebookEnabledBeamformed is set to TRUE and csi-RS-ConfigNZPIdListExt is not configured. E-UTRAN applies value beamformedKN when csi-RS-ConfigNZPIdListExt is configured. E-UTRAN applies value beamformedKN when eMIMO-Type is set to beamformed, csi-RS-ConfigNZPIdListExt is not configured and alternativeCodebookEnabledBeamformed is set to FALSE.

**codebookSubsetRestriction**
Parameter: codebookSubsetRestriction, see TS 36.213 [23] and TS 36.211 [21]. The number of bits in the codebookSubsetRestriction for applicable transmission modes is defined in TS 36.213 [23].

**codebookSubsetRestriction1**
Parameter: codebookSubsetRestriction1, see TS 36.213 [23, Table 7.2-1d]. The number of bits in the codebookSubsetRestriction1 for applicable transmission modes is defined in TS 36.213 [23].

**codebookSubsetRestriction2**
Parameter: codebookSubsetRestriction2, see TS 36.213 [23, Table 7.2-1e]. The number of bits in the codebookSubsetRestriction2 for applicable transmission modes is defined in TS 36.213 [23].

**codebookSubsetRestriction3**
Parameter: codebookSubsetRestriction3, see TS 36.213 [23, Table 7.2-1f]. The UE shall ignore codebookSubsetRestriction-r11 or codebookSubsetRestriction-r10 if codebookSubsetRestriction3-r13 is configured. The number of bits in the codebookSubsetRestriction3 for applicable transmission modes is defined in TS 36.213 [23].

**codebookSubsetRestriction4**
Parameter: codebookSubsetRestriction4, see TS 36.213 [23, Table 7.2. The number of bits in the codebookSubsetRestriction4 for applicable transmission modes is defined in TS 36.213 [23].

**p-C**
Parameter: $P_c$, see TS 36.213 [23, 7.2.5].

**P-C-AndCBRS-Pair**
E-UTRAN includes a single entry if the UE is configured with TM9. If the UE is configured with TM10 and E-UTRAN includes 2 entries, this indicates that the subframe patterns configured for CSI (CQI/PMI/PTI/RI/CRI) reporting (i.e. as defined by field csi-MeasSubframeSet1 and csi-MeasSubframeSet2, or as defined by csi-MeasSubframeSets-r12) are to be used for this CSI process, while including a single entry indicates that the subframe patterns are not to be used for this CSI process. For a UE configured with TM10, E-UTRAN does not include 2 entries with csi-MeasSubframeSet1 and csi-MeasSubframeSet2 for CSI processes concerning a secondary frequency. Furthermore, E-UTRAN includes 2 entries when configuring both cqi-pmi-ConfigIndex and cqi-pmi-ConfigIndex2.

---

**PDCCH-ConfigSCell**
The IE **PDCCH-ConfigSCell** specifies PDCCH monitoring parameters that E-UTRAN may configure for a serving cell.

**PDCCH-ConfigSCell information element**

```plaintext
-- ASN1START

PDCCH-ConfigSCell-r13 ::= SEQUENCE {
   skipMonitoringDCI-format0-1A-r13 ENUMERATED {true} OPTIONAL -- Need OR
}

PDCCH-ConfigLAA-r14 ::= SEQUENCE {
   maxNumberOfSchedSubframes-Format0B-r14 ENUMERATED {sf2, sf3, sf4} OPTIONAL, -- Need OR
   maxNumberOfSchedSubframes-Format4B-r14 ENUMERATED {sf2, sf3, sf4} OPTIONAL, -- Need OR
   skipMonitoringDCI-Format0A-r14 ENUMERATED {true} OPTIONAL, -- Need OR
   skipMonitoringDCI-Format4A-r14 ENUMERATED {true} OPTIONAL, -- Need OR
   pdcch-CandidateReductions-Format0A-r14 PDCCCH-CandidateReductions-r13 OPTIONAL, -- Need ON
   pdcch-CandidateReductions-Format4A-r14 PDCCCH-CandidateReductionsLAA-UL-r14 OPTIONAL, -- Need ON
}

PDCCH-CandidateReductionValue-r13 ::= ENUMERATED {n0, n33, n66, n100}

PDCCH-CandidateReductionValue-r14 ::= ENUMERATED {n0, n50, n100, n150}

-- ASN1STOP
```
PDCCH-CandidateReductions-r13 ::= CHOICE {
  release       NULL,
  setup        SEQUENCE {
    pdcch-candidateReductionAL1-r13  PDCCH-CandidateReductionValue-r13,
    pdcch-candidateReductionAL2-r13  PDCCH-CandidateReductionValue-r13,
    pdcch-candidateReductionAL3-r13  PDCCH-CandidateReductionValue-r13,
    pdcch-candidateReductionAL4-r13  PDCCH-CandidateReductionValue-r13,
    pdcch-candidateReductionAL5-r13  PDCCH-CandidateReductionValue-r13
  }
}

PDCCH-CandidateReductionsLAA-UL-r14 ::= CHOICE {
  release       NULL,
  setup        SEQUENCE {
    pdcch-candidateReductionAL1-r14  PDCCH-CandidateReductionValue-r13,
    pdcch-candidateReductionAL2-r14  PDCCH-CandidateReductionValue-r13,
    pdcch-candidateReductionAL3-r14  PDCCH-CandidateReductionValue-r14,
    pdcch-candidateReductionAL4-r14  PDCCH-CandidateReductionValue-r14,
    pdcch-candidateReductionAL5-r14  PDCCH-CandidateReductionValue-r14
  }
}

-- ASN1STOP

---

PDCCH-ConfigSCell field descriptions

**maxNumberOfSchedSubframes-Format0B**
Indicates maximum number of schedulable subframes for DCI format 0B as specified in TS 36.213 [23]. Value sf2 corresponds to 2 subframes, value sf3 corresponds to 3 subframes and so on.

**maxNumberOfSchedSubframes-Format4B**
Indicates maximum number of schedulable subframes for DCI format 4B as specified in TS 36.213 [23]. Value sf2 corresponds to 2 subframes, value sf3 corresponds to 3 subframes and so on.

**skipMonitoringDCI-format0-1A**
Indicates whether the UE is configured to omit monitoring DCI format 0/1A, see TS 36.213 [23, 9.1.1].

**skipMonitoringDCI-Format0A**
Indicates whether the UE is configured to omit monitoring DCI format 0A as specified in TS 36.213 [23].

**skipMonitoringDCI-Format4A**
Indicates whether the UE is configured to omit monitoring DCI format 4A as specified in TS 36.213 [23].

**pdcch-candidateReductionALx**
Indicates reduced (E)PDCCH monitoring requirements on UE specific search space of the x-th aggregation level, see TS 36.213 [23, 9.1.1]. Value n0 corresponds to 0%, value n33 corresponds to 33% and so on.

**pdcch-CandidateReductions-Formatx**
Indicates number of blind detections on UE specific search space for each aggregation layer as specified in TS 36.213 [23]. The field can only be present when the UE is configured with uplink of an LAA SCell. If pdcch-CandidateReductions-Formatx is not configured, pdcch-CandidateReductions-r13 applies to the corresponding DCIs (if configured).

---

**PDCP-Config**

The IE PDCP-Config is used to set the configurable PDCP parameters for data radio bearers.

**PDCP-Config information element**

---

-- ASN1START

PDCP-Config ::= SEQUENCE {
  discardTimer      ENUMERATED {
    ms50, ms100, ms150, ms300, ms500,
    ms750, ms1500, infinity
  } OPTIONAL, -- Cond Setup
  rlc-AM        SEQUENCE {
    statusReportRequired    BOOLEAN
  } OPTIONAL, -- Cond Rlc-AM
  rlc-UM        SEQUENCE {
    pdcp-SN-Size      ENUMERATED {len7bits, len12bits}
  } OPTIONAL, -- Cond Rlc-UM
  headerCompression     CHOICE {
    notUsed        NULL,
    rohc        SEQUENCE {
      maxCID        INTEGER (1..16383) DEFAULT 15,
      profiles        SEQUENCE {
        profile0x0001
      } OPTIONAL
    }
  }
}

-- ASN1STOP
profile0x0002 BOOLEAN,
profile0x0003 BOOLEAN,
profile0x0004 BOOLEAN,
profile0x0006 BOOLEAN,
profile0x0010 BOOLEAN,
profile0x0102 BOOLEAN,
profile0x0103 BOOLEAN,
profile0x0104 BOOLEAN,

...,

[, ...]

[[ rn-IntegrityProtection-r10 ENUMERATED {enabled} OPTIONAL -- Cond RN ]],
[[ pdcp-SN-Size-v1130 ENUMERATED {len15bits} OPTIONAL -- Cond Rlc-AM2 ]],
[[ ul-DataSplitDRB-ViaSCG-r12 t-Reordering-r12 BOOLEAN OPTIONAL, -- Need ON
  ENUMERATED {ms0, ms20, ms40, ms60, ms80, ms100, ms120, ms140,
  ms160, ms180, ms200, ms220, ms240, ms260, ms280, ms300,
  ms500, ms750, spare14, spare13, spare12, spare11, spare10,
  spare9, spare8, spare7, spare6, spare5, spare4, spare3,
  spare2, spare1} OPTIONAL -- Cond SetupS ]],
[[ ul-DataSplitThreshold-r13 CHOICE {
  release NULL,
  setup ENUMERATED {
    b0, b100, b200, b400, b800, b1600, b3200, b6400, b12800,
    b25600, b51200, b102400, b204800, b409600, b819200,
    spare1} OPTIONAL, -- Need ON
}]]
[[ uplinkDataCompression-r15 SEQUENCE {
  bufferSize-r15 ENUMERATED {kbyte2, kbyte4, kbyte8, spare1},
  dictionary-r15 ENUMERATED {sip-SDP, operator} OPTIONAL, -- Need ON
  ...]

OPTIONAL, -- Cond Rlc-AM2}
```asciidoc
pdcp-DuplicationConfig-r15  CHOICE {
    release  NULL,
    setup    SEQUENCE {
        pdcp-Duplication-r15  ENUMERATED (configured, activated)
    }
}
]]

-- ASN1STOP
```
### PDCP-Config field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bufferSize</strong></td>
<td>Indicates the buffer size applied for UDC specified in TS 36.323 [8]. Value kbyte2 means 2048 bytes, kbyte4 means 4096 bytes and so on. E-UTRAN does not reconfigure bufferSize for a DRB except for handover cases.</td>
</tr>
<tr>
<td><strong>dictionary</strong></td>
<td>Indicates which pre-defined dictionary is used for UDC as specified in TS 36.323 [8]. The value sip-SDP means that UE shall prefill the buffer with standard dictionary for SIP and SDP defined in TS 36.323 [8], and the value operator means that UE shall prefill the buffer with operator-defined dictionary.</td>
</tr>
<tr>
<td><strong>discardTimer</strong></td>
<td>Indicates the discard timer value specified in TS 36.323 [8]. Value in milliseconds. Value ms50 means 50 ms, ms100 means 100 ms and so on.</td>
</tr>
<tr>
<td><strong>headerCompression</strong></td>
<td>E-UTRAN does not reconfigure header compression for an MCG DRB except for upon handover and upon the first reconfiguration after RRC connection re-establishment. E-UTRAN does not reconfigure header compression for a SCG DRB except for upon SCG change involving PDCP re-establishment. For split and LWA DRBs E-UTRAN configures only notUsed. E-UTRAN only configures this field when neither uplinkOnlyHeaderCompression nor uplinkDataCompression is configured. If headerCompression is configured, the UE shall apply the configured ROHC profile(s) in both uplink and downlink.</td>
</tr>
<tr>
<td><strong>maxCID</strong></td>
<td>Indicates the value of the MAX_CID parameter as specified in TS 36.323 [8]. The total value of MAX_CIDs across all bearers for the UE should be less than or equal to the value of maxNumberROHC-ContextSessions parameter as indicated by the UE. E-UTRAN configures the same value for maxCID in both headerCompression and uplinkOnlyHeaderCompression.</td>
</tr>
<tr>
<td><strong>pdcp-Duplication</strong></td>
<td>Parameter for configuring PDCP duplication as specified in TS 36.323 [8]. Value configured indicates that PDCP duplication is configured but initially deactivated and value activated indicates that PDCP duplication is configured and activated upon configuration. For EN-DC, E-UTRAN configures PDCP duplication for MCG DRB only if PDCP duplication is not configured for any split DRB.</td>
</tr>
<tr>
<td><strong>pdcp-SN-Size</strong></td>
<td>Indicates the PDCP Sequence Number length in bits. For RLC UM: value len7bits means that the 7-bit PDCP SN format is used and len12bits means that the 12-bit PDCP SN format is used. For RLC AM: value len15bits means that the 15-bit PDCP SN format is used, value len18bits means that the 18-bit PDCP SN format is used, otherwise if the field is not included upon setup of the PDCP entity 12-bit PDCP SN format is used, as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td><strong>profiles</strong></td>
<td>The profiles used by both compressor and decompressor in both UE and E-UTRAN. The field indicates which of the ROHC profiles specified in TS 36.323 [8] are supported, i.e. value true indicates that the profile is supported. Profile 0x0000 shall always be supported when the use of ROHC is configured. If support of two ROHC profile identifiers with the same 8 LSB's is signalled, only the profile corresponding to the highest value shall be applied. E-UTRAN does not configure ROHC while t-Reordering is configured (i.e. for split DRBs, for LWA bearers or upon reconfiguration from split or LWA to MCG DRB).</td>
</tr>
<tr>
<td><strong>statusFeedback</strong></td>
<td>Indicates whether the UE shall send PDCP Status Report periodically or by E-UTRAN polling as specified in TS 36.323 [8]. E-UTRAN configures this field only for LWA DRB.</td>
</tr>
<tr>
<td><strong>statusPDU-TypeForPolling</strong></td>
<td>Indicates the PDCP Control PDU option when it is triggered by E-UTRAN polling. Value type1 indicates using the legacy PDCP Control PDU for PDCP status reporting and value type2 indicates using the LWA specific PDCP Control PDU for LWA status reporting as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td><strong>statusPDU-Periodicity-Type1</strong></td>
<td>Indicates the value of the PDCP Status reporting periodicity for type1 Status PDU, as specified in TS 36.323 [8]. Value in milliseconds. Value ms5 means 5 ms, ms10 means 10 ms and so on.</td>
</tr>
<tr>
<td><strong>statusPDU-Periodicity-Type2</strong></td>
<td>Indicates the value of the PDCP Status reporting periodicity for type2 Status PDU, as specified in TS 36.323 [8]. Value in milliseconds. Value ms5 means 5 ms, ms10 means 10 ms and so on.</td>
</tr>
<tr>
<td><strong>statusPDU-Periodicity-Offset</strong></td>
<td>Indicates the value of the offset for type2 Status PDU periodicity, as specified in TS 36.323 [8]. Value in milliseconds. Value ms1 means 1 ms, ms2 means 2 ms and so on.</td>
</tr>
<tr>
<td><strong>t-Reordering</strong></td>
<td>Indicates the value of the reordering timer, as specified in TS 36.323 [8]. Value in milliseconds. Value ms0 means 0 ms and behaviour as specified in 7.3.2 applies, ms20 means 20 ms and so on.</td>
</tr>
<tr>
<td><strong>rm-IntegrityProtection</strong></td>
<td>Indicates that integrity protection or verification shall be applied for all subsequent packets received and sent by the RN on the DRB.</td>
</tr>
<tr>
<td><strong>statusReportRequired</strong></td>
<td>Indicates whether or not the UE shall send a PDCP Status Report upon re-establishment of the PDCP entity and upon PDCP data recovery as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td><strong>ul-DataSplitDRB-ViaSCG</strong></td>
<td>Indicates whether the UE shall send PDCP PDUs via SCG as specified in TS 36.323 [8]. E-UTRAN only configures the field (i.e. indicates value TRUE) for split DRBs.</td>
</tr>
</tbody>
</table>
**PDCP-Config field descriptions**

**ul-DataSplitThreshold**
Indicates the threshold value for uplink data split operation specified in TS 36.323 [8]. Value b100 means 100 Bytes, b200 means 200 Bytes and so on. E-UTRAN only configures this field for split DRBs.

**ul-LWA-DRB-ViaWLAN**
Indicates whether the UE shall send PDCP PDUs via the LWAAP entity as specified in TS 36.323 [8]. E-UTRAN only configures this field (i.e. indicates value TRUE) for LWA DRBs.

**ul-LWA-DataSplitThreshold**
Indicates the threshold value for uplink data split operation as specified in TS 36.323 [8]. Value b0 means 0 Bytes, b100 means 100 Bytes and so on. E-UTRAN only configures this field for LWA DRBs.

**uplinkDataCompression**
Indicates the UDC configuration that the UE shall apply. E-UTRAN does not configure uplinkDataCompression for a DRB, if headerCompression or uplinkOnlyHeaderCompression is already configured for the DRB. E-UTRAN does not configure uplinkDataCompression for the split and LWA DRBs. The maximum number of DRBs where uplinkDataCompression can be applied is two. In this version of the specification, for existing DRBs, E-UTRAN can only configure uplinkDataCompression via handover procedure.

**uplinkOnlyHeaderCompression**
Indicates the ROHC configuration that the UE shall apply uplink-only ROHC operations, see TS 36.323 [8]. E-UTRAN only configures this field when headerCompression is not configured. E-UTRAN does not reconfigure header compression for an MCG DRB except for upon handover and upon the first reconfiguration after RRC connection re-establishment. E-UTRAN does not reconfigure header compression for a SCG DRB except for upon SCG change involving PDCP re-establishment. For split and LWA DRBs E-UTRAN configures only notUsed.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rlc-AM</td>
<td>The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC AM. The field is optional, need ON, in case of reconfiguration of a PDCP entity at handover, at the first reconfiguration after RRC re-establishment or at SCG change involving PDCP re-establishment or PDCP data recovery for a radio bearer configured with RLC AM. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Rlc-AM2</td>
<td>The field is optionally present, need OP, upon setup of a PDCP entity for a radio bearer configured with RLC AM. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Rlc-AM3</td>
<td>The field is optionally present, need OP, upon setup of a PDCP entity for a radio bearer configured with RLC AM, if pdcp-SN-Size-v1130 is absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Rlc-UM</td>
<td>The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC UM. It is optionally present, Need ON, upon handover within E-UTRA, upon the first reconfiguration after re-establishment and upon SCG change involving PDCP re-establishment. Otherwise the field is not present.</td>
</tr>
<tr>
<td>RN</td>
<td>The field is optionally present when signalled to the RN, need OR. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Setup</td>
<td>The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>SetupS</td>
<td>The field is mandatory present in case of setup of or reconfiguration to a split DRB or LWA DRB. The field is optionally present upon reconfiguration of a split DRB or LWA DRB or upon DRB type change from split to MCG DRB or from LWA to LTE only, need ON. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

**PDSCH-Config**

The IE PDSCH-ConfigCommon and the IE PDSCH-ConfigDedicated are used to specify the common and the UE specific PDSCH configuration respectively.

**PDSCH-Config information element**

```asn1
-- ASN1START
PDSCH-ConfigCommon ::= SEQUENCE {
  referenceSignalPower INTEGER {-60..50},
  p-b INTEGER {0..3}
}
PDSCH-ConfigCommon-v1310 ::= SEQUENCE {
  pdsch-maxNumRepetitionCEmodeA-r13 ENUMERATED {r16, r32 } OPTIONAL, -- Need OR
  pdsch-maxNumRepetitionCEmodeB-r13 ENUMERATED 
-- ASN1END
```
PDSCH-ConfigDedicated::= SEQUENCE {
p-s ENUMERATED {
  dB-6, dB-4.77, dB-3, dB-1.77, 
  dB0, dB1, dB2, dB3}
}

PDSCH-ConfigDedicated-v1130 ::= SEQUENCE {
dmrs-ConfigPDSCH-r11 DMRS-Config-r11 OPTIONAL, -- Need ON 
qcl-Operation ENUMERATED {typeA, typeB} OPTIONAL, -- Need OR 
re-MappingQCLConfigToReleaseList-r11 RE-MappingQCLConfigToReleaseList-r11 OPTIONAL, -- Need ON 
re-MappingQCLConfigToAddModList-r11 RE-MappingQCLConfigToAddModList-r11 OPTIONAL -- Need ON 
}

PDSCH-ConfigDedicated-v1280 ::= SEQUENCE {
tbsIndexAlt-r12 ENUMERATED {a26, a33} OPTIONAL -- Need OR 
}

PDSCH-ConfigDedicated-v1310 ::= SEQUENCE {
dmrs-ConfigPDSCH-v1310 DMRS-Config-v1310 OPTIONAL -- Need ON 
}

PDSCH-ConfigDedicated-v1430 ::= SEQUENCE {
ce-PDSCH-MaxBandwidth-r14 ENUMERATED {bw5, bw20} OPTIONAL, -- Need OP 
ce-PDSCH-TenProcesses-r14 ENUMERATED {on} OPTIONAL, -- Need OR 
ce-HARQ-AckBundling-r14 ENUMERATED {on} OPTIONAL, -- Need OR 
tbsIndexAlt2-r14 ENUMERATED {b33} OPTIONAL -- Need OR 
}

PDSCH-ConfigDedicated-v1530 ::= SEQUENCE {
qcl-Operation-v1530 ENUMERATED {typeC} OPTIONAL, -- Need OR 
tbs-IndexAlt3-r15 ENUMERATED {a37} OPTIONAL, -- Need OR 
  -- eNote (ToDo): Clarify that eMTC fields (i.e. fields starting with ce-) do not apply 
  -- for SCell (merging issue) 
ce-CQI-AlternativeTableConfig-r15 ENUMERATED {on} OPTIONAL, -- Need OR 
ce-PDSCH-64QAM-Config-r15 ENUMERATED {on} OPTIONAL, -- Need OR 
ce-PDSCH-FlexibleStartPRB-AllocConfig-r15 ENUMERATED {on} OPTIONAL, -- Need OR 
tbsIndexAlt2-r14 ENUMERATED {b33} OPTIONAL -- Need OR 
}

PDSCH-ConfigDedicatedSCell-v1430 ::= SEQUENCE {
tbsIndexAlt2-r14 ENUMERATED {b33} OPTIONAL -- Need OR 
}

RE-MappingQCLConfigToAddModList-r11 ::= SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF PDSCH-RE-MappingQCL-Config-r11

RE-MappingQCLConfigToReleaseList-r11 ::= SEQUENCE (SIZE (1..maxRE-MapQCL-r11)) OF PDSCH-RE-MappingQCL-Config-r11

PDSCH-RE-MappingQCL-Config-r11 ::= SEQUENCE {
pdsch-RE-MappingQCL-ConfigId-r11 PDSCH-RE-MappingQCL-ConfigId-r11, 
  optionalSetOfFields-r11 SEQUENCE {
    crs-PortsCount-r11 ENUMERATED {n1, n2, n4, spare1}, 
    crs-FreqShift-r11 INTEGER (0..5), 
    mbsfn-SubframeConfigList-r11 MBSFN-SubframeConfigList 
      release setup 
      { 
        subframeConfigList MBSFN-SubframeConfigList 
      } 
      OPTIONAL, -- Need OR 
    pdsch-Start-r11 ENUMERATED {reserved, n1, n2, n3, n4, assigned} 
  } 
  OPTIONAL, -- Need ON 
  csi-RS-Config2PId-r11 CSI-RS-Config2PId-r11, 
  qcl-CSI-RS-ConfigN2PId-r11 CSI-RS-ConfigN2PId-r11 
  OPTIONAL, -- Need OR 
}
\[
\begin{array}{l}
\text{codewordOneConfig-v1530 CODEWORD }
\end{array}
\]

\[
\begin{array}{l}
type \text{= CHOICE }
\end{array}
\]

\[
\begin{array}{l}
\text{release } \text{NULL, set up } \text{SEQUENCE }
\end{array}
\]

\[
\begin{array}{l}
crs-PortsCount-v1530 \text{ ENUMERATED \{n1, n2, n4, spare\}, crs-FreqShift-v1530 } \text{INTEGER \{0..5\},}
\end{array}
\]

\[
\begin{array}{l}
mbsfn-SubframeConfigList-v1530 \text{ MBSFN-SubframeConfigList } \text{OPTIONAL, mbsfn-SubframeConfigListExt-v1530 MBSFN-SubframeConfigList-v1430 } \text{OPTIONAL,}
\end{array}
\]

\[
\begin{array}{l}
pdsch-Start-v1530 \text{ ENUMERATED \{reserved, n1, n2, n3, n4, assigned\},}
\end{array}
\]

\[
\begin{array}{l}
csi-RS-ConfigZPId-v1530 \text{ CSI-RS-ConfigZPId-r11,}
\end{array}
\]

\[
\begin{array}{l}
qcl-CS1-RS-ConfigNZPId-v1530 \text{ CSI-RS-ConfigNZPId-r11 } \text{OPTIONAL }
\end{array}
\]
**PDSCH-Config** field descriptions

**altMCS-TableScalingConfig**
Presence of the field indicates activation of 6-bit MCS table (i.e., altMCS-Table) for UE indicating support for altMCS-Table, see TS 36.212 [22] and TS 36.213 [23]. The indicated value configures the parameter altMCS-Table-Scaling where value oDot5 corresponds to scaling factor 0.5, value oDot625 corresponds to scaling factor 0.625 and so on, see TS 36.213 [23].

**ce-CQI-AlternativeTableConfig**
Configures the UE supporting alternative CQI table to use the alternative CQI table in CE mode A. See TS 36.213 [23].

**ce-HARQ-AckBundling**
Activation of PDSCH HARQ-ACK bundling in half duplex FDD in CE mode A, see TS 36.212 [22] and TS 36.213 [23].

**ce-PDSCH-64QAM-Config**
Activation of 64 QAM for non-repeated unicast PDSCH in CE mode A.

**ce-PDSCH-FlexibleStartPRB-AllocConfig**
Activation of flexible starting PRB for PDSCH resource allocation in CE mode A or B.

**ce-PDSCH-MaxBandwidth**
Maximum PDSCH channel bandwidth in CE mode A and B, see TS 36.212 [22] and TS 36.213 [23]. Value bw5 corresponds to 5 MHz, and value bw20 corresponds to 20 MHz. If this field is absent, the UE shall release any existing value and set the maximum PDSCH channel bandwidth in CE mode A and B to 1.4 MHz. Parameter: transmission bandwidth configuration, see TS 36.101 [42, table 5.6-1]. The max bandwidth can be configured to 5MHz for BL UEs and 5MHz or 20MHz for UEs in CE.

**ce-PDSCH-TenProcesses**
Configuration of 10 (instead of 8) DL HARQ processes in FDD in CE mode A, see TS 36.212 [22] and TS 36.213 [23].

**codewordOneConfig**
The field corresponds to codeword 1, see TS 36.213 [23], section 7.1.10. If absent, the UE applies the values from the serving cell configured on the same frequency.

**mbsfn-SubframeConfigList**
Indicates the MBSFN configuration for the CSI-RS resources. If optionalSetOfFields is absent, the fields mbsfn-SubframeConfigList-r11 and mbsfn-SubframeConfigList-v1430 are released.

**optionalSetOfFields**
If absent, the UE releases the configuration provided previously, if any, and applies the values from the serving cell configured on the same frequency. If the UE is configured with qcl-Operation-v1530, this field corresponds to codeword 0, see TS 36.213 [23], section 7.1.10.

**p-a**
Parameter: $P_a$, see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

**p-b**
Parameter: $P_b$, see TS 36.213 [23, Table 5.2-1].

**pdsch-maxNumRepetitionCEmodeA**
Maximum value to indicate the set of PDSCH repetition numbers for CE mode A, see TS 36.211 [21] and TS 36.213 [23].

**pdsch-maxNumRepetitionCEmodeB**
Maximum value to indicate the set of PDSCH repetition numbers for CE mode B, see TS 36.211 [21] and TS 36.213 [23].

**pdsch-Start**
The starting OFDM symbol of PDSCH for the concerned serving cell, see TS 36.213 [23], clause 7.1.6.4. Values 1, 2, 3 are applicable when dl-Bandwidth for the concerned serving cell is greater than 10 resource blocks, values 2, 3, 4 are applicable when dl-Bandwidth for the concerned serving cell is less than or equal to 10 resource blocks, see TS 36.211 [21], Table 6.7-1. Value n1 corresponds to 1, value n2 corresponds to 2 and so on. If the field pdsch-Start-v1530 is also configured, E-UTRAN ensures that this value is the same as pdsch-Start (i.e., without suffix).

**qcl-CSI-RS-ConfigNZPId**
Indicates the CSI-RS resource that is quasi co-located with the PDSCH antenna ports, see TS 36.213 [23, 7.1.9]. E-UTRAN configures this field if and only if the UE is configured with qcl-Operation set to typeB or qcl-Operation-v1530 set to typeC. If the UE is configured with qcl-Operation-v1530 set to typeC, the field qcl-CSI-RS-ConfigNZPId-r11 corresponds to codeword 0, and the field qcl-CSI-RS-ConfigNZPId-v1530 corresponds to codeword 1, see TS 36.213 [23], section 7.1.10.

**qcl-Operation**
Indicates the quasi co-location behaviour to be used by the UE, type A, type B, or type C, as described in TS 36.213 [23], clause 7.1.10. In case qcl-Operation-v1530 is present, the UE shall ignore the field qcl-Operation (without suffix). E-UTRAN configures qcl-Operation-v1530 only when transmission mode 10 is configured for the serving cell on this carrier frequency and QCL type C is configured.

**referenceSignalPower**
Parameter: Reference-signal power, which provides the downlink reference-signal EPRE, see TS 36.213 [23, 5.2]. The actual value in dBm.
PDSCH-Config field descriptions

altMCS-TableScalingConfig
Presence of the field indicates activation of 6-bit MCS table (i.e., altMCS-Table) for UE indicating support for altMCS-Table, see TS 36.212 [22] and TS 36.213 [23]. The indicated value configures the parameter altMCS-Table-Scaling where value oDot5 corresponds to scaling factor 0.5, value oDot625 corresponds to scaling factor 0.625 and so on, see TS 36.213 [23].

ce-CQI-AlternativeTableConfig
Configures the UE supporting alternative CQI table to use the alternative CQI table in CE mode A. See TS 36.213 [23].

ce-HARQ-AckBundling
Activation of PDSCH HARQ-ACK bundling in half duplex FDD in CE mode A, see TS 36.212 [22] and TS 36.213 [23].

cnPDSCH-64QAM-Config
Activation of 64 QAM for non-repeated unicast PDSCH in CE mode A.

re-MappingQCLConfigToAddModList, re-MappingQCLConfigToReleaseList
For a serving frequency E-UTRAN configures at least one PDSCH-RE-MappingQCL-Config when transmission mode 10 is configured for the serving cell on this carrier frequency. Otherwise it does not configure this field.

tbsIndexAlt
Indicates the applicability of the alternative TBS index for the ITBS 26 and 33 (see TS 36.213 [23, Table 7.1.7.2.1-1]) to all subframes scheduled by DCI format 2C or 2D. Value a26 refers to the alternative TBS index ITBS 26A, and value a33 refers to the alternative TBS index ITBS 33A. If this field is not configured, the UE shall use ITBS 26 specified in Table 7.1.7.2.1-1 in TS 36.213 [23] for all subframes instead. If neither this field nor tbsIndexAlt2 configures an alternative TBS index for ITBS 33, the UE shall use ITBS 33 specified in Table 7.1.7.2.1-1 in TS 36.213 [23] for all subframes instead.

tbsIndexAlt2
Indicates the applicability of the alternative TBS index for the ITBS 33 (see TS 36.213 [23], Table 7.1.7.2.1-1) to all subframes. Value b33 refers to the alternative TBS index ITBS 33B. If neither this field nor tbsIndexAlt2 configures an alternative TBS index for ITBS 33, the UE shall use ITBS 33 specified in Table 7.1.7.2.1-1 in TS 36.213 [23] for all subframes instead.

tbsIndexAlt3
Indicates the applicability of the alternative TBS index for the ITBS 37 (see TS 36.213 [23], Table 7.1.7.2.1-1) to all subframes. Value a37 refers to the alternative TBS index ITBS 37A.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TypeC</td>
<td>The field is optional, need ON when qcl-Operation is configured with typeC. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

— PDSCH-RE-MappingQCL-ConfigId

The IE PDSCH-RE-MappingQCL-ConfigId is used to identify a set of PDSCH parameters related to resource element mapping and quasi co-location, as configured by the IE PDSCH-RE-MappingQCL-Config. The identity is unique within the scope of a carrier frequency.

PDSCH-RE-MappingQCL-ConfigId information elements

-- ASN1START
PDSCH-RE-MappingQCL-ConfigId-r11 ::= INTEGER (1..maxRE-MapQCL-r11)
-- ASN1STOP

— PerCC-GapIndicationList

The IE PerCC-GapIndicationList is used to specify the UE measurement gap preference.

PerCC-GapIndication information elements

-- ASN1START
PerCC-GapIndicationList-r14 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF PerCC-GapIndication-r14
PerCC-GapIndication-r14 ::= SEQUENCE {
  servCellId-r14       ServCellIndex-r13,
  gapIndication-r14    ENUMERATED (gap, ncsg, nogap-noNcsg)
}
-- ASN1STOP
**PerCC-GapIndication field descriptions**

**servCellId**
This field identifies the serving cell for which the measurement gap preference is provided.

**gapIndication**
This field is used to indicate the measurement gap preference per component carrier (serving cell) by the UE both in non-CA and CA configurations. Value `gap` indicates that a measurement gap is needed for the associated `servCellId`, value `nogap-noNcsg` indicates that neither a measurement gap nor a ncsg is needed for the associated `servCellId`, value `ncsg` indicates that ncsg is needed for the associated `servCellId`. The UE shall indicate the per CC measurement gap preference consistently for the same non-CA or CA configuration and measurement configuration during the same RRC connection.

---

**PHICH-Config**

The IE **PHICH-Config** is used to specify the PHICH configuration.

**PHICH-Config information element**

```asn1
PHICH-Config ::=  SEQUENCE {
  phich-Duration      ENUMERATED {normal, extended},
  phich-Resource      ENUMERATED {oneSixth, half, one, two}
}
```

**PHICH-Config field descriptions**

**phich-Duration**
Parameter: PHICH-Duration, see TS 36.211 [21, Table 6.9.3-1].

**phich-Resource**
Parameter: Ng, see TS 36.211 [21, 6.9]. Value oneSixth corresponds to 1/6, half corresponds to 1/2 and so on.

---

**PhysicalConfigDedicated**

The IE **PhysicalConfigDedicated** is used to specify the UE specific physical channel configuration.

**PhysicalConfigDedicated information element**

```asn1
PhysicalConfigDedicated ::=  SEQUENCE {
  pdsch-ConfigDedicated    PDSCH-ConfigDedicated   OPTIONAL,  -- Need ON
  pucch-ConfigDedicated    PUCCH-ConfigDedicated   OPTIONAL,  -- Need ON
  pusch-ConfigDedicated    PUSCH-ConfigDedicated   OPTIONAL,  -- Need ON
  uplinkPowerControlDedicated   UplinkPowerControlDedicated   OPTIONAL,  -- Need ON
  tpc-PDCCH-ConfigPUCCH    TPC-PDCCH-Config    OPTIONAL,  -- Need ON
  tpc-PDCCH-ConfigPUSCH    TPC-PDCCH-Config    OPTIONAL,  -- Need ON
  cqi-ReportConfig     CQI-ReportConfig    OPTIONAL,  -- Cond CQI-
  soundingRS-UL-ConfigDedicated  SoundingRS-UL-ConfigDedicated  OPTIONAL,  -- Need ON
  antennaInfo       CHOICE {
    explicitValue      AntennaInfoDedicated,
    defaultValue      NULL
  }                 OPTIONAL, -- Cond AI-r8
  schedulingRequestConfig    SchedulingRequestConfig   OPTIONAL,  -- Need ON
  ...                   OPTIONAL,  -- Need ON
  cqi-ReportConfig-v920   CQI-ReportConfig-v920  OPTIONAL,  -- Cond CQI-
  antennaInfo-v920      AntennaInfoDedicated-v920 OPTIONAL  -- Cond AI-
  cqi-ReportConfig-r10   CQI-ReportConfig-r10   OPTIONAL, -- Cond CQI-r10
  csi-RS-Config-r10    CSI-RS-Config-r10    OPTIONAL,  -- Need ON
  pucch-ConfigDedicated-v1020  PUCCH-ConfigDedicated-v1020  OPTIONAL,  -- Need ON
}
```

---
pusch-ConfigDedicated-v1020 PUSCH-ConfigDedicated-v1020 OPTIONAL, -- Need ON
schedulingRequestConfig-v1020 SchedulingRequestConfig-v1020 OPTIONAL, -- Need ON
soundingRS-UL-ConfigDedicated-v1020 SoundingRS-UL-ConfigDedicated-v1020 OPTIONAL, -- Need ON
soundingRS-UL-ConfigDedicatedAperiodic-r10 SoundingRS-UL-ConfigDedicatedAperiodic-r10 OPTIONAL, -- Need ON
uplinkPowerControlDedicated-v1020 UplinkPowerControlDedicated-v1020 OPTIONAL -- Need ON
]
[ additionalSpectrumEmissionCA-r10 CHOICE {
release NULL,
setup SEQUENCE {
  additionalSpectrumEmissionPCell-r10 AdditionalSpectrumEmission
} OPTIONAL -- Need ON
}
]
[
  additionalSpectrumEmissionCA-r10 CHOICE {
release NULL,
setup SEQUENCE {
  additionalSpectrumEmissionPCell-r10 AdditionalSpectrumEmission
} OPTIONAL -- Need ON
}
]
[
  -- DL configuration as well as configuration applicable for DL and UL
csi-RS-ConfigNZPToReleaseList-r11 C1-RS-ConfigNZPToReleaseList-r11 OPTIONAL, -- Need ON
csi-RS-ConfigNZPToAddModList-r11 C1-RS-ConfigNZPToAddModList-r11 OPTIONAL, -- Need ON
csi-RS-ConfigNZPToReleaseList-r11 C1-RS-ConfigNZPToReleaseList-r11 OPTIONAL, -- Need ON
csi-RS-ConfigNZPToAddModList-r11 C1-RS-ConfigNZPToAddModList-r11 OPTIONAL, -- Need ON
epdcch-Config-r11 EPDCCH-Config-r11 OPTIONAL, -- Need ON
pdsch-ConfigDedicated-v1130 PDSCH-ConfigDedicated-v1130 OPTIONAL, -- Need ON
-- UL configuration
cqi-ReportConfig-v1130 CQI-ReportConfig-v1130 OPTIONAL, -- Need ON
pusch-ConfigDedicated-v1130 PUSCH-ConfigDedicated-v1130 OPTIONAL, -- Need ON
pusch-ConfigDedicated-v1130 PUSCH-ConfigDedicated-v1130 OPTIONAL, -- Need ON
uplinkPowerControlDedicated-v1130 UplinkPowerControlDedicated-v1130 OPTIONAL -- Need ON
]
[
  antennaInfo-v1250 AntennaInfoDedicated-v1250 OPTIONAL, -- Cond AI-r10
eimta-MainConfig-r12 EIMTA-MainConfig-r12 OPTIONAL, -- Need ON
eimta-MainConfigPCell-r12 EIMTA-MainConfigServCell-r12 OPTIONAL, -- Need ON
pusch-ConfigDedicated-v1250 PUSCH-ConfigDedicated-v1250 OPTIONAL, -- Need ON
cqi-ReportConfigCell-v1250 CQI-ReportConfig-v1250 OPTIONAL, -- Need ON
uplinkPowerControlDedicated-v1250 UplinkPowerControlDedicated-v1250 OPTIONAL, -- Need ON
pusch-ConfigDedicated-v1250 PUSCH-ConfigDedicated-v1250 OPTIONAL, -- Need ON
csi-RS-Config-v1250 CSI-RS-Config-v1250 OPTIONAL, -- Need ON
]
[
  pdsch-ConfigDedicated-v1280 PDSCH-ConfigDedicated-v1280 OPTIONAL, -- Need ON
]
[
  pdsch-ConfigDedicated-v1310 PDSCH-ConfigDedicated-v1310 OPTIONAL, -- Need ON
  pusch-ConfigDedicated-r13 PUSCH-ConfigDedicated-r13 OPTIONAL, -- Need ON
  pusch-ConfigDedicated-r13 PUSCH-ConfigDedicated-r13 OPTIONAL, -- Need ON
  pdcch-CandidateReductions-r13 PDCCH-CandidateReductions-r13 OPTIONAL, -- Need ON
cqi-ReportConfig-v1310 CQI-ReportConfig-v1310 OPTIONAL, -- Need ON
soundingRS-UL-ConfigDedicated-v1310 SoundingRS-UL-ConfigDedicated-v1310 OPTIONAL, -- Need ON
soundingRS-UL-ConfigDedicatedUpPtsExt-r13 SoundingRS-UL-ConfigDedicatedUpPtsExt-r13 OPTIONAL, -- Need ON
soundingRS-UL-ConfigDedicatedAperiodic-r13 SoundingRS-UL-ConfigDedicatedAperiodic-r13 OPTIONAL, -- Need ON
soundingRS-UL-ConfigDedicatedAperiodicUpPtsExt-r13 SoundingRS-UL-ConfigDedicatedAperiodicUpPtsExt-r13 OPTIONAL, -- Need ON
csi-RS-Config-v1310 CSI-RS-Config-v1310 OPTIONAL, -- Need ON
ce-Mode-r13 CHOICE {
  release NULL,
  setup ENUMERATED {ce-ModeA,ce-ModeB}
} OPTIONAL, -- Need ON
csi-RS-ConfigNZPToAddModListExt-r13 CSI-RS-ConfigNZPToAddModListExt-r13 OPTIONAL, -- Need ON
csi-RS-ConfigNZPToReleaseListExt-r13 CSI-RS-ConfigNZPToReleaseListExt-r13 OPTIONAL -- Need ON
]
[
  typeA-SRS-TPC-PDCCH-Group-r14 CHOICE {
  release NULL,
  setup SEQUENCE (SIZE (1..32)) OF SRS-TPC-PDCCH-Config-r14
} OPTIONAL, -- Need ON
cqi-ReportConfig-v1320 CQI-ReportConfig-v1320 OPTIONAL, -- Need ON
]
[
k-max-r14  ENUMERATED {11, 13},
p-a-must-r14  ENUMERATED {
    dB-6, dB-4dot77, dB-3, dB-1dot77,
    dB0, dB1, dB2, dB3} OPTIONAL -- Need ON

pusch-EnhancementsConfig-r14  PUSCH-EnhancementsConfig-r14 OPTIONAL, -- Need ON

pusch-Dedicated-r14  PUSCH-Dedicated-r14 OPTIONAL, -- Need ON

pusch-DedicatedFromPUSCHEnhancementsConfig-r14  PUSCH-DedicatedFromPUSCHEnhancementsConfig-r14 OPTIONAL, -- Need ON

pusch-DedicatedFromPUSCHEnhancementsConfig-r14  PUSCH-DedicatedFromPUSCHEnhancementsConfig-r14 OPTIONAL, -- Need ON

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pusch-DedicatedFromPUSCHEnhancementsConfig-r14  PUSCH-DedicatedFromPUSCHEnhancementsConfig-r14 OPTION
CrossCarrierSchedulingConfig-r10 OPTIONAL, -- Need ON
  csi-RS-Config-r10 CSI-RS-Config-r10 OPTIONAL, -- Need ON
  pdsch-ConfigDedicated-r10 PDSCH-ConfigDedicated OPTIONAL, -- Need ON
} OPTIONAL, -- Cond SCellAdd

-- UL configuration
ul-Configuration-r10 SEQUENCE {
  antennaInfoUL-r10 AntennaInfoUL-r10 OPTIONAL, -- Need ON
  pusch-ConfigDedicatedSCell-r10 PUSCH-ConfigDedicatedSCell-r10 OPTIONAL, -- Cond PUSCH-SCell
  uplinkPowerControlDedicatedSCell-r10 UplinkPowerControlDedicatedSCell-r10 OPTIONAL, -- Need ON
  cqi-ReportConfigSCell-r10 CQI-ReportConfigSCell-r10 OPTIONAL, -- Need ON
  soundingRS-UL-ConfigDedicated-r10 SoundingRS-UL-ConfigDedicated OPTIONAL, -- Need ON
  soundingRS-UL-ConfigDedicatedAperiodic-r10 SoundingRS-UL-ConfigDedicatedAperiodic-r10 OPTIONAL, -- Need ON
}

...,
[
  -- DL configuration as well as configuration applicable for DL and UL
  csi-RS-ConfigNZPToReleaseList-r11 CSI-RS-ConfigNZPToReleaseList-r11 OPTIONAL, -- Need ON
  csi-RS-ConfigNZPToAddModList-r11 CSI-RS-ConfigNZPToAddModList-r11 OPTIONAL, -- Need ON
  csi-RS-ConfigZPToReleaseList-r11 CSI-RS-ConfigZPToReleaseList-r11 OPTIONAL, -- Need ON
  csi-RS-ConfigZPToAddModList-r11 CSI-RS-ConfigZPToAddModList-r11 OPTIONAL, -- Need ON
  epdcch-Config-r11 EPDCCH-Config-r11 OPTIONAL, -- Need ON
  pdsch-ConfigDedicated-v1130 PDSCH-ConfigDedicated-v1130 OPTIONAL, -- Need ON
} OPTIONAL, -- Cond CommonUL

-- UL configuration
  cqi-ReportConfig-v1130 CQI-ReportConfig-v1130 OPTIONAL, -- Need ON
  pusch-ConfigDedicated-v1130 PUSCH-ConfigDedicated-v1130 OPTIONAL, -- Cond PUSCH-SCell
  uplinkPowerControlDedicatedSCell-v1130 UplinkPowerControlDedicatedSCell-v1130 OPTIONAL, -- Need ON
  cqi-ReportConfigSCell-v1250 CQI-ReportConfig-v1250 OPTIONAL, -- Need ON
  uplinkPowerControlDedicatedSCell-v1250 UplinkPowerControlDedicatedSCell-v1250 OPTIONAL, -- Need ON
  csi-RS-Config-v1250 CSI-RS-Config-v1250 OPTIONAL, -- Need ON
}]

]}

[ pucch-Cell-v13 CHOICE {
  release ENUMERATED {true} OPTIONAL, -- Cond PUCCH-SCell
  setup SEQUENCE {
    pusch-ConfigDedicated-r13 PUSCH-ConfigDedicated-r13 OPTIONAL, -- Need ON
    schedulingRequestConfig-r13 SchedulingRequestConfigSCell-r13 OPTIONAL, -- Need ON
    tpc-PDCCH-ConfigPUCCH-SCell-r13 TPC-PDCCH-ConfigSCell-r13 OPTIONAL, -- Need ON
    pusch-ConfigDedicated-r13 PUSCH-ConfigDedicated-r13 OPTIONAL, -- Cond PUSCH-SCell
  } OPTIONAL, -- Cond PUSCH-SCell
  uplinkPowerControlDedicated-r13 UplinkPowerControlDedicatedSCell-v1310 OPTIONAL -- Need ON
}

}]

crossCarrierSchedulingConfig-r13 CrossCarrierSchedulingConfig-r13 OPTIONAL, -- Cond Cross-Carrier-Config
  pdch-ConfigSCell-r13 PDCCH-ConfigSCell-r13 OPTIONAL, -- Need ON
  cqi-ReportConfig-v1310 CQI-ReportConfig-v1310 OPTIONAL, -- Need ON
  pdsch-ConfigDedicated-v1310 PDSCH-ConfigDedicated-v1310 OPTIONAL, -- Need ON
  soundingRS-UL-ConfigDedicated-v1310 SoundingRS-UL-ConfigDedicated-v1310 OPTIONAL, -- Need ON
  soundingRS-UL-ConfigDedicatedAperiodic-v1310 SoundingRS-UL-ConfigDedicatedAperiodic-v1310 OPTIONAL, -- Need ON
  soundingRS-UL-ConfigDedicatedAperiodicUpPTSExt-r13 SoundingRS-UL-ConfigDedicatedAperiodicUpPTSExt-r13 OPTIONAL, -- Need ON
  csi-RS-Config-v1310 CSI-RS-Config-v1310 OPTIONAL, -- Need ON


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<td>LAA-SCellConfiguration-v1320 OPTIONAL, -- Need ON</td>
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<td>csi-RS-ConfigNZPToAddModListExt-r13</td>
<td>CSI-RS-ConfigNZPToAddModListExt-r13 OPTIONAL, -- Need ON</td>
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<td>csi-RS-ConfigNZPToReleaseListExt-r13</td>
<td>CSI-RS-ConfigNZPToReleaseListExt-r13 OPTIONAL -- Need ON</td>
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<td>cqi-ReportConfig-v1320</td>
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<tr>
<td>laa-SCellConfiguration-v1430</td>
<td>LAA-SCellConfiguration-v1430 OPTIONAL, -- Need ON</td>
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<td>typeB-SRS-TPC-PDCCH-Config-r14</td>
<td>SRS-TPC-PDCCH-Config-r14 OPTIONAL, -- Need ON</td>
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<tr>
<td>csi-RS-Config-v1430</td>
<td>CSI-RS-Config-v1430 OPTIONAL, -- Need ON</td>
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<td>cqi-ReportConfig-v1430</td>
<td>CQI-ReportConfig-v1430 OPTIONAL, -- Need ON</td>
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<td>semiOpenLoop-r14</td>
<td>BOOLEAN OPTIONAL, -- Need ON</td>
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<td>uplinkPUSCH-LessPowerControlDedicated-v1430</td>
<td>UplinkPUSCH-LessPowerControlDedicated-v1430 OPTIONAL, -- Need ON</td>
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<td>PUSCH-ConfigDedicated-v1430</td>
<td>PUSCH-ConfigDedicated-v1430 OPTIONAL, -- Need ON</td>
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<td>PDSCH-ConfigDedicated-v1530</td>
<td>PDSCH-ConfigDedicated-v1530 OPTIONAL, -- Need ON</td>
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<td>CQI-ReportConfigSCell-r15</td>
<td>CQI-ReportConfigSCell-r15 OPTIONAL, -- Need ON</td>
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<td>CQI-ShortConfigSCell-r15</td>
<td>CQI-ShortConfigSCell-r15 OPTIONAL, -- Need ON</td>
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<tr>
<td>UplinkPowerControlDedicatedSCell-v1530</td>
<td>UplinkPowerControlDedicatedSCell-v1530 OPTIONAL, -- Need ON</td>
</tr>
<tr>
<td>PhysicalConfigDedicatedSTTI-r15</td>
<td>PhysicalConfigDedicatedSTTI-r15 OPTIONAL, -- Need ON</td>
</tr>
<tr>
<td>PUSCH-ConfigDedicatedScell-v1530</td>
<td>PUSCH-ConfigDedicatedScell-v1530 OPTIONAL, -- Cond AUL</td>
</tr>
<tr>
<td>semiStaticCFI-Config-r15</td>
<td>CHOICE { release NULL, setup CHOICE { cfi-Config-r15 CFI-Config-r15, cfi-PatternConfig-r15 CFI-PatternConfig-r15 } } OPTIONAL, -- Need ON</td>
</tr>
<tr>
<td>blindPDSCH-Repetition-Config-r15</td>
<td>CHOICE { release NULL, setup SEQUENCE {blindSubframePDSCH-Repetitions-r15 BOOLEAN, blindSlotSubslotPDSCH-Repetitions-r13 BOOLEAN, maxNumber-SubframePDSCH-Repetitions-r15 ENUMERATED {n4,n6}, maxNumber-SlotSubslotPDSCH-Repetitions-r15 ENUMERATED {n4,n6} } OPTIONAL, -- Need ON maxNumber-SubframePDSCH-Repetitions-r15 ENUMERATED {n4,n6}, maxNumber-SlotSubslotPDSCH-Repetitions-r15 ENUMERATED {n4,n6} OPTIONAL, -- Need ON } OPTIONAL, -- Need ON</td>
</tr>
<tr>
<td>rv-SubframePDSCH-Repetitions-r15</td>
<td>ENUMERATED {dlrvseq1, dlrvseq2} OPTIONAL, -- Need ON</td>
</tr>
<tr>
<td>rv-SlotsublotPDSCH-Repetitions-r15</td>
<td>ENUMERATED {dlrvseq1, dlrvseq2} OPTIONAL, -- Need ON</td>
</tr>
</tbody>
</table>

**Notes:**
- **AUL:** AUL stands for Absolute Timing and Uplink Slot Timing.
- **CFI:** Configuration Format Indicator.
- **PUSCH:** PUSCH (Physical Uplink Shared Channel).
- **PDSCH:** PDSCH (Physical Downlink Shared Channel).
- **STTI:** Synchronization Time to Initial Transmission Indicator.
- **CFI-Config:** CFI Configuration.
- **CFI-PatternConfig:** CFI Pattern Configuration.
- **blindSubframePDSCH-Repetitions:** Blind Subframe PDSCH Repetitions.
- **blindSlotSubslotPDSCH-Repetitions:** Blind Slot Subslot PDSCH Repetitions.
mcs-restrictionSubframePDSCH-Repetitions-r15 ENUMERATED {n0, n1} OPTIONAL, -- Need ON
mcs-restrictionSlotSubslotPDSCH-Repetitions-r15 ENUMERATED {n0, n1} OPTIONAL -- Need ON

PhysicalConfigDedicatedSCell-v1370 ::= SEQUENCE {
pucch-SCell-v1370 CHOICE{
  release NULL,
  setup SEQUENCE {
pucch-ConfigDedicated-v1370 PUCCH-ConfigDedicated-v1370 OPTIONAL -- Cond
PUCCH-Format4or5
  }
}
}

CFI-Config-r15 ::= SEQUENCE {
cfi-SubframeNonMBSFN-r15 INTEGER (1..4) OPTIONAL, -- Need ON
cfi-SlotSubslotNonMBSFN-r15 INTEGER (1..3) OPTIONAL, -- Need ON
cfi-SubframeMBSFN-r15 INTEGER (1..2) OPTIONAL, -- Need ON
cfi-SlotSubslotMBSFN-r15 INTEGER (1..2) OPTIONAL -- Need ON
}

CFI-PatternConfig-r15 ::= SEQUENCE {
cfi-PatternSubframe-r15 SEQUENCE (SIZE(10)) OF INTEGER (1..4) OPTIONAL, -- Need ON
cfi-PatternSlotSubslot-r15 SEQUENCE (SIZE(10)) OF INTEGER (1..3) OPTIONAL -- Need ON
}

LAA-SCellConfiguration-r13 ::= SEQUENCE {
  subframeStartPosition-r13 ENUMERATED {s0, s07},
  laa-SCellSubframeConfig-r13 BIT STRING (SIZE(8))
}

LAA-SCellConfiguration-v1430 ::= SEQUENCE {
crossCarrierSchedulingConfig-UL-r14 CHOICE {
  release NULL,
  setup SEQUENCE {
crossCarrierSchedulingConfigLAA-UL-r14 CrossCarrierSchedulingConfigLAA-UL-r14
  }

  lbt-Config-r14 LBT-Config-r14 OPTIONAL, -- Cond LAA-ConfigUL
  pduch-ConfigLAA-r14 PDCCH-ConfigLAA-r14 OPTIONAL, -- Need ON
  absenceOfAnyOtherTechnology-r14 ENUMERATED {true} OPTIONAL, -- Need OR
  soundingRS-UL-ConfigDedicatedAperiodic-v1430 SoundingRS-UL-ConfigDedicatedAperiodic-v1430 OPTIONAL -- Need ON
}

LAA-SCellConfiguration-v1530 ::= SEQUENCE {
pusch-ModeConfigLAA-r15 AUL-Config-r15 OPTIONAL, -- Need ON
}

PUSCH-ModeConfigLAA-r15 ::= SEQUENCE {
  laa-PUSCH-Mode1 BOOLEAN,
  laa-PUSCH-Mode2 BOOLEAN,
  laa-PUSCH-Mode3 BOOLEAN
}

LBT-Config-r14 ::= CHOICE{
  maxEnergyDetectionThreshold-r14 INTEGER (-85..-52),
  energyDetectionThresholdOffset-r14 INTEGER (-13..20)
}

CSI-RS-ConfigNZPToAddModList-r11 ::= SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF CSI-RS-ConfigNZP-r11
CSI-RS-ConfigNZPToAddModListExt-r13 ::= SEQUENCE (SIZE (1..maxCSI-RS-NZP-v1310)) OF CSI-RS-ConfigNZP-r11
CSI-RS-ConfigNZPToAddModList-r15 ::= SEQUENCE (SIZE (1..maxCSI-RS-NZP-r13)) OF CSI-RS-ConfigNZP-r11
CSI-RS-ConfigNZPToReleaseList-r11 ::= SEQUENCE (SIZE (1..maxCSI-RS-NZP-r11)) OF CSI-RS-ConfigNZPId-r11
CSI-RS-ConfigNZPToReleaseListExt-r13 ::= SEQUENCE (SIZE (1..maxCSI-RS-NZP-v1310)) OF CSI-RS-ConfigNZPId-v1310

CSI-RS-ConfigNZPToReleaseList-r15 ::= SEQUENCE (SIZE (1..maxCSI-RS-NZP-r13)) OF CSI-RS-ConfigNZPId-r13

CSI-RS-Config2PToAddModList-r11 ::= SEQUENCE (SIZE (1..maxCSI-RS-2P-r11)) OF CSI-RS-Config2PId-r11

CSI-RS-Config2PToReleaseList-r11 ::= SEQUENCE (SIZE (1..max

PhysicalConfigDedicatedSTTI-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    antennaInfoDedicatedSTTI-r15 AntennaInfoDedicatedSTTI-r15 OPTIONAL, -- Need ON
    pucch-ConfigDedicated-v1530 PUCCH-ConfigDedicated-v1530 OPTIONAL, -- Need ON
    schedulingRequestConfig-v1530 SchedulingRequestConfig-v1530 OPTIONAL, -- Need ON
    uplinkPowerControlDedicatedSTTI-r15 UplinkPowerControlDedicatedSTTI-r15 OPTIONAL, -- Need ON
    cqi-ReportConfig-r15 CQI-ReportConfig-r15 OPTIONAL, -- Need ON
    csi-RS-Config-r15 CSI-RS-Config-r15 OPTIONAL, -- Need ON
    csi-RS-ConfigNZPToReleaseList-r15 CSI-RS-ConfigNZPToReleaseList-r15 OPTIONAL, -- Need ON
    csi-RS-Config2PToReleaseList-r15 CSI-RS-Config2PToReleaseList-r15 OPTIONAL, -- Need ON
    csi-RS-Config2PToAddModList-r11 CSI-RS-Config2PToAddModList-r11 OPTIONAL, -- Need ON
    eimta-MainConfig-r12 EIMTA-MainConfig-r12 OPTIONAL, -- Need ON
    eimta-MainConfigServCell-r15 EIMTA-MainConfigServCell-r15 OPTIONAL, -- Need ON
    semiOpenLoopSTTI-r15 BOOLEAN,
    slotOrSubslotPDSCH-Config-r15 SlotOrSubslotPDSCH-Config-r15 OPTIONAL, -- Need ON
    slotOrSubslotPUSCH-Config-r15 SlotOrSubslotPUSCH-Config-r15 OPTIONAL, -- Need ON
    spdcch-Config-r15 SPDCCH-Config-r15 OPTIONAL, -- Need ON
    spucch-Config-r15 SPUCCH-Config-r15 OPTIONAL, -- Need ON
    srs-DCI7-TrigerConfig-r15 BOOLEAN,
    shortProcessingTime-r15 BOOLEAN,
    shortTTI-r15 ShortTTI-r15 OPTIONAL -- Need ON
  }
}

SoundingRS-AperiodicSet-r14 ::= SEQUENCE{
  srs-CC-SetIndexList-r14 SEQUENCE (SIZE (1..)) OF SRS-CC-SetIndex-r14 OPTIONAL, -- Cond SRS-Trigger-TypeA
  soundingRS-UL-ConfigDedicatedAperiodic-r14 SoundingRS-UL-ConfigDedicatedAperiodic-r10
}

SoundingRS-AperiodicSetUpPtsExt-r14 ::= SEQUENCE{
  srs-CC-SetIndexList-r14 SEQUENCE (SIZE (1..)) OF SRS-CC-SetIndex-r14 OPTIONAL, -- Cond SRS-Trigger-TypeA
}

ShortTTI-r15 ::= SEQUENCE {
  dl-STTI-Length-r15 ShortTTI-Length-r15 OPTIONAL, -- Need OR
  ul-STTI-Length-r15 ShortTTI-Length-r15 OPTIONAL -- Need OR
}

ShortTTI-Length-r15 ::= ENUMERATED {slot, subslot}

-- ASN1STOP
**PhysicalConfigDedicated field descriptions**

**absenceOfAnyOtherTechnology**
Presence of this field indicates absence on a long term basis (e.g. by level of regulation) of any other technology sharing the carrier; absence of this field indicates the potential presence of any other technology sharing the carrier, as specified in TS 36.213 [23].

**additionalSpectrumEmissionPCell**
E-UTRAN does not configure this field in this release of the specification.

**antennaInfo**
A choice is used to indicate whether the antennaInfo is signalled explicitly or set to the default antenna configuration as specified in section 9.2.4.

**blindSlotSubslotPDSCH-Repetitions**
Enables HARQ-less/blind slot or subslot PDSCH repetitions for a UE in a given cell, i.e. back to back slot/subslot PDSCH transmissions for the same transport block. The number of slot/subslot PDSCH transmissions is indicated in the DCI.

**blindSubframePDSCH-Repetitions**
Enables HARQ-less/blind subframe PDSCH repetitions for a UE in a given cell, i.e. back to back PDSCH transmissions for the same transport block. The number of PDSCH transmissions is indicated in the DCI.

**cqi-ShortConfigSCell**
Indicates whether the CSI (CQI/PMI/RI/PTI/CRI) reporting resource configured by cqi-ShortConfigSCell is available upon receiving the SCell activation command for this SCell. E-UTRAN only configures this field when transmission mode 1-8 is configured for the serving cell on this carrier frequency.

**ce-Mode**
Indicates the CE mode as specified in TS 36.213 [23].

**ce-pdsch-pusch-Enhancement-Config**
Activation of new numbers of repetitions for PUSCH and modulation restrictions for PDSCH/PUSCH in CE mode A, see TS 36.212 [22] and TS 36.213 [23].

**csi-RS-Config**
For a serving frequency E-UTRAN does not configure csi-RS-Config (includes zeroTxPowerCSI-RS) when transmission mode 10 is configured for the serving cell on this carrier frequency.

**csi-RS-ConfigNZPToAddModList**
For a serving frequency E-UTRAN configures one or more CSI-RS-ConfigNZP only when transmission mode 9 or 10 is configured for the serving cell on this carrier frequency. For a serving frequency, EUTRAN configures a maximum number of CSI-RS-ConfigNZP in accordance with transmission mode (including CSI processes), eMIMO (including class) and associated UE capabilities (e.g. k-Max, n-MaxList).

**csi-RS-ConfigZP-ApList**
The aperiodic ZP CSI-RS for PDSCH rate matching. The field subframeConfig is applicable to semi-persistent CSI RS reporting. In other cases, the UE shall ignore field subframeConfig.

**csi-RS-ConfigZPToAddModList**
For a serving frequency E-UTRAN configures one or more CSI-RS-ConfigZP only when transmission mode 10 is configured for the serving cell on this carrier frequency.

**dl-STTI-Length, ul-STTI-Length**
Indicates the DL and UL short TTI lengths. Value slot corresponds to 7 OFDM symbols and value subslot corresponds to 2 or 3 OFDM symbols. E-UTRAN configures the same value for all serving cells sending PUCCH feedback on the same cell. If one SCell is configured with short TTI in the group of cells configured to send PUCCH on the same cell, the cell carrying PUCCH shall be configured with short TTI. E-UTRAN can configure different value of dl-STTI-Length and ul-STTI-Length for serving cells sending PUCCH feedback on different cells. E-UTRAN does not configure the combination {slot,subslot} for {DL,UL}.

**eimta-MainConfigPCell, eimta-MainConfigSCell**
If E-UTRAN configures eimta-MainConfigPCell or eimta-MainConfigSCell for one serving cell in a frequency band, E-UTRAN configures eimta-MainConfigPCell or eimta-MainConfigSCell for all serving cells residing on the frequency band. E-UTRAN configures eimta-MainConfigPCell or eimta-MainConfigSCell only if eimta-MainConfig is configured.

**energyDetectionThresholdOffset**
Indicates the offset to the default maximum energy detection threshold value. Unit in dB. Value -13 corresponds to -13dB, value -12 corresponds to -12dB, and so on (i.e. in steps of 1dB) as specified in TS 36.213 [23].

**epdcch-Config**
Indicates the EPDCCH-Config for the cell. E-UTRAN does not configure EPDCCH-Config for an SCell that is configured with value other for schedulingCellInfo in CrossCarrierSchedulingConfig.

**k-max**
Indicates the maximum number of interfering spatial layers signaled in the assistance information for MUST. Value 1 corresponds to 1 layer, Value 3 corresponds to 3 layers.

**laa-PUSCH-Mode1, laa-PUSCH-Mode2, laa-PUSCH-Mode3**
Indicates whether LAA PUSCH mode 1, 2 and/or 3 is configured as specified in TS 36.212 [22], clause 5.3.3.1. A bit-map indicating LAA SCell subframe configuration, "1" denotes that the corresponding subframe is allocated as MBSFN subframe. The bitmap is interpreted as follows:
Starting from the first/leftmost bit in the bitmap, the allocation applies to subframes #1, #2, #3, #4, #6, #7, #8, and #9.
**PhysicalConfigDedicated** field descriptions

**maxEnergyDetectionThreshold**
Indicates the absolute maximum energy detection threshold value. Unit in dBm. Value -85 corresponds to -85 dBm, value -84 corresponds to -84 dBm, and so on (i.e. in steps of 1dBm) as specified in TS 36.213 [23]. If the field is not configured, the UE shall use a default maximum energy detection threshold value as specified in TS 36.213 [23].

**maxNumberOfSlotSubslotPDSCH-Repetitions**
Indicates the maximum number of PDSCH transmissions for slot or subslot PDSCH repetitions.

**maxNumberOfSubframePDSCH-Repetitions**
Indicates the maximum number of PDSCH transmissions for subframe PDSCH repetitions.

**mcs-restrictionSlotSubslotPDSCH-Repetitions**
Indicates the MCS restriction in terms of number of non-addressable MSB in the MCS bit-field for slot or subslot PDSCH repetition applicable when \( k > 1 \).

**mcs-restrictionSubframePDSCH-Repetitions**
Indicates MCS restriction in terms of number of non-addressable MSB in the MCS bit-field for subframe PDSCH repetition applicable when \( k > 1 \).

**numberOfProcesses-SlotSubslotPDSCH-Repetitions**
Indicates the number of HARQ processes for slot/subslot PDSCH repetition applicable when \( k > 1 \) configured per serving cell.

**numberOfProcesses-SubframePDSCH-Repetitions**
Indicates the number of HARQ processes for subframe PDSCH repetition applicable when \( k > 1 \) configured per serving cell.

**p-a-must**
Parameter: \( P_a \), see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

**pdsch-ConfigDedicated-v1130**
For a serving frequency, E-UTRAN configures pdsch-ConfigDedicated-v1130 only when transmission mode 10 is configured for the serving cell on this carrier frequency.

**pdsch-ConfigDedicated-v1280**
For a serving frequency, E-UTRAN configures pdsch-ConfigDedicated-v1280 only when transmission mode 9 or 10 is configured for the serving cell on this carrier frequency.

**pucch-Cell**
If present, PUCCH feedback of this SCell is sent on the PUCCH SCell. If absent, PUCCH feedback of this SCell is sent on PCell or PSCell, or if the cell concerns the PUCCH SCell, on the concerned cell. If this field is not modified upon change of PUCCH SCell, the UE shall always send the PUCCH feedback of the concerned SCell using the configured PUCCH SCell.

**pucch-ConfigDedicated**
E-UTRAN configures pucch-ConfigDedicated-r13 only if pucch-ConfigDedicated (i.e., without suffix) is not configured. UE shall ignore pucch-ConfigDedicated-v1020 when pucch-ConfigDedicated-r13 is configured.

**pucch-SCell**
If present, the concerned SCell is the PUCCH SCell. E-UTRAN only configures this field upon SCell addition i.e. this field is only released when the SCell is released. The field is not applicable for an LAA SCell in this release.

**pusch-ConfigDedicated-r13**
E-UTRAN configures pusch-ConfigDedicated-r13 only if pusch-ConfigDedicated is not configured.

**pusch-ConfigDedicated-v1250**
E-UTRAN configures pusch-ConfigDedicated-v1250 only if tpc-SubframeSet is configured.

**pusch-EnhancementsConfig**
Indicates that the UE shall transmit in the PUSCH enhancement mode if pusch-EnhancementsConfig is set to setup, see TS 36.211 [21] and TS 36.213 [23].

**rv-SlotSubslotPDSCH-Repetitions**
Indicates the RV cycling sequence for slot or subslot PDSCH repetition. Value dirvseq1 = \( \{0, 0, 0, 0\} \) and value dirvseq2 = \( \{0, 2, 3, 1\} \).

**rv-SubframePDSCH-Repetitions**
Indicates the RV cycling sequence for subframe PDSCH repetition. Value dirvseq1 = \( \{0, 0, 0, 0\} \) and value dirvseq2 = \( \{0, 2, 3, 1\} \).

**semiOpenLoop, semiOpenLoopSTTI**
Value TRUE indicates that semi-open-loop transmission is used for deriving CSI reporting and corresponding PDSCH transmission (DMRS).

**semiStaticCFI-SlotSubslotNonMBSFN**
Indicates the semi-static control format indicator for slot/subslot operation in non-MBSFN subframes.

**semiStaticCFI-SlotSubslotMBSFN**
Indicates the semi-static control format indicator for slot/subslot operation in MBSFN subframes.

**semiStaticCFI-SubframeMBSFN**
Indicates the semi-static control format indicator for subframe operation in MBSFN subframes.

**semiStaticCFI-SubframeNonMBSFN**
Indicates the semi-static control format indicator for subframe operation in non-MBSFN subframes.

**shortProcessingTime**
Indicates whether short processing time is configured as specific in TS 36.321 [6]. An SCell can only be configured with short processing if the cell carrying PUCCH for that SCell is configured with short processing time.
<table>
<thead>
<tr>
<th><strong>PhysicalConfigDedicated</strong> field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>soundingRS-UL-PeriodicConfigDedicatedList</strong></td>
</tr>
<tr>
<td>Indicates periodic soundingRS configuration except for the extension sounding symbols of the UpPTs subframe.</td>
</tr>
<tr>
<td><strong>soundingRS-UL-PeriodicConfigDedicatedUpPTsExtList</strong></td>
</tr>
<tr>
<td>Indicates periodic soundingRS configuration in extension sounding symbols of the UpPTs subframe.</td>
</tr>
<tr>
<td><strong>soundingRS-UL-AperiodicConfigDedicatedList</strong></td>
</tr>
<tr>
<td>Indicates aperiodic soundingRS configuration except for the extension sounding symbols of the UpPTs subframe.</td>
</tr>
<tr>
<td><strong>soundingRS-UL-DedicatedApUpPTsExtList</strong></td>
</tr>
<tr>
<td>Indicates aperiodic soundingRS configuration in extension sounding symbols of the UpPTs subframe.</td>
</tr>
<tr>
<td><strong>srs-CC-SetIndexList</strong></td>
</tr>
<tr>
<td>Indicates the srs-CC-SetIndex list which the soundingRS-UL-ConfigDedicatedAperiodic and soundingRS-UL-ConfigDedicatedAperiodicUpPTsExt belongs to.</td>
</tr>
<tr>
<td><strong>srs-DCI7-TriggeringConfig</strong></td>
</tr>
<tr>
<td>Indicates whether SRS triggering via DCI7 is configured.</td>
</tr>
<tr>
<td><strong>subframeStartPosition</strong></td>
</tr>
<tr>
<td>Indicates possible starting positions of transmission in the first subframe of the DL transmission burst, see TS 36.211 [21]. Value $s0$ means the starting position is subframe boundary, $s07$ means the starting position is either subframe boundary or slot boundary.</td>
</tr>
<tr>
<td><strong>tpc-PDCCH-ConfigPUCCH</strong></td>
</tr>
<tr>
<td>PDCCH configuration for power control of PUCCH using format 3/3A, see TS 36.212 [22].</td>
</tr>
<tr>
<td><strong>tpc-PDCCH-ConfigPUSCH</strong></td>
</tr>
<tr>
<td>PDCCH configuration for power control of PUSCH using format 3/3A, see TS 36.212 [22].</td>
</tr>
<tr>
<td><strong>typeA-SRS-TPC-PDCCH-Group</strong></td>
</tr>
<tr>
<td>Indicates Type A trigger configuration for SRS transmission on a PUSCH-less SCell. E-UTRAN configures the UE with either typeA-SRS-TPC-PDCCH-Group or typeB-SRS-TPC-PDCCH-Group, if any.</td>
</tr>
<tr>
<td><strong>uplinkPowerControlDedicated</strong></td>
</tr>
<tr>
<td>E-UTRAN configures uplinkPowerControlDedicated-v1130 only if uplinkPowerControlDedicated (without suffix) is configured.</td>
</tr>
<tr>
<td><strong>uplinkPowerControlDedicatedSCell</strong></td>
</tr>
<tr>
<td>E-UTRAN configures uplinkPowerControlDedicatedSCell-v1130 only if uplinkPowerControlDedicatedSCell-r10 is configured for this serving cell.</td>
</tr>
</tbody>
</table>
### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI-r8</td>
<td>The field is optionally present, need ON, if antennaInfoDedicated-r10 is absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>AI-r10</td>
<td>The field is optionally present, need ON, if antennaInfoDedicated is absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>AperiodicSRS</td>
<td>If soundingRS-UL-ConfigDedicatedAperiodic-r10 is absent, the field is optional, Need ON. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>AperiodicSRSExt</td>
<td>If soundingRS-UL-ConfigDedicatedAperiodicUpPTSExt-r13 is absent, the field is optional, Need ON. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>AUL</td>
<td>The field is optionally present, need ON, if aul-config-r15 is present. Otherwise the field is not present.</td>
</tr>
<tr>
<td>CommonUL</td>
<td>The field is mandatory present if ul-Configuration of RadioResourceConfigCommonSCell-r10 is present; otherwise it is optional, need ON.</td>
</tr>
<tr>
<td>CQI-r8</td>
<td>The field is optionally present, need ON, if cqi-ReportConfig-r10 is absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>CQI-r10</td>
<td>The field is optionally present, need ON, if cqi-ReportConfig is absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Cross-Carrier-Config</td>
<td>The field is optionally present, need ON, if crossCarrierSchedulingConfig-r10 is absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Cross-Carrier-ConfigUL</td>
<td>The field is optionally present, need ON, if crossCarrierSchedulingConfig-r10 and crossCarrierSchedulingConfig-r13 are absent or schedulingCellInfo is set to ‘own’. Otherwise the field is not present.</td>
</tr>
<tr>
<td>PeriodicSRS</td>
<td>If soundingRS-UL-ConfigDedicated-r10 is absent, the field is optional, Need ON. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>PeriodicSRSPCell</td>
<td>If soundingRS-UL-ConfigDedicated is absent, the field is optional, Need ON. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>PeriodicSRSExt</td>
<td>If soundingRS-UL-ConfigDedicatedUpPTSExt-r13 is absent, the field is optional, Need ON. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>PUCCH-Format4or5</td>
<td>The field is mandatory present with pucch-Format-v1370 set to setup if pucch-ConfigDedicated-r13 is configured and pucch-ConfigDedicated-r13 indicates PUCCH format 4 or PUCCH format 5; otherwise it is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>PUCCH-SCell1</td>
<td>The field is optionally present, need OR, for SCell not configured with pucch-configDedicated-r13. Otherwise it is not present.</td>
</tr>
<tr>
<td>PUSCH-SCell</td>
<td>The field is optionally present, need ON, if pusch-ConfigDedicatedSCell-r10 and pusch-ConfigDedicated-v1130 are absent. Otherwise the field is not present.</td>
</tr>
<tr>
<td>PUSCH-SCell1</td>
<td>The field is optionally present, need ON, for SCell not configured with pusch-configDedicated-r13. Otherwise it is not present.</td>
</tr>
<tr>
<td>SCellAdd</td>
<td>The field is mandatory present if cellIdentification is present; otherwise it is optional, need ON.</td>
</tr>
<tr>
<td>SRS-Trigger-TypeA</td>
<td>The field is mandatory present if typeA-SRS-TPC-PDCCH-Group-r14 is present. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

**NOTE 1:** During handover, the UE performs a MAC reset, which involves reverting to the default CQI/ SRS/ SR configuration in accordance with subclause 5.3.13 and TS 36.321 [6, 5.9 & 5.2]. Hence, for these parts of the dedicated radio resource configuration, the default configuration (rather than the configuration used in the source PCell) is used as the basis for the delta signalling that is included in the message used to perform handover.

**NOTE 2:** Since delta signalling is not supported for the common SCell configuration, E-UTRAN can only add or release the uplink of an SCell by releasing and adding the concerned SCell.

---

### P-Max

The IE P-Max is used to limit the UE’s uplink transmission power on a carrier frequency and is used to calculate the parameter Pcompensation defined in TS 36.304 [4]. Corresponds to parameter $P_{EMAX}$ or $P_{MAX}$, in TS 36.101 [42]. The UE transmit power on one serving cell shall not exceed the configured maximum UE output power of the serving cell determined by this value as specified in TS 36.101 [42, 6.2.5 or 6.2.5A] or, when transmitting sidelink discovery announcements within the coverage of the concerned cell, as specified in TS 36.101 [42, 6.2.5D].

**P-Max information element**

---

**ASN1START**
The IE PRACH-ConfigSIB and IE PRACH-Config are used to specify the PRACH configuration in the system information and in the mobility control information, respectively.

**PRACH-Config information elements**

**PRACH-ConfigSIB**

```
PRACH-ConfigSIB ::= SEQUENCE {
  rootSequenceIndex     INTEGER (0..837),
  prach-ConfigInfo     PRACH-ConfigInfo
}
```

**PRACH-ConfigSIB-v1310**

```
PRACH-ConfigSIB-v1310 ::= SEQUENCE {
  rsrp-ThresholdsPrachInfoList-r13  RSRP-ThresholdsPrachInfoList-r13,
  mpdcch-startSF-CSS-RA-r13   CHOICE {
    fdd-r13        ENUMERATED {v1, v1dot5, v2, v2dot5, v4, v5, v8, v10},
    tdd-r13        ENUMERATED {v1, v2, v4, v5, v8, v10, v20, spare}
  }
  prach-HoppingOffset-r13    INTEGER (0..94)      OPTIONAL, -- Cond MP
  prach-ParametersListCE-r13   PRACH-ParametersListCE-r13
}
```

**PRACH-ConfigSIB-v1530**

```
PRACH-ConfigSIB-v1530 ::= SEQUENCE {
  edt-PRACH-ParametersListCE-r15  SEQUENCE (SIZE(1..maxCE-Level-r13)) OF EDT-PRACH-ParametersCE-r15
}
```

**PRACH-Config**

```
PRACH-Config ::= SEQUENCE {
  rootSequenceIndex     INTEGER (0..837),
  prach-ConfigInfo     PRACH-ConfigInfo     OPTIONAL -- Need ON
}
```

**PRACH-Config-v1310**

```
PRACH-Config-v1310 ::= SEQUENCE {
  rsrp-ThresholdsPrachInfoList-r13  RSRP-ThresholdsPrachInfoList-r13  OPTIONAL, -- Cond MP
  mpdcch-startSF-CSS-RA-r13   CHOICE {
    fdd-r13        ENUMERATED {v1, v1dot5, v2, v2dot5, v4, v5, v8, v10},
    tdd-r13        ENUMERATED {v1, v2, v4, v5, v8, v10, v20, spare}
  }
  prach-HoppingOffset-r13    INTEGER (0..94)      OPTIONAL, -- Cond MP
  prach-ParametersListCE-r13   PRACH-ParametersListCE-r13   OPTIONAL, -- Cond MP
  initial-CE-level-r13     INTEGER (0..3)  OPTIONAL -- Need OR
}
```

**PRACH-Config-v1430**

```
PRACH-Config-v1430 ::= SEQUENCE {
  rootSequenceIndexHighSpeed-r14    INTEGER (0..837),
  zeroCorrelationZoneConfigHighSpeed-r14  INTEGER (0..12),
  prach-ConfigIndexHighSpeed-r14    INTEGER (0..63),
  prach-FreqOffsetHighSpeed-r14    INTEGER (0..94)
}
```

**PRACH-ConfigSCell-r10**

```
PRACH-ConfigSCell-r10 ::= SEQUENCE {
  prach-ConfigIndex-r10     INTEGER (0..63)
}
```

**PRACH-ConfigInfo**

```
PRACH-ConfigInfo ::= SEQUENCE {
  prach-ConfigIndex     INTEGER (0..63),
  highSpeedFlag      BOOLEAN,
  zeroCorrelationZoneConfig   INTEGER (0..15),
  prach-FreqOffset     INTEGER (0..94)
}
```

**PRACH-ParametersListCE-r13**

```
PRACH-ParametersListCE-r13 ::= SEQUENCE (SIZE(1..maxCE-Level-r13)) OF PRACH-ParametersCE-r13
```

**PRACH-ParametersCE-r13**

```
PRACH-ParametersCE-r13 ::= SEQUENCE {
  prach-ConfigIndex-r13     INTEGER (0..63),
  prach-FreqOffset-r13      INTEGER (0..94),
  prach-StartingSubframe-r13    ENUMERATED {sf2, sf4, sf8, sf16, sf32, sf64, sf128,
```
maxNumPreambleAttemptCE-r13  ENUMERATED {n3, n4, n5, n6, n7, n8, n10}  OPTIONAL, -- Need OP
numRepetitionPerPreambleAttempt-r13  ENUMERATED {n1,n2,n4,n8,n16,n32,n64,n128},
mpdcch-NarrowbandsToMonitor-r13  SEQUENCE (SIZE(1..2)) OF
  INTEGER (1..maxAvailNarrowBands-r13),
mpdcch-NumRepetition-RA-r13  ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256},
prach-HoppingConfig-r13  ENUMERATED {on,off}
EDT-PRACH-ParametersCE-r15 ::=  SEQUENCE {
edt-PRACH-ParametersCE-r15  SEQUENCE {
  prach-ConfigIndex-r15  INTEGER (0..63),
  prach-FreqOffset-r15  INTEGER (0..94),
  prach-StartingSubframe-r15  ENUMERATED {sf2, sf4, sf8, sf16, sf32, sf64, sf128, sf256}  OPTIONAL, -- Need OP
  mpdcch-NarrowbandsToMonitor-r15  SEQUENCE (SIZE(1..2)) OF INTEGER
  (1..maxAvailNarrowBands-r13)  OPTIONAL -- Need OR
}

RSRP-ThresholdsPrachInfoList-r13 ::= SEQUENCE (SIZE(1..3)) OF RSRP-Range
-- ASN1STOP
**PRACH-Config field descriptions**

**edt-PRACH-ParametersListCE**
Configures PRACH parameters for each CE level applicable to a UE performing EDT. If included, the number of entries is same as number of entries in prach-ParametersListCE. The first entry in the list is the PRACH parameters for CE level 0, the second entry in the list is the PRACH parameters for CE level 1, and so on. The parameters maxNumPreambleAttemptCE, numRepetitionPerPreambleAttempt, mpdcch-NumRepetition-RA, prach-HoppingConfig included in prach-ParametersListCE for CE level X are also applicable for EDT.

**initial-CE-level**
Indicates initial PRACH CE level at random access, see TS 36.321 [6]. If not configured, UE selects PRACH CE level based on measured RSRP level, see TS 36.321 [6].

**highSpeedFlag**
Parameter: High-speed-flag, see TS 36.211 [21, 5.7.2]. TRUE corresponds to Restricted set and FALSE to Unrestricted set.

**maxNumPreambleAttemptCE**
Maximum number of preamble transmission attempts per CE level. See TS 36.321 [6].
If the field is absent, the UE shall use the default value n3.

**mpdcch-NarrowbandsToMonitor**
Narrowbands to monitor for MPDCCH for RAR, see TS 36.213 [23, 6.2]. Field values (1..maxAvailNarrowBands-r13) correspond to narrowband indices (0..[maxAvailNarrowBands-r13-1]) as specified in TS 36.211 [21].

**mpdcch-NumRepetition-RA**
Maximum number of repetitions for MPDCCH common search space (CSS) for RAR, Msg3 and Msg4, see TS 36.211 [21].

**mpdcch-startSF-CSS-RA**
Starting subframe configuration for MPDCCH common search space (CSS), including RAR, Msg3 retransmission, PDSCH with contention resolution and PDSCH with CCCH MAC SDU, see TS 36.211 [21] and TS 36.213 [23]. Value v1 corresponds to 1, value v1dot5 corresponds to 1.5, and so on.

**numRepetitionPerPreambleAttempt**
Number of PRACH repetitions per attempt for each CE level, See TS 36.211 [21].

**prach-ConfigIndex**
Parameter: prach-ConfigurationIndex, see TS 36.211 [21, 5.7.1].

**prach-ConfigIndexHighSpeed**
Parameter: prach-ConfigurationIndexHighSpeed, see TS 36.211 [21, 5.7.1]. If this field is present, the UE shall ignore prach-ConfigIndex.

**prach-FreqOffset**
Parameter: prach-FrequencyOffset, see TS 36.211 [21, 5.7.1]. For TDD the value range is dependent on the value of prach-ConfigIndex.

**prach-FreqOffsetHighSpeed**
Parameter: prach-FrequencyOffsetHighSpeed, see TS 36.211 [21, 5.7.1]. For TDD the value range is dependent on the value of prach-ConfigIndexHighSpeed. If this field is present, the UE shall ignore prach-FreqOffset.

**prach-HoppingConfig**
Coverage level specific frequency hopping configuration for PRACH.

**prach-HoppingOffset**
Parameter: PRACH frequency hopping offset, expressed as a number of resource blocks, see TS 36.211 [21, 5.7.1].

**prach-ParametersListCE**
Configures PRACH parameters for each CE level. The first entry in the list is the PRACH parameters of CE level 0, the second entry in the list is the PRACH parameters of CE level 1, and so on.

**prach-StartingSubframe**
PRACH starting subframe periodicity, expressed in number of subframes available for preamble transmission (PRACH opportunities), see TS 36.211 [21]. Value sf2 corresponds to 2 subframes, sf4 corresponds to 4 subframes and so on. EUTRAN configures the PRACH starting subframe periodicity larger than or equal to the number of PRACH repetitions per attempt for each CE level (numRepetitionPerPreambleAttempt).
If the field is absent, the value is determined implicitly in TS 36.211 [21, 5.7.1].

**rootSequenceIndex**
Parameter: RACH_ROOT_SEQUENCE, see TS 36.211 [21, 5.7.1].

**rootSequenceIndexHighSpeed**
The field indicates starting logical root sequence index used to derive the 64 random access preambles based on restricted set type B in high speed scenario, see TS 36.211 [21, 5.7.2]. If this field is present, the UE shall generate random access preambles based on restricted set type B and ignore rootSequenceIndex.

**rsrp-ThresholdsPrachInfoList**
The criterion for BL UEs and UEs in CE to select PRACH resource set. Up to 3 RSRP threshold values are signalled to determine the CE level for PRACH, see TS 36.213 [23]. The first element corresponds to RSRP threshold 1, the second element corresponds to RSRP threshold 2 and so on, see TS 36.321 [6]. The UE shall ignore this field if only one CE level, i.e. CE level 0, is configured in prach-ParametersListCE. The number of RSRP thresholds present in rsrp-ThresholdsPrachInfoList is equal to the number of CE levels configured in prach-ParametersListCE minus one.
A UE that supports powerClass-14dBm shall correct the RSRP threshold values before applying them as follows: RSRP threshold = Signalled RSRP threshold - min(0, (14-min(23, P-Max))) where P-Max is the value of P-Max field in SystemInformationBlockType1-BR.
**PRACH-Config field descriptions**

**zeroCorrelationZoneConfig**
Parameter: Nₜₚ configuration, see TS 36.211 [21, 5.7.2: table 5.7.2-2] for preamble format 0..3 and TS 36.211 [21, 5.7.2: table 5.7.2-3] for preamble format 4.

**zeroCorrelationZoneConfigHighSpeed**
The field indicates Nₜₚ configuration for the restricted set type B in high speed scenario, see TS 36.211 [21, 5.7.2]. If this field is present, the UE shall generate random access preambles based on restricted set type B and ignore zeroCorrelationZoneConfig.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MP</strong></td>
<td>The field is mandatory present.</td>
</tr>
</tbody>
</table>

**PresenceAntennaPort1**
The IE PresenceAntennaPort1 is used to indicate whether all the neighbouring cells use Antenna Port 1. When set to TRUE, the UE may assume that at least two cell-specific antenna ports are used in all neighbouring cells.

**PresenceAntennaPort1 information element**

```
-- ASN1START
PresenceAntennaPort1 ::=    BOOLEAN
-- ASN1STOP
```

**PUCCH-Config**
The IE PUCCH-ConfigCommon and IE PUCCH-ConfigDedicated are used to specify the common and the UE specific PUCCH configuration respectively.

**PUCCH-Config information elements**

```
-- ASN1START
PUCCH-ConfigCommon ::=    SEQUENCE {
    deltaPUCCH-Shift     ENUMERATED {ds1, ds2, ds3},
    nRB-CQI        INTEGER (0..98),
    nCS-AN        INTEGER (0..7),
    n1PUCCH-AN       INTEGER (0..2047)
}

PUCCH-ConfigCommon-v1310 ::=  SEQUENCE {
    n1PUCCH-AN-InfoList-r13     N1PUCCH-AN-InfoList-r13  OPTIONAL, -- Need OR
    pucch-NumRepetitionCE-Msg4-Level0-r13 ENUMERATED {n1, n2, n4, n8} OPTIONAL, -- Need OR
    pucch-NumRepetitionCE-Msg4-Level1-r13 ENUMERATED {n1, n2, n4, n8} OPTIONAL, -- Need OR
    pucch-NumRepetitionCE-Msg4-Level2-r13 ENUMERATED {n4, n8, n16, n32} OPTIONAL, -- Need OR
    pucch-NumRepetitionCE-Msg4-Level3-r13 ENUMERATED {n4, n8, n16, n32} OPTIONAL -- Need OR
}

PUCCH-ConfigCommon-v1430 ::=  SEQUENCE {
    pucch-NumRepetitionCE-Msg4-Level3-r14 ENUMERATED {n64, n128} OPTIONAL -- Need OR
}

PUCCH-ConfigDedicated ::=   SEQUENCE {
    ackNackRepetition     CHOICE{
        release        NULL,
        setup        SEQUENCE {
            repetitionFactor     ENUMERATED {n2, n4, n6, spare1},
            n1PUCCH-AN-Rep      INTEGER (0..2047)
        }
    },
    tdd-AckNackFeedbackMode    ENUMERATED {bundling, multiplexing} OPTIONAL -- Cond TDD
}

PUCCH-ConfigDedicated-v1020 ::=  SEQUENCE {
    pucch-Format-r10     CHOICE {
        format3-r10      PUCCH-Format3-Conf-r13,
        channelSelection-r10  SEQUENCE {
            }
    }
}
```
n1PUCCH-AN-CS-r10  
release NULL,
setup SEQUENCE {
  n1PUCCH-AN-CS-List-r10 SEQUENCE (SIZE (1..2)) OF N1PUCCH-AN-CS-r10
}
] OPTIONAL -- Need ON
}
}
} OPTIONAL, -- Need OR

twoAntennaPortActivatedPUCCH-Format1alb-r10 ENUMERATED {true} OPTIONAL, -- Need OR
simultaneousPUCCH-PUSCH-r10 ENUMERATED {true} OPTIONAL, -- Need OR
n1PUCCH-AN-RepP1-r10 INTEGER (0..2047) OPTIONAL -- Need OR
}
PUCCH-ConfigDedicated-v1130 ::= SEQUENCE {
n1PUCCH-AN-CS-v1130 CHOICE {
  release NULL,
  setup SEQUENCE {
    n1PUCCH-AN-CS-ListP1-r11 SEQUENCE (SIZE (2..4)) OF INTEGER (0..2047)
  }
}
nPUCCH-Param-r11 CHOICE {
  release NULL,
  setup SEQUENCE {
   nPUCCH-Identity-r11 INTEGER (0..503),
n1PUCCH-AN-r11 INTEGER (0..2047)
  }
}
] OPTIONAL -- Need ON
}
PUCCH-ConfigDedicated-v1250 ::= SEQUENCE {
nkaPUCCH-Param-r12 CHOICE {
  release NULL,
  setup SEQUENCE {
nkaPUCCH-AN-r12 INTEGER (0..2047)
  }
}
}
PUCCH-ConfigDedicated-r13 ::= SEQUENCE {
  --Release 8
  ackNackRepetition-r13 CHOICE{
    release NULL,
    setup SEQUENCE {
      repetitionFactor-r13 ENUMERATED {n2, n4, n6, spare1},
n1PUCCH-AN-Rep-r13 INTEGER (0..2047)
    }
  }
  --Release 10
  pucch-Format-r13 CHOICE {
    format3-r13 SEQUENCE {
      n3PUCCH-AN-List-r13 SEQUENCE (SIZE (1..4)) OF INTEGER (0.549) OPTIONAL, -- Need ON
twoAntennaPortActivatedPUCCH-Format3-r13 CHOICE {
      release NULL,
      setup SEQUENCE {
        n3PUCCH-AN-ListP1-r13 SEQUENCE (SIZE (1..4)) OF INTEGER (0.549)
      }
    }
    channelSelection-r13 SEQUENCE {
      n1PUCCH-AN-CS-r13 CHOICE {
        release NULL,
        setup SEQUENCE {
          n1PUCCH-AN-CS-List-r13 SEQUENCE (SIZE (1..2)) OF N1PUCCH-AN-CS-r10,
n1PUCCH-AN-CS-ListP1-r13 SEQUENCE (SIZE (2..4)) OF INTEGER (0..2047)
        }
      }
    }
    format4-r13 SEQUENCE {
      format4-resourceConfiguration-r13 SEQUENCE (SIZE (4)) OF Format4-resource-r13,
      format4-MultiCSI-resourceConfiguration-r13 Format4-resource-r13 OPTIONAL -- Need OR
    }
    format5-r13 SEQUENCE {
      format5-resourceConfiguration-r13 SEQUENCE (SIZE (4)) OF Format5-resource-r13,
      format5-MultiCSI-resourceConfiguration-r13 Format5-resource-r13 OPTIONAL -- Need OR
    }
  }
}
}}
twoAntennaPortActivatedPUCCH-Format1a1b-r13 ENUMERATED {true} OPTIONAL, -- Need OR
simultaneousPUCCH-PUSCH-r13 ENUMERATED {true} OPTIONAL, -- Need OR
nPUCCH-AN-RepP1-r13 INTEGER (0..2047) OPTIONAL, -- Need OR

--Release 11
nPUCCH-Param-r13 CHOICE {
  release NULL,
  setup SEQUENCE {
    nPUUCCH-Identity-r13 INTEGER (0..503),
    nPUUCCH-AN-r13 INTEGER (0..2047)
  }
}

--Release 12
nkaPUCCH-Param-r13 CHOICE {
  release NULL,
  setup SEQUENCE {
    nkaPUCCH-AN-r13 INTEGER (0..2047)
  }
}

--Release 13
spatialBundlingPUCCH-r13 BOOLEAN,
spatialBundlingPUSCH-r13 BOOLEAN,
harq-TimingTDD-r13 BOOLEAN,
codebooksizeDetermination-r13 ENUMERATED {dai,cc} OPTIONAL, -- Need OR
maximumPayloadCoderate-r13 INTEGER (0..7) OPTIONAL, -- Need OR

pucch-NumRepetitionCE-r13 CHOICE {
  release NULL,
  setup CHOICE {
    modeA SEQUENCE {
      pucch-NumRepetitionCE-format1-r13 ENUMERATED {r1, r2, r4, r8},
      pucch-NumRepetitionCE-format2-r13 ENUMERATED {r1, r2, r4, r8}
    },
    modeB SEQUENCE {
      pucch-NumRepetitionCE-format1-r13 ENUMERATED {r4, r8, r16, r32},
      pucch-NumRepetitionCE-format2-r13 ENUMERATED {r4, r8, r16, r32}
    }
  }
}

PUCCH-ConfigDedicated-v1370 ::= SEQUENCE {
  pucch-Format-v1370 CHOICE {
    release NULL,
    setup PUCCH-Format3-Conf-r13
  }
}

PUCCH-Format3-Conf-r13 ::= SEQUENCE {
  n3PUCCH-AN-List-r13 SEQUENCE (SIZE (1..4)) OF INTEGER (0..549) OPTIONAL, -- Need ON
twoAntennaPortActivatedPUCCH-Format3-r13 CHOICE {
  release NULL,
  setup SEQUENCE {
    n3PUCCH-AN-ListP1-r13 SEQUENCE (SIZE (1..4)) OF INTEGER (0..549)
  }
}

PUCCH-ConfigDedicated-v1430 ::= SEQUENCE {
  pucch-NumRepetitionCE-format1-r14 ENUMERATED (r64,r128) OPTIONAL -- Need OR
}

PUCCH-ConfigDedicated-v1530 ::= SEQUENCE {
  n1PUCCH-AN-SPT-r13 INTEGER (0..2047) OPTIONAL, -- Need OR
codebooksizeDeterminationSTTI-r15 ENUMERATED {dai,cc} OPTIONAL -- Need OR
}

Format4-resource-r13 ::= SEQUENCE {
  startingPRB-format4-r13 INTEGER (0..109),
  numberOfPRB-format4-r13 INTEGER (0..7)
}

Format5-resource-r13 ::= SEQUENCE {
  startingPRB-format5-r13 INTEGER (0..109),
  cdm-index-format5-r13 INTEGER (0..1)
}

N1PUCCH-AN-CS-r10 ::= SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)
N1PUCCH-AN-InfoList-r13 ::= SEQUENCE (SIZE(1..maxCE-Level-r13)) OF INTEGER (0..2047)
-- ASN1STOP
**PUCCH-Config field descriptions**

- **ackNackRepetition**
  Parameter indicates whether ACK/NACK repetition is configured, see TS 36.213 [23, 10.1].

- **cdm-index-format5**
  Parameter \( n_{\text{pc}} \) see TS 36.211 [21, 5.4.2c] for determining PUCCH resource(s) of PUCCH format 5.

- **codebooksizeDetermination, codebooksizeDeterminationSTTI**
  Parameter indicates whether HARQ codebook size is determined with downlink assignment indicator based solution or number of configured CCs, see TS 36.212 [22, 5.2.2.6, 5.2.3.1 and 5.3.3.1.2] and TS 36.213 [23, 10.1.2.2.3, 10.1.3.2.3.1, 10.1.3.2.3.2 and 10.1.3.2.4].

- **deltaPUCCH-Shift**
  Parameter: \( \Delta_{\text{PUCCH,shift}} \), see TS 36.211 [21, 5.4.1], where \( ds_1 \) corresponds to value 1, \( ds_2 \) corresponds to value 2 etc.

- **harq-TimingTDD**
  Parameter indicates for a TDD SCell when aggregated with a TDD PCell of different UL/DL configurations whether deriving the HARQ timing for such a cell is done in the same way as the DL HARQ timing of an FDD SCell with a TDD PCell, see TS 36.213 [23, 10.2].

- **maximumPayloadCoderate**
  Maximum payload or code rate for multi P-CSI on each PUCCH resource, see TS 36.213 [23, 10.1.1].

- **n1PUCCH-AN**
  Parameter: \( N_{\text{PUCCH}}^{(1)} \), see TS 36.213 [23, 10.1].

- **n1PUCCH-AN-r11**
  Parameter: \( n_{\text{PUCCH,AN}}^{(1)} \) indicates UE-specific PUCCH AN resource offset, see TS 36.213 [23, 10.1].

- **n1PUCCH-AN-CS-List**
  Parameter: \( n_{\text{PUCCH,CS}}^{(1)} \) for antenna port \( p_0 \) for PUCCH format 1b with channel selection, see TS 36.213 [23, 10.1.2.2.1, 10.1.3.2.1].

- **n1PUCCH-AN-CS-ListP1**
  Parameter: \( n_{\text{PUCCH,CS}}^{(1)} \) for antenna port \( p_1 \) for PUCCH format 1b with channel selection, see TS 36.213 [23, 10.1.1]. E-UTRAN configures this field only when \( \text{pucch-Format} \) is set to \( \text{channelSelection} \).

- **n1PUCCH-AN-Rep, n1PUCCH-AN-RepP1**
  Parameter: \( n_{\text{PUCCH,ANRep}}^{(1)} \) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1].

- **n3PUCCH-AN-List, n3PUCCH-AN-ListP1**
  Parameter: \( n_{\text{PUCCH,AN}}^{(3)} \) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1].

- **n1PUCCH-AN-SPT**
  Parameter: \( N_{\text{PUCCH}}^{(1)} \), see TS 36.213 [23], clause 10.1. Indicates UE-specific PUCCH AN resource offset for short processing time.

- **nCS-An**
  Parameter: \( N_{\text{CS}}^{(1)} \), see TS 36.211 [21, 5.4].

- **nkaPUCCH-AN**
  Parameter: \( N_{\text{PUCCH}}^{(k)} \), see TS 36.213 [23, 10.1.3].

- **nkaPUCCH-AN-r12**
  Parameter: \( n_{\text{PUCCH,ANr12}}^{(k)} \) for the subframe set \( K^A \), see TS 36.213 [23, 10.1.3]. E-UTRAN configures \( n_{\text{kaPUCCH-AN}}^{(k)} \) only if \( \text{eimta-MainConfig} \) is configured.

- **nPUCCH-Identity**
  Parameter: \( n_{\text{PUCCH}}^{(m)} \), see TS 36.211 [21, 5.5.1.5].

- **nRB-CQI**
  Parameter: \( N_{\text{RB}}^{(2)} \), see TS 36.211 [21, 5.4].

- **numberOfPRB-format4**
  Parameter: \( n_{\text{PUCCH}}^{(4)} \) see TS 36.213 [23, Table 10.1.1-2] for determining PUCCH resource(s) of PUCCH format 4.

- **n1PUCCH-AN-InfoList**
  Starting offsets of the PUCCH resource(s) indicated by SIB1-BR. The first entry in the list is the starting offset of the PUCCH resource(s) of CE level 0, the second entry in the list is the starting offset of the PUCCH resource(s) of CE level 1, and so on. If E-UTRAN includes \( n_{\text{1PUCCH-AN-InfoList}} \), it includes the same number of entries as in \( \text{prach-ParametersListCE} \). See TS 36.213 [23].

- **pucch-Format**
  Parameter indicates one of the PUCCH formats for transmission of HARQ-ACK, see TS 36.213 [23, 10.1]. For TDD, if the UE is configured with PCell only, the \( \text{channelSelection} \) indicates the transmission of HARQ-ACK multiplexing as defined in Tables 10.1.3-5, 10.1.3-6, and 10.1.3-7 in TS 36.213 [23] for PUCCH, and in 7.3 in TS 36.213 [23] for PUSCH. E-UTRAN only configures \( \text{pucch-Format-v1370} \) when \( \text{pucch-Format-r13} \) is configured and set to \( \text{format4} \) or \( \text{format5} \).
PUCCH-Config field descriptions

**pucch-NumRepetitionCE**
Number of PUCCH repetitions for PUCCH format 1/1a and for PUCCH format 2/2a/2b for CE modes A and B, see TS 36.211 [21] and TS 36.213 [23]. The UE shall ignore *pucch-NumRepetitionCE-format1-r13*, if received, for CE mode B in this release of specification. For UE in CE mode B supporting extended PUCCH repetition, if *pucch-NumRepetitionCE-format1-r14* is included then the UE shall ignore *pucch-NumRepetitionCE-format1-r13*.

**pucch-NumRepetitionCE-Msg4-Level0**, **pucch-NumRepetitionCE-Msg4-Level1**, **pucch-NumRepetitionCE-Msg4-Level2**, **pucch-NumRepetitionCE-Msg4-Level3**
Number of repetitions for PUCCH carrying HARQ response to PDSCH containing Msg4 for PRACH CE levels 0, 1, 2 and 3, see TS 36.211 [21] and TS 36.213 [23]. Value n1 corresponds to 1 repetition, value n2 corresponds to 2 repetitions, and so on. For BL UEs or non-BL UEs in enhanced coverage supporting extended PUCCH repetition, if *pucch-NumRepetitionCE-Msg4-Level3-r14* is included then the UE shall ignore *pucch-NumRepetitionCE-Msg4-Level3-r13*.

**repetitionFactor**
Parameter $N_{ANRP}$ see TS 36.213 [23, 10.1] where n2 corresponds to repetition factor 2, n4 to 4.

**simultaneousPUCCH-PUSCH**
Parameter indicates whether simultaneous PUCCH and PUSCH or simultaneous SPUCCH and SlotOrSubslotPUSCH transmissions are configured, see TS 36.213 [23, 10.1 and 5.1.1]. E-UTRAN configures this field for the PCell, only when the *nonContiguousUL-RA-WithinCC-Info* is set to supported in the band on which PCell is configured. Likewise, E-UTRAN configures this field for the PSCell, only when the *nonContiguousUL-RA-WithinCC-Info* is set to supported in the band on which PSCell is configured. Likewise, E-UTRAN configures this field for the PUCCH SCell, only when the *nonContiguousUL-RA-WithinCC-Info* is set to supported in the band on which PUCCH SCell is configured.

**spatialBundlingPUCCH**
Parameter indicates whether spatial bundling is enabled or not for PUCCH, see TS 36.212 [22, 5.2.3.1].

**spatialBundlingPUSCH**
Parameter indicates whether spatial bundling is enabled or not for PUSCH, see see TS 36.212 [22, 5.2.2.6].

**startingPRB-format4**
Parameter $n_{PUCCH}^{(4)}$ see TS 36.211 [21, 5.4.3] for determining PUCCH resource(s) of PUCCH format 4.

**startingPRB-format5**
Parameter $n_{PUCCH}^{(5)}$ see TS 36.211 [21, 5.4.3] for determining PUCCH resource(s) of PUCCH format 5.

**tdd-AckNackFeedbackMode**
Parameter indicates one of the TDD ACK/NACK feedback modes used, see TS 36.213 [23, 7.3 and 10.1.3]. The value bundling corresponds to use of ACK/NACK bundling whereas, the value multiplexing corresponds to ACK/NACK multiplexing as defined in Tables 10.1.3-2, 10.1.3-3, and 10.1.3-4 in TS 36.213 [23]. The same value applies to both ACK/NACK feedback modes on PUCCH as well as on PUSCH.

**twoAntennaPortActivatedPUCCH-Format1a1b**
Indicates whether two antenna ports are configured for PUCCH format 1a/1b for HARQ-ACK, see TS 36.213 [23, 10.1]. The field also applies for PUCCH format 1a/1b transmission when format3 is configured, see TS 36.213 [23, 10.1.2.2.2, 10.1.3.2.2].

**twoAntennaPortActivatedPUCCH-Format3**
Indicates whether two antenna ports are configured for PUCCH format 3 for HARQ-ACK, see TS 36.213 [23, 10.1].

---

**PUSCH-Config**

The IE *PUSCH-ConfigCommon* is used to specify the common PUSCH configuration and the reference signal configuration for PUSCH and PUCCH. The IE *PUSCH-ConfigDedicated* is used to specify the UE specific PUSCH configuration.

**PUSCH-Config information element**
ul-ReferenceSignalsPUSCH

PUSCH-ConfigCommon-v1270 ::= SEQUENCE {
    enable64QAM-v1270 ENUMERATED {true}
}

PUSCH-ConfigCommon-v1310 ::= SEQUENCE {
    pusch-maxNumRepetitionCEmodeA-r13 ENUMERATED {r8, r16, r32 } OPTIONAL, -- Need OR
    pusch-maxNumRepetitionCEmodeB-r13 ENUMERATED {r192, r256, r384, r512, r768, r1024,
                                                  r1536, r2048} OPTIONAL, -- Need OR
    pusch-HoppingOffset-v1310 INTEGER {1..maxAvailNrNarrowBands-r13} OPTIONAL -- Need OR
}

PUSCH-ConfigDedicated ::= SEQUENCE {
    betaOffset-ACK-Index INTEGER (0..15),
    betaOffset-RI-Index INTEGER (0..15),
    betaOffset-CQI-Index INTEGER (0..15)
}

PUSCH-ConfigDedicated-v1020 ::= SEQUENCE {
    betaOffsetMC-r10 SEQUENCE {
        betaOffset-ACK-Index-MC-r10 INTEGER (0..15),
        betaOffset-RI-Index-MC-r10 INTEGER (0..15),
        betaOffset-CQI-Index-MC-r10 INTEGER (0..15)
    } OPTIONAL, -- Need OR
    groupHoppingDisabled-r10 ENUMERATED {true} OPTIONAL, -- Need OR
dmrs-WithOCC-Activated-r10 ENUMERATED {true} OPTIONAL -- Need OR
}

PUSCH-ConfigDedicated-v1130 ::= SEQUENCE {
    pusch-DMRS-r11 CHOICE {
        release NULL,
        setup SEQUENCE {
           nPUSCH-Identity-r11 INTEGER (0..509),
            nDMRS-CSH-Identity-r11 INTEGER (0..509)
        }
    }
}

PUSCH-ConfigDedicated-v1250 ::= SEQUENCE {
    uciOnPUSCH CHOICE {
        release NULL,
        setup SEQUENCE {
            betaOffset-ACK-Index-SubframeSet2-r12 INTEGER (0..15),
            betaOffset-RI-Index-SubframeSet2-r12 INTEGER (0..15),
            betaOffset-CQI-Index-SubframeSet2-r12 INTEGER (0..15),
            betaOffsetMC-r12 SEQUENCE {
                betaOffset-ACK-Index-MC-SubframeSet2-r12 INTEGER (0..15),
                betaOffset-RI-Index-MC-SubframeSet2-r12 INTEGER (0..15),
                betaOffset-CQI-Index-MC-SubframeSet2-r12 INTEGER (0..15)
            } OPTIONAL -- Need OR
        }
    }
}

PUSCH-ConfigDedicated-r13 ::= SEQUENCE {
    betaOffset-ACK-Index-r13 INTEGER (0..15),
    betaOffset2-ACK-Index-r13 INTEGER (0..15) OPTIONAL, -- Need OR
    betaOffset-RI-Index-r13 INTEGER (0..15),
    betaOffset-CQI-Index-r13 INTEGER (0..15),
    betaOffsetMC-r13 SEQUENCE {
        betaOffset-ACK-Index-MC-r13 INTEGER (0..15),
        betaOffset2-ACK-Index-MC-r13 INTEGER (0..15) OPTIONAL, -- Need OR
        betaOffset-RI-Index-MC-r13 INTEGER (0..15),
        betaOffset-CQI-Index-MC-r13 INTEGER (0..15)
    } OPTIONAL, -- Need OR
groupHoppingDisabled-r13 ENUMERATED {true} OPTIONAL, -- Need OR
dmrs-WithOCC-Activated-r13 ENUMERATED {true} OPTIONAL, -- Need OR
    pusch-DMRS-r11 CHOICE {
        release NULL,
        setup SEQUENCE {
           nPUSCH-Identity-r13 INTEGER (0..509),
            nDMRS-CSH-Identity-r13 INTEGER (0..509)
        } OPTIONAL, -- Need ON
    }
}
uciOnPUSCH  CHOICE {
release         NULL,
setup          SEQUENCE {
  betaOffset-ACK-Index-SubframeSet2-r13 INTEGER (0..15),
  betaOffset2-ACK-Index-SubframeSet2-r13 INTEGER (0..15) OPTIONAL, -- Need OR
  betaOffset-RI-Index-SubframeSet2-r13 INTEGER (0..15),
  betaOffset-CQI-Index-SubframeSet2-r13 INTEGER (0..15),
  betaOffsetMC-r12      SEQUENCE {
    betaOffset-ACK-Index-MC-SubframeSet2-r13 INTEGER (0..15),
    betaOffset2-ACK-Index-MC-SubframeSet2-r13 INTEGER (0..15) OPTIONAL, -- Need OR
    betaOffset-RI-Index-MC-SubframeSet2-r13  INTEGER (0..15),
    betaOffset-CQI-Index-MC-SubframeSet2-r13 INTEGER (0..15) OPTIONAL -- Need OR
  } OPTIONAL -- Need OR

  pusch-HoppingConfig-r13     ENUMERATED {on} OPTIONAL -- Need OR
}

PUSCH-ConfigDedicated-v1430 ::=  SEQUENCE {
  ce-PUSCH-NB-MaxTBS-r14     ENUMERATED {on} OPTIONAL, -- Need OR
  ce-PUSCH-MaxBandwidth-r14    ENUMERATED {bw5} OPTIONAL, --Need OR
  tdd-PUSCH-UpPTS-r14      TDD-PUSCH-UpPTS-r14 OPTIONAL, -- Need ON
  ui-DMRS-IFDMA-r14      BOOLEAN,
  enable256QAM-r14      Enable256QAM-r14 OPTIONAL -- Need ON
}

PUSCH-ConfigDedicated-v1530 ::=  SEQUENCE {
  ce-PUSCH-FlexibleStartPRB-AllocConfig-r15  CHOICE {
release        NULL,
setup        SEQUENCE {
  offsetCE-ModeB-r15   INTEGER (-1..3) OPTIONAL -- Cond CE-ModeB
}
},
  ce-PUSCH-SubPRB-Config-r15  CHOICE {
release        NULL,
setup        SEQUENCE {
  locationCE-ModeB-r15   INTEGER (0..5) OPTIONAL, -- Cond CE-ModeB
  sixToneCyclicShift-r15  INTEGER (0..3),
  threeToneCyclicShift-r15  INTEGER (0..2)
}
} OPTIONAL -- Need ON

PUSCH-ConfigDedicatedSCell-r10 ::=  SEQUENCE {
  groupHoppingDisabled-r10    ENUMERATED {true} OPTIONAL, -- Need OR
  dmrs-WithOCC-Activated-r10    ENUMERATED {true} OPTIONAL -- Need OR
}

PUSCH-ConfigDedicatedSCell-v1430 ::=  SEQUENCE {
  enable256QAM-r14      Enable256QAM-r14 OPTIONAL -- Need OR
}

PUSCH-ConfigDedicatedSCell-v1530 ::=  SEQUENCE {
  uci-OnPUSCH-r15  CHOICE {
release        NULL,
setup        SEQUENCE {
  betaOffsetAUL-r15      INTEGER (0..15)
}
}

TDD-PUSCH-UpPTS-r14 ::=  CHOICE {
release        NULL,
setup        SEQUENCE {
  symPUSCH-UpPTS-r14      ENUMERATED {sym1, sym2, sym3, sym4, sym5, sym6} OPTIONAL, -- Need ON
  dmrs-LessUpPTS-Config-r14    ENUMERATED {true} OPTIONAL -- Need OR
}

Enable256QAM-r14 ::=  CHOICE {
release        NULL,
setup        CHOICE {
  tpc-SubframeSet-Configured-r14      SEQUENCE {
    subframeSet1-DCI-Format0-r14 BOOLEAN,
    subframeSet1-DCI-Format4-r14 BOOLEAN,
    subframeSet2-DCI-Format0-r14 BOOLEAN,
    subframeSet2-DCI-Format4-r14 BOOLEAN
  }
}

tpc-SubframeSet-NotConfigured-r14 SEQUENCE {
  dci-Format0-r14 BOOLEAN,
  dci-Format4-r14 BOOLEAN
}

PUSCH-EnhancementsConfig-r14 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    pusch-HoppingOffsetPUSCH-Enh-r14 INTEGER (1..100) OPTIONAL, -- Need ON
    interval-ULHoppingPUSCH-Enh-r14 CHOICE {
      interval-FDD-PUSCH-Enh-r14 ENUMERATED {int1, int2, int4, int8},
      interval-TDD-PUSCH-Enh-r14 ENUMERATED {int1, int5, int10, int20}
    } OPTIONAL -- Need ON
  }
}

UL-ReferenceSignalsPUSCH ::= SEQUENCE {
  groupHoppingEnabled BOOLEAN,
  groupAssignmentPUSCH INTEGER (0..29),
  sequenceHoppingEnabled BOOLEAN,
  cyclicShift INTEGER (0..7)
}

-- ASN1STOP
**PUSCH-Config field descriptions**


  Parameter: \( \beta_{\text{offset}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-1]. \( \beta_{\text{offset}} \) and betaOffset2-ACK-INDEX-MC are used for single-codeword and betaOffset-ACK-INDEX-MC and betaOffset2-ACK-INDEX-MC are used for multiple-codeword. If betaOffset2-ACK-INDEX-MC is configured; betaOffset-ACK-INDEX is used when up to 22 HARQ-ACK bits are transmitted otherwise betaOffset2-ACK-INDEX is used. If betaOffset2-ACK-INDEX-MC is configured; betaOffset-ACK-INDEX-MC is used when up to 22 HARQ-ACK bits are transmitted otherwise betaOffset2-ACK-INDEX-MC is used. One value applies for all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send PUCCH on the same cell in case PUCCH SCell is configured) and configured with uplink power control subframe sets. The same value also applies for subframe set 1 of all serving cells with an uplink in that cell group and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell).


  Parameter: \( \beta_{\text{offset}, \text{set2}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-1]. betaOffset-ACK-Index-SubframeSet2 and betaOffset2-ACK-Index-SubframeSet2 are used for single-codeword, betaOffset-ACK-INDEX-MC-SubframeSet2, betaOffset2-ACK-INDEX-MC-SubframeSet2 are used for multiple-codeword. If betaOffset2-ACK-INDEX-SubframeSet2 is configured; betaOffset-ACK-INDEX-SubframeSet2 is used when up to 22 HARQ-ACK bits are transmitted otherwise betaOffset2-ACK-INDEX-SubframeSet2 is used. If betaOffset2-ACK-INDEX-MC-SubframeSet2 is configured; betaOffset-ACK-INDEX-MC-SubframeSet2 is used when up to 22 HARQ-ACK bits are transmitted otherwise betaOffset2-ACK-INDEX-MC-SubframeSet2 is used. One value applies for subframe set 2 of all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send PUCCH on the same cell in case PUCCH SCell is configured) and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell configured with uplink power control subframe sets).

- **betaOffsetAUL**

  Parameter: \( \beta_{\text{offsetAUL}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, clause 8.6.3].

- **betaOffset-CQI-Index**, betaOffset-CQI-Index-MC

  Parameter: \( \beta_{\text{offset}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-3]. One value applies for all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send PUCCH on the same cell in case PUCCH SCell is configured) and not configured with uplink power control subframe sets. The same value also applies for subframe set 1 of all serving cells with an uplink in that cell group and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell).

- **betaOffset-CQI-Index-SubframeSet2**, betaOffset-CQI-Index-MC-SubframeSet2

  Parameter: \( \beta_{\text{offset}, \text{set2}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-3]. One value applies for subframe set 2 of all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send PUCCH on the same cell in case PUCCH SCell is configured) and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell configured with uplink power control subframe sets).

- **betaOffset-Ri-Index**, betaOffset-Ri-Index-MC

  Parameter: \( \beta_{\text{offset}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-2]. One value applies for all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send PUCCH on the same cell in case PUCCH SCell is configured) and not configured with uplink power control subframe sets. The same value also applies for subframe set 1 of all serving cells with an uplink in that cell group and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell).

- **betaOffset-Ri-Index-SubframeSet2**, betaOffset-Ri-Index-MC-SubframeSet2

  Parameter: \( \beta_{\text{offset}, \text{set2}} \), for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-2]. One value applies for subframe set 2 of all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send PUCCH on the same cell in case PUCCH SCell is configured) and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell configured with uplink power control subframe sets).

- **ce-PUSCH-FlexibleStartPRB-AllocConfig**

  Activation of flexible starting PRB for PUSCH resource allocation in CE mode A or B. offsetCE-ModeB indicates starting PRB offset when flexible starting PRB for PUSCH resource allocation in CE mode B is enabled. See TS 36.212 [22] and TS 36.213 [23].
**PUSCH-Config field descriptions**

**ce-PUSCH-MaxBandwidth**
Maximum PUSCH channel bandwidth in CE mode A, see TS 36.212 [22] and TS 36.213 [23]. Value bw5 corresponds to 5 MHz. If this field is not configured, the maximum PUSCH channel bandwidth in CE mode A set to 1.4 MHz. The maximum PUSCH channel bandwidth in CE mode B is 1.4 MHz regardless of the setting of this parameter. Parameter: transmission bandwidth configuration, see TS 36.101 [42, table 5.6-1].

**ce-PUSCH-NB-MaxTBS**
Activation of 2984 bits maximum PUSCH TBS in 1.4 MHz in CE mode A, see TS 36.212 [22] and TS 36.213 [23].

**ce-PUSCH-SubPRB-Config**
Activation of PUSCH sub-PRB allocation in CE mode A or B, see TS 36.211 [21], TS 36.212 [22] and TS 36.213 [23].

**cyclicShift**
Parameters: cyclicShift, see TS 36.211 [21, Table 5.5.2.1.1-2].

**dmrs-LessUpPTS-Config**
Indicates the UE not to transmit DMRS for PUSCH in UpPTS, see TS36.211 [21, 5.5.2.1.2].

**dmrs-WithOCC-Activated**
Parameter: Activate-DMRS-with OCC, see TS 36.211 [21, 5.5.2.1].

**enable256QAM**
See TS 36.213 [23, 8.6.1]. If enable256QAM is included and if uplink power control subframe sets are configured by tpc-SubframeSet, the field indicates (if set to TRUE) per uplink power control subframe set and DCI format 0/0A/0B and 4/4A/4B that 256QAM is allowed for UE UL categories 16 to 20 indicated in ue-CategoryUL-v1430, while FALSE indicates that 256QAM is not allowed. If enable256QAM is included and if uplink power control subframe sets are not configured by tpc-SubframeSet, the field indicates (if set to TRUE) per DCI format 0/0A/0B and 4/4A/4B that 256QAM is allowed for UE UL categories 16 to 20 indicated in ue-CategoryUL-v1430, while FALSE indicates that 256 QAM is not allowed.

**enable64QAM**
See TS 36.213 [23, 8.6.1]. If enable64QAM (without suffix) is set to TRUE, it indicates that 64QAM is allowed for UE categories 5 and 8 indicated in ue-Category and UL categories indicated in ue-CategoryUL which support UL 64QAM and can fallback to category 5 or 8, see TS 36.306 [5, Table 4.1A-2 and Table 4.1A-6], while FALSE indicates that 64QAM is not allowed. If enable64QAM-v1270 is set to TRUE, it indicates that 64QAM is allowed for UE categories 5 and 8 indicated in ue-CategoryUL-v1430, while FALSE indicates that 256 QAM is not allowed.

**interval-ULHoppingPUSCH-Enh**
Number of consecutive absolute subframes over which PUSCH stays at the same PRBs before hopping to other PRBs. For interval-FDD-PUSCH-Enh, int1 corresponds to 1 subframe, int2 corresponds to 2 subframes, and so on. For interval-TDD-PUSCH-Enh, int1 corresponds to 1 subframe, int5 corresponds to 5 subframes, and so on. See TS 36.211 [21, 5.3.4].

**groupAssignmentPUSCH**
Parameter: ΔSS See TS 36.211 [21, 5.5.1.3].

**groupHoppingDisabled**
Parameter: Disable-sequence-group-hopping, see TS 36.211 [21, 5.5.1.3].

**groupHoppingEnabled**
Parameter: Group-hopping-enabled, see TS 36.211 [21, 5.5.1.3].

**hoppingMode**
Parameter: Hopping-mode, see TS 36.211 [21, 5.3.4].

**locationCE-ModeB**
PRB location within the narrowband when PUSCH sub-PRB allocation is enabled in CE mode B.

**nDMRS-CSH-Identity**
Parameter: $N_{ID}^{DMRS}$, see TS 36.211 [21, 5.5.2.1.1].

**nPUSCH-Identity**
Parameter: $N_{ID}^{PUSCH}$, see TS 36.211 [21, 5.5.1.5].

**n-SB**
Parameter: $N_{SB}$ see TS 36.211 [21, 5.3.4].

**pusch-HoppingConfig**
For BL UEs and UEs in CE, frequency hopping activation/deactivation for unicast PUSCH, see TS 36.211 [21]

**pusch-HoppingOffset**
Except for BL UEs and UEs in CE, parameter: $N_{HO}^{RB}$, see TS 36.211 [21, 5.3.4]. For BL UEs and UEs in CE, the pusch-hoppingOffset-v1310 indicates the parameter $N_{HO}^{RB}$, see TS 36.211 [21, 5.3.4]. In case pusch-hoppingOffset-v1310 is signalled, the BL UEs and UEs in CE shall ignore pusch-hoppingOffset (i.e. without suffix).

**pusch-HoppingOffsetPUSCH-Enh**
Indicates the frequency domain hopping offset between PRBs for PUSCH in frequency hopping, see TS 36.211 [21, 5.3.4]. Value 1 corresponds to 1 PRB, value 2 corresponds to 2 PRBs, and so on.
**PUSCH-Config field descriptions**

**pusch-maxNumRepetitionCEmodeA**
Maximum value to indicate the set of PUSCH repetition numbers for CE mode A, see TS 36.211 [21] and TS 36.213 [23]. E-UTRAN does not configure value r8. If the field is not configured, the UE shall apply the default value as defined in TS 36.213 [23, 8.0].

**pusch-maxNumRepetitionCEmodeB**
Maximum value to indicate the set of PUSCH repetition numbers for CE mode B, see TS 36.211 [21] and TS 36.213 [23].

**sequenceHoppingEnabled**
Parameter: Sequence-hopping-enabled, see TS 36.211 [21, 5.5.1.4].

**sixToneCyclicShift, threeToneCyclicShift**
Cyclic shift for PUSCH reference signal sequence of six/three subcarriers in CE mode A or B.

**symPUSCH-UpPTS**
Indicates the number of data symbols that configured for PUSCH transmission in UpPTS. Values sym2, sym3, sym4, sym5 and sym6 can be used for normal cyclic prefix and values sym1, sym2, sym3, sym4 and sym5 can be used for extended cyclic prefix, see TS 36.213 [23, 8.6.2] and TS 36.211 [21, 5.3.4].

**ul-DMRS-IFDMA**
Value TRUE indicates that the UE is configured with enhanced UL DMRS.

**ul-ReferenceSignalsPUSCH**
Used to specify parameters needed for the transmission on PUSCH (or PUCCH).

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE-ModeB</td>
<td>The field is optionally present, need ON, for CE Mode B. Otherwise, the field is not present.</td>
</tr>
</tbody>
</table>

---

**RACH-ConfigCommon**

The IE **RACH-ConfigCommon** is used to specify the generic random access parameters.

**RACH-ConfigCommon information element**

```asn1
-- ASN1START
RACH-ConfigCommon ::= SEQUENCE {
    preambleInfo SEQUENCE {
        numberOfRA-Preambles ENUMERATED {
            n4, n8, n12, n16, n20, n24, n28,
            n32, n36, n40, n44, n48, n52, n56,
            n60, n64},
        preamblesGroupAConfig SEQUENCE {
            sizeOfRA-PreamblesGroupA ENUMERATED {
                n4, n8, n12, n16, n20, n24, n28,
                n32, n36, n40, n44, n48, n52, n56,
                n60},
            messageSizeGroupA ENUMERATED {b56, b144, b208, b256},
            messagePowerOffsetGroupB ENUMERATED {
                minusinfinity, dB0, dB5, dB8, dB10, dB12,
                dB15, dB18},
            ... OPTIONAL -- Need OP
        },
        powerRampingParameters PowerRampingParameters,
        ra-SupervisionInfo SEQUENCE {
            preambleTransMax PreambleTransMax,
            ra-ResponseWindowSize ENUMERATED {
                sf2, sf3, sf4, sf5, sf6, sf7,
                sf8, sf10},
            mac-ContentionResolutionTimer ENUMERATED {
                sf8, sf16, sf24, sf32, sf40, sf48,
                sf56, sf64}
        },
        maxHARQ-Msg3Tx INTEGER (1..8),
    } OPTIONAL -- Need OP
},
maxHARQ-Msg3Tx INTEGER (1..8),
... [[ preambleTransMax-CE-r13 PreambleTransMax OPTIONAL, -- Need OR
    rach-CE-LevelInfoList-r13 RACH-CE-LevelInfoList-r13 OPTIONAL -- Need OR
    ]],
[ [ edt-SmallTBS-Subset-r15 ENUMERATED {true} OPTIONAL -- Cond
    EDT-OR
    ]]
} -- ASN1END
```
RACH-ConfigCommon-v1250 ::= SEQUENCE {
  txFailParams-r12  SEQUENCE {
    connEstFailCount-r12 ENUMERATED {n1, n2, n3, n4},
    connEstFailOffsetValidity-r12 ENUMERATED {s30, s60, s120, s240, s300, s420, s600, s900},
    connEstFailOffset-r12 INTEGER (0..15) OPTIONAL -- Need OP
  }
}

RACH-ConfigCommonSCell-r11 ::= SEQUENCE {
  powerRampingParameters-r11 PowerRampingParameters,
  ra-SupervisionInfo-r11 SEQUENCE {
    preambleTransMax-r11 PreambleTransMax
  },
  ...
}

RACH-CE-LevelInfoList-r13 ::= SEQUENCE (SIZE (1..maxCE-Level-r13)) OF RACH-CE-LevelInfo-r13

RACH-CE-LevelInfo-r13 ::= SEQUENCE {
  preambleMappingInfo-r13 SEQUENCE {
    firstPreamble-r13 INTEGER (0..63),
    lastPreamble-r13 INTEGER (0..63)
  },
  ra-ResponseWindowSize-r13 ENUMERATED {sf20, sf50, sf80, sf120, sf180, sf240, sf320, sf400},
  mac-ContentionResolutionTimer-r13 ENUMERATED {sf80, sf100, sf120, sf160, sf200, sf240, sf480, sf960},
  rar-HoppingConfig-r13 ENUMERATED {on, off},
  [[
    edt-Parameters-r15 SEQUENCE {
      edt-LastPreamble-r15 INTEGER (0..63),
      edt-SmallTBS-Enabled-r15 BOOLEAN,
      edt-TBS-r15 ENUMERATED {b328, b408, b504, b600, b712, b808, b936, b1000or456},
      mac-ContentionResolutionTimer-r15 ENUMERATED {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240}
    } OPTIONAL -- Need OP
  ]} OPTIONAL -- Cond EDT
}

PowerRampingParameters ::= SEQUENCE {
  powerRampingStep ENUMERATED {dB0, dB2, dB4, dB6},
  preambleInitialReceivedTargetPower ENUMERATED {
    dBm-120, dBm-118, dBm-116, dBm-114, dBm-112,
    dBm-110, dBm-108, dBm-106, dBm-104, dBm-102, dBm-100, dBm-98, dBm-96, dBm-94, dBm-92, dBm-90}
}

PreambleTransMax ::= ENUMERATED {
  n3, n4, n5, n6, n7, n8, n10, n20, n50, n100, n200}
-- ASN1STOP
RACH-ConfigCommon field descriptions

connEstFailCount
Number of times that the UE detects T300 expiry on the same cell before applying connEstFailOffset.

connEstFailOffset
Parameter "Qoffsettemp" in TS 36.304 [4]. If the field is not present the value of infinity shall be used for "Qoffsettemp".

connEstFailOffsetValidity
Amount of time that the UE applies connEstFailOffset before removing the offset from evaluation of the cell. Value s30 corresponds to 30 seconds, s60 corresponds to 60 seconds, and so on.

edt-LastPreamble
Provides the mapping of preambles to groups for each CE level for EDT, as specified in TS 36.321 [6]. The preambles for EDT are the preambles lastPreamble-r13 +1 to edt-LastPreamble-r15. E-UTRAN configures this field only when random access preambles group B is not used.

edt-SmallTBS-Enabled
Value TRUE indicates UE performing EDT is allowed to select TBS smaller than edt-TBS for Msg3 in the corresponding CE level, as specified in TS 36.213 [23].

edt-SmallTBS-Subset
Presence indicates only two of the TBS values can be used according to edt-TBS corresponding to the CE level, as specified in TS 36.213 [23]. When the field is not present, any of the TBS values according to edt-TBS corresponding to the CE level can be used. This field is applicable for a CE level only when edt-SmallTBS-Enabled is included for the corresponding CE level.

edt-TBS
Largest TBS for Msg3 for a CE level applicable to a UE performing EDT. Value in bits. Value b328 corresponds to 328 bits, b408 corresponds to 408 bits and so on. Additionally, value b1000or456 corresponds to 1000 bits for CE levels 0 and 1, and 456 bits for CE levels 2 and 3. See TS 36.213 [23].

mac-ContentionResolutionTimer
Timer for contention resolution in TS 36.321 [6]. Value in subframes. Value sf8 corresponds to 8 subframes, sf16 corresponds to 16 subframes and so on. mac-ContentionResolutionTimer-r15 is only applicable for EDT. UE performing EDT shall use mac-ContentionResolutionTimer-r15, if present.

maxHARQ-Msg3Tx
Maximum number of Msg3 HARQ transmissions in TS 36.321 [6], used for contention based random access. Value is an integer.

messagePowerOffsetGroupB
Threshold for preamble selection in TS 36.321 [6]. Value in dB. Value minusinfinity corresponds to –infinity. Value dB0 corresponds to 0 dB, dB5 corresponds to 5 dB and so on.

messageSizeGroupA
Threshold for preamble selection in TS 36.321 [6]. Value in bits. Value b56 corresponds to 56 bits, b144 corresponds to 144 bits and so on.

numberOfRA-Preambles
Number of non-dedicated random access preambles in TS 36.321 [6]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.

powerRampingStep
Power ramping factor in TS 36.321 [6]. Value in dB. Value dB0 corresponds to 0 dB, dB2 corresponds to 2 dB and so on.

preambleInitialReceivedTargetPower
Initial preamble power in TS 36.321 [6]. Value in dBm. Value dBm-120 corresponds to -120 dBm, dBm-118 corresponds to -118 dBm and so on.

preambleMappingInfo
Provides the mapping of preambles to groups for each CE level, except for EDT, as specified in TS 36.321 [6]. When random access preambles group B is used, firstPreamble-r13 is set to 0 and lastPreamble-r13 is set to numberOfRA-Preambles-1.

preamblesGroupAConfig
Provides the configuration for preamble grouping in TS 36.321 [6]. If the field is not signalled, the size of the random access preambles group A [6] is equal to numberOfRA-Preambles.

preambleTransMax, preambleTransMax-CE
Maximum number of preamble transmission in TS 36.321 [6]. Value is an integer. Value n3 corresponds to 3, n4 corresponds to 4 and so on.

rach-CE-LevelInfoList
Provides RACH information for each coverage level. The first entry in the list contains RACH information of CE level 0, the second entry in the list contains RACH information of CE level 1, and so on. It E-UTRAN includes rach-CE-LevelInfoList, it includes the same number of entries as in prach-ParametersListCE.

ra-ResponseWindowSize
Duration of the RA response window in TS 36.321 [6]. Value in subframes. Value sf2 corresponds to 2 subframes, sf3 corresponds to 3 subframes and so on. The same value applies for each serving cell (although the associated functionality is performed independently for each cell).

rar-HoppingConfig
Frequency hopping activation/deactivation for RAR/Msg3/Msg4 for a CE level, see TS 36.211 [21].
### RACH-ConfigCommon field descriptions

**connEstFailCount**  
Number of times that the UE detects T300 expiry on the same cell before applying connEstFailOffset.

**sizeOfRA-PreamblesGroupA**  
Size of the random access preambles group A in TS 36.321 [6]. Value is an integer. Value n4 corresponds to 4, n8 corresponds to 8 and so on.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDT</td>
<td>The field is mandatory present if cp-EDT or up-EDT in SystemInformationBlockType2 is present; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>EDT-OR</td>
<td>The field is optionally present. Need OR, if cp-EDT or up-EDT in SystemInformationBlockType2 is present; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

### RACH-ConfigDedicated

The IE **RACH-ConfigDedicated** is used to specify the dedicated random access parameters.

#### RACH-ConfigDedicated information element

```asn1
RACH-ConfigDedicated ::= SEQUENCE {
  ra-PreambleIndex     INTEGER (0..63),
  ra-PRACH-MaskIndex     INTEGER (0..15)
}
```

---

### RACH-ConfigDedicated field descriptions

**ra-PRACH-MaskIndex**  
Explicitly signalled PRACH Mask Index for RA Resource selection in TS 36.321 [6].

**ra-PreambleIndex**  

---

### RadioResourceConfigCommon

The IE **RadioResourceConfigCommonSIB** and IE **RadioResourceConfigCommon** are used to specify common radio resource configurations in the system information and in the mobility control information, respectively, e.g., the random access parameters and the static physical layer parameters.

#### RadioResourceConfigCommon information element

```asn1
RadioResourceConfigCommonSIB ::= SEQUENCE {
  rach-ConfigCommon     RACH-ConfigCommon,
  bcch-Config      BCCH-Config,
  pch-Config      PCCH-Config,
  prach-Config      PRACH-ConfigSIB,
  pdsch-ConfigCommon     PDSCH-ConfigCommon,
  pucch-ConfigCommon     PUCCH-ConfigCommon,
  soundingRS-UL-ConfigCommon   SoundingRS-UL-ConfigCommon,
  uplinkPowerControlCommon   UplinkPowerControlCommon,
  ul-CyclicPrefixLength    UL-CyclicPrefixLength,
  ...
,[[
  uplinkPowerControlCommon-v1020 UplinkPowerControlCommon-v1020 OPTIONAL -- Need OR
]],
,[[
  rach-ConfigCommon-v1250 RACH-ConfigCommon-v1250 OPTIONAL -- Need OR
]],
,[[
  pucch-ConfigCommon-v1270 PUCCH-ConfigCommon-v1270 OPTIONAL -- Need OR
]],
,[[
  bcch-Config-v1310 BCCH-Config-v1310 OPTIONAL, -- Need OR
]],
,[[
  pch-Config-v1310 PCCH-Config-v1310 OPTIONAL, -- Need OR
]].
```
RadioResourceConfigCommon ::= SEQUENCE {
  rach-ConfigCommon  RACH-ConfigCommon  OPTIONAL,  -- Need ON
  prach-Config       PRACH-Config,       OPTIONAL,  -- Need ON
  pdsch-ConfigCommon PDSCH-ConfigCommon v1310  OPTIONAL,  -- Need ON
  pusch-ConfigCommon PUSCH-ConfigCommon,  OPTIONAL,  -- Need ON
  phich-Config       PHICH-Config,       OPTIONAL,  -- Need ON
  pucch-ConfigCommon PUCCH-ConfigCommon,  OPTIONAL,  -- Need ON
  soundingRS-UL-ConfigCommon SoundingRS-UL-ConfigCommon,  OPTIONAL,  -- Need ON
  uplinkPowerControlCommon UplinkPowerControlCommon  OPTIONAL,  -- Need ON
  antennaInfoCommon  AntennaInfoCommon,  OPTIONAL,  -- Need ON
  p-Max              P-Max,              OPTIONAL,  -- Need OP
  tdd-Config         TDD-Config,         OPTIONAL,  -- Cond TDD
  ul-CyclicPrefixLength UL-CyclicPrefixLength, ...
  [[ uplinkPowerControlCommon-v1020 UplinkPowerControlCommon-v1020  OPTIONAL -- Need ON ]],
  [ [ tdd-Config-v1130 TDD-Config-v1130  OPTIONAL -- Cond TDD3 ]],
  [ [ prach-ConfigCommon-v1270 PUSCH-ConfigCommon-v1270  OPTIONAL -- Need OR ]],
  [ [ prach-Config-v1310 PRACH-Config-v1310  OPTIONAL,  -- Need ON
    freqHoppingParameters-r13 FreqHoppingParameters-r13  OPTIONAL,  -- Need ON
    pdsch-ConfigCommon-v1310 PDSCH-ConfigCommon-v1310  OPTIONAL,  -- Need ON
    pusch-ConfigCommon-v1310 PUSCH-ConfigCommon-v1310  OPTIONAL,  -- Need ON
    uplinkPowerControlCommon-v1310 UplinkPowerControlCommon-v1310  OPTIONAL,  -- Need ON ]],
  [ [ highSpeedConfig-r14 HighSpeedConfig-r14  OPTIONAL,  -- Need OR
    prach-Config-v1430 PRACH-Config-v1430  OPTIONAL,  -- Need OR
    pusch-ConfigCommon-v1430 PUSCH-ConfigCommon-v1430  OPTIONAL,  -- Need OR
    tdd-Config-v1430 TDD-Config-v1430  OPTIONAL,  -- Cond TDD3
    ],
  [ [ tdd-Config-v1450 TDD-Config-v1450  OPTIONAL -- Cond TDD3 ]],
  [ [ prach-ConfigCommon-v1530 PRACH-ConfigCommon-v1530  OPTIONAL,  -- Need OR
    highSpeedConfig-v1530 HighSpeedConfig-v1530  OPTIONAL,  -- Need OR ]]
}

RadioResourceConfigCommonPSCell-r12 ::= SEQUENCE {
  basicFields-r12  RadioResourceConfigCommonPSCell-r10,  
  pucch-ConfigCommon-r12 PUSCH-ConfigCommon,  
  rach-ConfigCommon-r12 RACH-ConfigCommon,  
  uplinkPowerControlCommonPSCell-r12 UplinkPowerControlCommonPSCell-r12,  ...
  [ [ uplinkPowerControlCommonPSCell-v1310 UplinkPowerControlCommon-v1310  OPTIONAL -- Need ON ]],
  [ [ uplinkPowerControlCommonPSCell-v1530 UplinkPowerControlCommon-v1530  OPTIONAL -- Need ON ]]
}

RadioResourceConfigCommonPSCell-v12f0 ::= SEQUENCE {
  basicFields-v12f0 RadioResourceConfigCommonPSCell-v1010
}

RadioResourceConfigCommonPSCell-v1440 ::= SEQUENCE {
  basicFields-v1440 RadioResourceConfigCommonPSCell-v1440
}
RadioResourceConfigCommonSCell-r10 ::= SEQUENCE {
  -- DL configuration as well as configuration applicable for DL and UL
  nonUL-Configuration-r10   SEQUENCE {
    -- 1: Cell characteristics
    dl-Bandwidth-r10          ENUMERATED {n6, n15, n25, n50, n75, n100},
    -- 2: Physical configuration, general
    antennaInfoCommon-r10     AntennaInfoCommon,
    mbsfn-SubframeConfigList-r10 MBSFN-SubframeConfigList OPTIONAL, -- Need OR
    -- 3: Physical configuration, control
    phich-Config-r10          PHICH-Config,
    -- 4: Physical configuration, physical channels
    pdsch-ConfigCommon-r10    PDSCH-ConfigCommon,  
    tdd-Config-r10           TDD-Config     OPTIONAL -- Cond TDDSCell
  },
  -- UL configuration
  ul-Configuration-r10      SEQUENCE {
    ul-FreqInfo-r10           SEQUENCE {
      ul-CarrierFreq-r10        ARFCN-ValueEUTRA   OPTIONAL, -- Need OP
      ul-Bandwidth-r10          ENUMERATED {n6, n15,  
n25, n50, n75, n100} OPTIONAL, -- Need OP
      additionalSpectrumEmissionSCell-r10 AdditionalSpectrumEmission
    },
    p-Max-r10                 P-Max       OPTIONAL, -- Need OP
    uplinkPowerControlCommonSCell-r10 UplinkPowerControlCommonSCell-r10, -- A special version of IE UplinkPowerControlCommon may be introduced
    -- 3: Physical configuration, control
    soundingRS-UL-ConfigCommon-r10 SoundingRS-UL-ConfigCommon,  
    ul-CyclicPrefixLength-r10  UL-CyclicPrefixLength,  
    -- 4: Physical configuration, physical channels
    prach-ConfigSCell-r10     PRACH-ConfigSCell-r10 OPTIONAL, -- Cond TDD-OR-NoR1II
  } pusch-ConfigCommon-r10 PUSCH-ConfigCommon
},
...,
[[ ul-CarrierFreq-v1090 ARFCN-ValueEUTRA-v9e0 OPTIONAL -- Need OP
],
[[ rach-ConfigCommonSCell-r11 RACH-ConfigCommonSCell-r11 OPTIONAL, -- Cond ULSCell
  tdd-Config-v1130 TDD-Config-v1130 OPTIONAL, -- Cond TDD2
  uplinkPowerControlCommonSCell-v1130 UplinkPowerControlCommonSCell-v1130 OPTIONAL -- Cond UL
]],
[[ pusch-ConfigCommon-v1270 PUSCH-ConfigCommon-v1270 OPTIONAL -- Need OR
],
[[ pucch-ConfigCommon-v1310 PUCCH-ConfigCommon OPTIONAL, -- Cond UL
  uplinkPowerControlCommonSCell-v1310 UplinkPowerControlCommonSCell-v1310 OPTIONAL -- Cond UL
]],
[[ highSpeedConfigSCell-r14 HighSpeedConfigSCell-r14 OPTIONAL, -- Need OR
  prach-Config-v1430 PRACH-Config-v1430 OPTIONAL, -- Cond UL
  ul-Configuration-r14      SEQUENCE {
    ul-FreqInfo-r14           SEQUENCE {
      ul-CarrierFreq-r14        ARFCN-ValueEUTRA-r9 OPTIONAL, -- Need OP
      ul-Bandwidth-r14          ENUMERATED {n6, n15,  
n25, n50, n75, n100} OPTIONAL, -- Need OP
      additionalSpectrumEmissionSCell-r14 AdditionalSpectrumEmission
    },
    p-Max-r14                 P-Max       OPTIONAL, -- Need OP
    soundingRS-UL-ConfigCommon-r14 SoundingRS-UL-ConfigCommon,  
    ul-CyclicPrefixLength-r14  UL-CyclicPrefixLength,  
    prach-ConfigSCell-r14     PRACH-ConfigSCell-r14 OPTIONAL, -- Cond TDD-OR-NoR1II
  } uplinkPowerControlCommonPUSCH-LessCell-v1430 UplinkPowerControlCommonPUSCH-LessCell-v1430 OPTIONAL -- Need OR
},
  harq-ReferenceConfig-r14  ENUMERATED {sa2, sa4, sa5} OPTIONAL, -- Cond ULSRS
  OR
  soundingRS-FlexibleTiming-r14 ENUMERATED {true} OPTIONAL -- Need OR
},
[[ mbsfn-SubframeConfigList-v1430 MBSFN-SubframeConfigList-v1430 OPTIONAL -- Need OR
],
[[ uplinkPowerControlCommonSCell-v1530 UplinkPowerControlCommonSCell-v1530 OPTIONAL -- Need OR
]]}
RadioResourceConfigCommonSCell-v1010 ::= SEQUENCE {
  -- UL configuration
  ul-Configuration-v1010  SEQUENCE {
    additionalSpectrumEmissionSCell-v1010  AdditionalSpectrumEmission-v1010
  }
}

RadioResourceConfigCommonSCell-v1440 ::= SEQUENCE {
  ul-Configuration-v1440  SEQUENCE {
    ul-FreqInfo-v1440     SEQUENCE {
      additionalSpectrumEmissionSCell-v1440  AdditionalSpectrumEmission-v1010
    }
  }
}

BCCH-Config ::=      SEQUENCE {
  modificationPeriodCoeff  ENUMERATED {n2, n4, n8, n16}
}

BCCH-Config-v1310 ::=    SEQUENCE {
  modificationPeriodCoeff-v1310  ENUMERATED {n64}
}

FreqHoppingParameters-r13 ::=  SEQUENCE {
  dummy       ENUMERATED {nb2, nb4}       OPTIONAL,
  dummy2      CHOICE {
    interval-FDD-r13  ENUMERATED {int1, int2, int4, int8},
    interval-TDD-r13  ENUMERATED {int1, int5, int10, int20}
  }       OPTIONAL,
  dummy3      CHOICE {
    interval-FDD-r13  ENUMERATED {int2, int4, int8, int16},
    interval-TDD-r13  ENUMERATED {int5, int10, int20, int40}
  }       OPTIONAL,
  interval-ULHoppingConfigCommonModeA-r13      CHOICE {
    interval-FDD-r13  ENUMERATED {int1, int2, int4, int8},
    interval-TDD-r13  ENUMERATED {int1, int5, int10, int20}
  }       OPTIONAL, -- Cond MP-A
  interval-ULHoppingConfigCommonModeB-r13      CHOICE {
    interval-FDD-r13  ENUMERATED {int2, int4, int8, int16},
    interval-TDD-r13  ENUMERATED {int5, int10, int20, int40}
  }       OPTIONAL, -- Cond MP-B
  dummy4    INTEGER (1..maxAvailNarrowBands-r13)   OPTIONAL
}

PCCH-Config ::=      SEQUENCE {
  defaultPagingCycle  ENUMERATED {rf32, rf64, rf128, rf256},
  nB         ENUMERATED {fourT, twoT, oneT, halfT, quarterT, oneEighthT, oneSixteenthT, oneThirtySecondT}
}

PCCH-Config-v1310 ::=    SEQUENCE {
  paging-narrowBands-r13    INTEGER (1..maxAvailNarrowBands-r13),
  mpcch-NumRepetition-Paging-r13  ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256},
  nb-v1310       ENUMERATED {one64thT, one128thT, one256thT}       OPTIONAL -- Need OR
}

UL-CyclicPrefixLength ::=   ENUMERATED {len1, len2}

HighSpeedConfig-r14 ::=     SEQUENCE {
  highSpeedEnhancedMeasFlag-r14  ENUMERATED {true}       OPTIONAL, -- Need OR
  highSpeedEnhancedDemodulationFlag-r14  ENUMERATED {true}       OPTIONAL, -- Need OR
}

HighSpeedConfig-v1530 ::=   SEQUENCE {
  highSpeedMeasGapCE-ModeA-r15  ENUMERATED {true}
}

HighSpeedConfigSCell-r14 ::=     SEQUENCE {
  highSpeedEnhancedDemodulationFlag-r14  ENUMERATED {true}       OPTIONAL, -- Need OR
}

-- ASN1STOP
**RadioResourceConfigCommon field descriptions**

**additionalSpectrumEmissionSCell**
The UE requirements related to `additionalSpectrumEmissionSCell` are defined in TS 36.101 [42]. E-UTRAN configures the same value in `additionalSpectrumEmissionSCell` for all SCell(s) of the same band with UL configured. The `additionalSpectrumEmissionSCell` is applicable for all serving cells (including PCell) of the same band with UL configured.

**defaultPagingCycle**
Default paging cycle, used to derive 'T' in TS 36.304 [4]. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on.

**dummy**
This field is not used in the specification. If received it shall be ignored by the UE.

**harq-ReferenceConfig**
Indicates UL/DL configuration used as the DL HARQ reference configuration for this serving cell. Value sa2 corresponds to Configuration2, sa4 to Configuration4 etc, as specified in TS 36.211 [21, table 4.2-2]. E-UTRAN configures the same value for all serving cells residing on same frequency band.

**highSpeedEnhancedMeasFlag**
If the field is present, the UE shall apply the high speed measurement enhancements as specified in TS 36.133 [16].

**highSpeedEnhancedDemodulationFlag**
If the field is present, the UE shall apply the advanced receiver in SFN scenario as specified in TS 36.101 [6].

**highSpeedMeasGapCE-ModeA**
If the field is present, the UE in CE mode A shall apply the measurement gap sharing table associated with high-velocity scenario for measurements, as specified in TS 36.133 [16].

**interval-DLHoppingConfigCommonModeX**
Number of consecutive absolute subframes over which MPDCCH or PDSCH for CE mode X stays at the same narrowband before hopping to another narrowband. For interval-FDD, int1 corresponds to 1 subframe, int2 corresponds to 2 subframes, and so on. For interval-TDD, int1 corresponds to 1 subframe, int5 corresponds to 5 subframes, and so on.

**interval-ULHoppingConfigCommonModeX**
Number of consecutive absolute subframes over which PUCCH or PUSCH for CE mode X stays at the same narrowband before hopping to another narrowband. For interval-FDD, int1 corresponds to 1 subframe, int2 corresponds to 2 subframes, and so on. For interval-TDD, int1 corresponds to 1 subframe, int5 corresponds to 5 subframes, and so on.

**modificationPeriodCoeff**
Actual modification period, expressed in number of radio frames = `modificationPeriodCoeff` * `defaultPagingCycle`. n2 corresponds to value 2, n4 corresponds to value 4, n8 corresponds to value 8, n16 corresponds to value 16, and n64 corresponds to value 64.

**mpdcch-NumRepetition-Paging**
Maximum number of repetitions for MPDCCH common search space (CSS) for paging, see TS 36.211 [21].

**mpdcch-pdsch-HoppingOffset**
Parameter: \( f_{\text{DL}, \text{hop}} \), see TS 36.211 [21, 6.4.1].

**mpdcch-pdsch-HoppingNB**
The number of narrowbands for MPDCCH/PDSCH frequency hopping. Value nb2 corresponds to 2 narrowbands and value nb4 corresponds to 4 narrowbands.

**nB**
Parameter: nB is used as one of parameters to derive the Paging Frame and Paging Occasion according to TS 36.304 [4]. Value in multiples of 'T' as defined in TS 36.304 [4]. A value of fourT corresponds to 4 * T, a value of twoT corresponds to 2 * T and so on. In case nB-v1310 is signalled, the UE shall ignore nB (i.e. without suffix). EUTRAN configures nB-v1310 only in the BR version of SI message.

**paging-narrowBands**
Number of narrowbands used for paging, see TS 36.304 [4], TS 36.212 [22] and TS 36.213 [23].

**p-Max**
Pmax to be used in the target cell. If absent, for the band used in the target cell, the UE applies the maximum power according to its capability as specified in 36.101 [42, 6.2.2]. In case the UE is configured with uplink intra-band contiguous CA and the UE indicates `ue-CA-PowerClass-N` in that band combination, then the `p-Max` in `RadioResourceConfigCommonSCell` for that SCell, if present, also applies for that band combination whenever that SCell is activated.

**prach-ConfigSCell**
Indicates a PRACH configuration for an SCell. The field is not applicable for an LAA SCell in this release.

**rach-ConfigCommonSCell**
Indicates a RACH configuration for an SCell. The field is not applicable for an LAA SCell in this release.

**soundingRS-FlexibleTiming**
Indicates the SRS flexible timing (if configured) for aperiodic SRS triggered by DL grant. If the SRS transmission is collided with ACK/NACK, postpone once to the next configured SRS transmission opportunity.
RadioResourceConfigCommon field descriptions

addSpectrumEmissionSCell
The UE requirements related to addSpectrumEmissionSCell are defined in TS 36.101 [42]. E-UTRAN configures the same value in additionalSpectrumEmissionSCell for all SCell(s) of the same band with UL configured. The additionalSpectrumEmissionSCell is applicable for all serving cells (including PCell) of the same band with UL configured.

ul-Bandwidth
Parameter: transmission bandwidth configuration, Nsa, in uplink, see TS 36.101 [42, table 5.6.1]. Value n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on. If for FDD this parameter is absent, the uplink bandwidth is equal to the downlink bandwidth. For TDD this parameter is absent and it is equal to the downlink bandwidth.

ul-CarrierFreq
For FDD: if absent, the (default) value determined from the default TX-RX frequency separation defined in TS 36.101 [42, table 5.7.3-1] applies. For TDD: This parameter is absent and it is equal to the downlink frequency.

ul-CyclicPrefixLength
Parameter: Uplink cyclic prefix length see TS 36.211 [21, 5.2.1] where len1 corresponds to normal cyclic prefix and len2 corresponds to extended cyclic prefix.

Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDT</td>
<td>The field is optionally present, Need OR, if edt-Parameters is present; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>MP-A</td>
<td>The field is mandatory present for CE mode A. Otherwise the field is optional, Need OR.</td>
</tr>
<tr>
<td>MP-B</td>
<td>The field is mandatory present for CE mode B. Otherwise the field is optional, Need OR.</td>
</tr>
<tr>
<td>TDD</td>
<td>The field is optional for TDD, Need ON; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDD2</td>
<td>If tdd-Config-r10 is present, the field is optional, Need OR. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDD3</td>
<td>If tdd-Config is present, the field is optional, Need OR. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDD-OR-NoR11</td>
<td>If prach-Config-r11 is absent, the field is optional, Need OR. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDDSCell</td>
<td>This field is mandatory present for TDD; it is not present for FDD and LAAS Cell, and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>UL</td>
<td>If the SCell is part of the STAG or concerns the PCell or PUCCH SCell and if ul-Configuration is included, the field is optional, Need OR. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>ULSCell</td>
<td>For the PCell (IE is included in RadioResourceConfigCommonPSCell) the field is absent. Otherwise, if the SCell is part of the STAG and if ul-Configuration is included, the field is optional, Need OR. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>ULRS</td>
<td>If ul-Configuration-r10 is absent, the field is optional, Need OR. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

RadioResourceConfigDedicated

The IE RadioResourceConfigDedicated is used to setup/modify/release RBs, to modify the MAC main configuration, to modify the SPS configuration and to modify dedicated physical configuration.

RadioResourceConfigDedicated information element

```asn1
-- ASN1START
RadioResourceConfigDedicated ::= SEQUENCE {
  srb-ToAddModList             SRB-ToAddModList   OPTIONAL,  -- Cond HO-Conn
  drb-ToAddModList             DRB-ToAddModList   OPTIONAL,  -- Cond HO-Conn
  drb-ToReleaseList            DRB-ToReleaseList   OPTIONAL,  -- Need ON
  mac-MainConfig               MAC-MainConfig,           
    explicitValue              CHOICE {                        
      defaultValue              NULL,                         
    }                         OPTIONAL,                  -- Cond HO-Conn
  toEUTRA2                     SPS-Config                   OPTIONAL,  -- Need ON
  physicalConfigDedicated      PhysicalConfigDedicated OPTIONAL,  -- Need ON
  ...                          LRF-TimersAndConstants-r9 OPTIONAL   -- Need ON
}
-- ASN1END
```
...}

RadioResourceConfigDedicatedPSCell-v1370 ::= SEQUENCE {
  physicalConfigDedicated-v1370  PhysicalConfigDedicated-v1370 OPTIONAL -- Need ON
}

RadioResourceConfigDedicatedSCell-v10 ::= SEQUENCE {
  -- UE specific configuration extensions applicable for an SCell
  physicalConfigDedicatedSCell-v10  PhysicalConfigDedicatedSCell-v10 OPTIONAL, -- Need ON

...}

RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON
}

 RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  -- UE specific configuration extensions applicable for an SCell
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON

...}

RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON

...}

RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  -- UE specific configuration extensions applicable for an SCell
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON

...}

RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON

...}

RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  -- UE specific configuration extensions applicable for an SCell
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON

...}

RadioResourceConfigDedicatedSCell-v1370 ::= SEQUENCE {
  physicalConfigDedicatedSCell-v1370  PhysicalConfigDedicatedSCell-v1370 OPTIONAL, -- Need ON

...}
[[
crs-IntfMitigEnabled-r15 BOOLEAN OPTIONAL, -- Need ON
neighCellCRS-Info-r15 NeighCellsCRS-Info-r15 OPTIONAL, -- Need ON
sps-Config-v1530 SPS-Config-v1530 OPTIONAL -- Need ON
]]

SRB-ToAddModList ::= SEQUENCE (SIZE (1..2)) OF SRB-ToAddMod
SRB-ToAddModExtList-r15 ::= SEQUENCE (SIZE (1)) OF SRB-ToAddMod
SRB-ToAddMod ::= SEQUENCE {
srb-Identity INTEGER (1..2),
rlc-Config CHOICE {
explicitValue RLC-Config, defaultValue NULL
} OPTIONAL, -- Cond Setup
logicalChannelConfig CHOICE {
explicitValue LogicalChannelConfig, defaultValue NULL
} OPTIONAL, -- Cond Setup...
[[
pdcp-verChange-r15 ENUMERATED {true} OPTIONAL, -- Cond NR-PDCP
rlc-Config-v1530 RLC-Config-v1530 OPTIONAL, -- Need ON
rlc-BearerConfigDupl-r15 RLC-BearerConfig-r15 OPTIONAL, -- Need ON
srb-Identity-v1530 INTEGER (4) OPTIONAL -- Need ON
]]

SRB-ToReleaseListDupl-r15 ::= SEQUENCE (SIZE (1..2)) OF INTEGER (1..2)
DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod
DRB-ToAddModList-r15 ::= SEQUENCE (SIZE (1..maxDRB-r15)) OF DRB-ToAddMod
DRB-ToAddModListSCG-r12 ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddModSCG-r12
DRB-ToAddModListSCG-r15 ::= SEQUENCE (SIZE (1..maxDRB-r15)) OF DRB-ToAddModSCG-r12
DRB-ToAddMod ::= SEQUENCE {
esps-BearerIdentity INTEGER (0..15) OPTIONAL, -- Cond DRB-Setup
drb-Identity DRB-Identity,
pdcp-Config PDCP-Config OPTIONAL, -- Cond PDCP
rlc-Config RLC-Config OPTIONAL, -- Cond SetupM
logicalChannelIdentity INTEGER (3..10) OPTIONAL, -- Cond DRB-SetupM
logicalChannelConfig LogicalChannelConfig OPTIONAL, -- Cond SetupM...
[[
[drb-TypeChange-r12 ENUMERATED {toMCG} OPTIONAL, -- Need OP
rlc-Config-v1250 RLC-Config-v1250 OPTIONAL -- Need ON
]],
[[
rlc-Config-v1310 RLC-Config-v1310 OPTIONAL, -- Need ON
drb-TypeLWA-r13 BOOLEAN OPTIONAL, -- Cond SetupS2
rlc-TypeLWIP-r13 ENUMERATED {lwip, lwip-DL-only, lwip-UL-only, etran} OPTIONAL -- Need ON
]],
[[
rlc-Config-v1430 RLC-Config-v1430 OPTIONAL, -- Need ON
lwip-UL-Aggregation-r14 BOOLEAN OPTIONAL, -- Cond LWIP
lwip-DL-Aggregation-r14 BOOLEAN OPTIONAL, -- Cond LWIP
lwa-WLAN-AC-r14 ENUMERATED {ac-bk, ac-be, ac-vi, ac-vo} OPTIONAL -- Cond UL-LWA
]],
[[
rlc-Config-v1510 RLC-Config-v1510 OPTIONAL -- Need ON
]],
[[
rlc-Config-v1530 RLC-Config-v1530 OPTIONAL, -- Need ON
rlc-BearerConfigDupl-r15 RLC-BearerConfig-r15 OPTIONAL, -- Need ON
logicalChannelIdentity-r15 INTEGER (32..38) OPTIONAL -- Need ON
]]

DRB-ToAddModSCG-r12 ::= SEQUENCE {
drb-Identity-r12 DRB-Identity,
drb-Type-r12 CHOICE {
split-r12 NULL,
scg-r12 SEQUENCE {
esps-BearerIdentity-r12 INTEGER (0..15) OPTIONAL, -- Cond DRB-Setup
pdcp-Config-r12 PDCP-Config OPTIONAL -- Cond PDCP-S
} OPTIONAL, -- Cond SetupS2
rlc-ConfigSCG-r12 RLC-Config OPTIONAL, -- Cond SetupS
rlc-Config-v1250 RLC-Config-v1250 OPTIONAL, -- Need ON
logicalChannelIdentitySCG-r12 INTEGER (3..10) OPTIONAL, -- Cond DRB-SetupS
logicalChannelConfigSCG-r12 LogicalChannelConfig OPTIONAL, -- Cond SetupS
}
[...]
]]
[[ logicalChannelIdentitySCG-r15 INTEGER (32..38) OPTIONAL, -- Need ON
  rlc-Config-v1530 RLC-Config-v1530 OPTIONAL, -- Need ON
  rlc-BearerConfigDupl-r15 RLC-BearerConfig-r15 OPTIONAL -- Need ON
]]
}

DRB-ToReleaseList ::= SEQUENCE (SIZE (1..maxDRB)) OF DB-Identity
DRB-ToReleaseList-r15 ::= SEQUENCE (SIZE (1..maxDRB-r15)) OF DB-Identity

MeasSubframePatternPCell-r10 ::= CHOICE {
  release NULL,
  setup MeasSubframePattern-r10
}

NeighCellsCRS-Info-r11 ::= CHOICE {
  release NULL,
  setup CRS-AssistanceInfoList-r11
}

CRS-AssistanceInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11

CRS-AssistanceInfo-r11 ::= SEQUENCE {
  physCellId-r11 PhysCellId,
  antennaPortsCount-r11 ENUMERATED {an1, an2, an4, spare1},
  mbsfn-SubframeConfigList-r11 MBSFN-SubframeConfigList,
  ...
  mbsfn-SubframeConfigList-v1430 MBSFN-SubframeConfigList-v1430 OPTIONAL -- Need ON
}]

NeighCellsCRS-Info-r13 ::= CHOICE {
  release NULL,
  setup CRS-AssistanceInfoList-r13
}

CRS-AssistanceInfoList-r13 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r13

CRS-AssistanceInfo-r13 ::= SEQUENCE {
  physCellId-r13 PhysCellId,
  antennaPortsCount-r13 ENUMERATED {an1, an2, an4, spare1},
  mbsfn-SubframeConfigList-r13 MBSFN-SubframeConfigList OPTIONAL, -- Need ON
  ...
  mbsfn-SubframeConfigList-v1430 MBSFN-SubframeConfigList-v1430 OPTIONAL -- Need ON
}]

NeighCellsCRS-Info-r15 ::= CHOICE {
  release NULL,
  setup CRS-AssistanceInfoList-r15
}

CRS-AssistanceInfoList-r15 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r15

CRS-AssistanceInfo-r15 ::= SEQUENCE {
  physCellId-r15 PhysCellId,
  crs-IntMitigEnabled-15 ENUMERATED {enabled} OPTIONAL -- Need ON
}

NAICS-AssistanceInfo-r12 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    neighCellsToReleaseList-r12 NeighCellsToReleaseList-r12 OPTIONAL, -- Need ON
    neighCellsToAddModList-r12 NeighCellsToAddModList-r12 OPTIONAL, -- Need ON
    servCellp-a-r12 P-a OPTIONAL -- Need ON
  }
}

NeighCellsToReleaseList-r12 ::= SEQUENCE (SIZE (1..maxNeighCell-r12)) OF PhysCellId

NeighCellsToAddModList-r12 ::= SEQUENCE (SIZE (1..maxNeighCell-r12)) OF NeighCellsInfo-r12

NeighCellsInfo-r12 ::= SEQUENCE {
  physCellId-r12 PhysCellId,
  p-b-r12 INTEGER (0..3),
  crs-PortsCount-r12 ENUMERATED {n1, n2, n4, spare},
}
mbsfn-SubframeConfig-r12 MBSFN-SubframeConfigList OPTIONAL, -- Need ON
p-aList-r12 SEQUENCE (SIZE (1..maxP-a-PerNeighCell-r12)) OF P-a,
transmissionModeList-r12 BIT STRING (SIZE(8)),
resAllocGranularity-r12 INTEGER (1..4),
...

P-a ::= ENUMERATED { dB-6, dB-4dot77, dB-3, dB-1dot77,
                        dB0, dB1, dB2, dB3}

RLC-BearerConfig-r15 ::= CHOICE {
release NULL,
setup SEQUENCE {
  rlc-Config-r15 RLC-Config-r15 OPTIONAL, -- Need ON
  logicalChannelIdentityConfig-r15 CHOICE {
    logicalChannelIdentity-r15 INTEGER (1..10),
    logicalChannelIdentityExt-r15 INTEGER (32..38)
  },
  logicalChannelConfig-r15 LogicalChannelConfig OPTIONAL -- Need ON
}

-- ASN1STOP
**RadioResourceConfigDedicated field descriptions**

**crs-IntfMitigConfig**
crs-IntfMitigEnabled-r15 indicates CRS interference mitigation is enabled for the cell, as specified in TS 36.133 [16], clause 3.6.1.1. For BL UEs or UEs in CE supporting ce-CRS-IntfMitig, presence of this field indicates CRS interference mitigation is enabled in the cell, as specified in TS 36.133 [16], clauses 3.6.1.1, 3.6.1.2 and 3.6.1.3, and the value crs-IntfMitigNumPRBs indicates number of PRBs, i.e. 6 or 24 PRBs, for CRS transmission in the central cell BW when CRS interference mitigation is enabled. For UEs not supporting this feature, the behaviour is undefined if this field is configured and the field cellBarred in SystemInformationBlockType1 (SystemInformationBlockType1-BR for BL UEs or UEs in CE) is set to notbarred.

**crs-PortsCount**
Parameter represents the number of antenna ports for cell-specific reference signal used by the signaled neighboring cell where n1 corresponds to 1 antenna port, n2 to 2 antenna ports etc. see TS 36.211 [21, 6.10.1].

**drb-Identity**
In case of DC, the DRB identity is unique within the scope of the UE i.e. an SCG DRB can not use the same value as used for an MCG or split DRB. For a split DRB the same identity is used for the MCG- and SCG parts of the configuration.

**drb-ToAddModList**
When drb-ToAddModList-r15 is configured, UE shall ignore the drb-ToAddModList (without suffix).

**drb-ToAddModListSCG**
When an SCG is configured, E-UTRAN configures at least one SCG or split DRB. When drb-ToAddModListSCG-r15 is configured, UE shall ignore the drb-ToAddModListSCG (without suffix).

**drb-ToReleaseList**
When drb-ToReleaseList-r15 is configured, UE shall ignore the drb-ToReleaseList (without suffix).

**drb-Type**
This field indicates whether the DRB is split or SCG DRB. E-UTRAN does not configure split and SCG DRBs simultaneously for the UE.

**drb-TypeChange**
Indicates that a split/SCG DRB is reconfigured to an MCG DRB (i.e. E-UTRAN only signals the field in case the DRB type changes).

**drb-TypeLWA**
Indicates whether a DRB is (re)configured as an LWA DRB or an LWA DRB is reconfigured not to use WLAN resources. NOTE 1

**drb-TypeLWIP**
Indicates whether a DRB is (re)configured to use LWIP Tunnel in UL and DL (value lwip), DL only (value lwip-DL-only), UL only (value lwip-UL-only) or not to use LWIP Tunnel (value eutran).

**logicalChannelConfig**
For SRBs a choice is used to indicate whether the logical channel configuration is signalled explicitly or set to the default logical channel configuration for SRB1 as specified in 9.2.1.1 or for SRB2 as specified in 9.2.1.2.

**logicalChannelIdentity, LogicalChannelIdentityExt**
The logical channel identity for both UL and DL. Value 4 is not configured for DRBs if SRB4 is configured. When logicalChannelIdentity-r15 is signalled, UE shall ignore contents of logicalChannelIdentity (without suffix).

**logicalChannelIdentitySCG**
The logical channel identity for both UL and DL. When logicalChannelIdentitySCG-r15 is signalled, UE shall ignore contents of logicalChannelIdentitySCG (without suffix).

**lwa-WLAN-AC**
For LWA bearers, indicates the corresponding WLAN access category for uplink. AC-BK (value ac-bk) corresponds to Background access category, AC-BE (value ac-be) corresponds to Best Effort access category, AC-VI (value ac-vi) corresponds to Video access category and AC-VO (value ac-vo) corresponds to Voice access category as defined by IEEE 802.11-2012 [67]. If lwa-WLAN-AC is not configured, it is left up to UE to decide which IEEE 802.11 AC value to use when performing transmissions of packets for this DRB over WLAN in the uplink.

**lwip-DL-Aggregation, lwip-UL-Aggregation**
Indicates whether LWIP is configured to utilize LWIP aggregation in DL or UL.

**mac-MainConfig**
Although the ASN.1 includes a choice that is used to indicate whether the mac-MainConfig is signalled explicitly or set to the default MAC main configuration as specified in 9.2.2, EUTRAN does not apply "defaultValue".

**mbsfn-SubframeConfig**
Defines the MBSFN subframe configuration used by the signaled neighboring cell. If absent, UE assumes no MBSFN configuration for the neighboring cell.

**measSubframePatternPCell**
Time domain measurement resource restriction pattern for the PCell measurements (RSRP, RSRQ and the radio link monitoring).
RadioResourceConfigDedicated field descriptions

**neighCellsCRS-Info, neighCellsCRS-InfoSCell, neighCellsCRS-InfoPSCell**
This field contains assistance information used by the UE to mitigate interference from CRS while performing RRM/RLM/CSI measurement or data demodulation or DL control channel demodulation. When the received CRS assistance information is for a cell with CRS non-colliding with that of the CRS of the cell to measure, the UE may use the CRS assistance information to mitigate CRS interference. When the received CRS assistance information is for a cell with CRS colliding with that of the CRS of the cell to measure, the UE may use the CRS assistance information to mitigate CRS interference RRM/RLM (as specified in TS 36.133 [16]) and for CSI (as specified in TS 36.101 [42]) on the subframes indicated by measSubframePatternPCell, measSubframePatternConfigNeigh, csi-MeasSubframeSet1 if configured, and the CSI subframe set 1 if csi-MeasSubframeSets-r12 is configured. The UE may use CRS assistance information to mitigate interference from the cells in the CRS-AssistanceInfoList for the demodulation purpose or DL control channel demodulation as specified in TS 36.101 [42]. EUTRAN does not configure neighCellsCRS-Info-r11 or neighCellsCRS-Info-r13 if eimta-MainConfigPCell-r12 is configured.

**neighCellsToAddModList**
This field contains assistance information used by the UE to cancel and suppress interference of a neighbouring cell. If this field is present for a neighbouring cell, the UE assumes that the transmission parameters listed in the sub-fields are used by the neighbouring cell. If this field is present for a neighbouring cell, the UE assumes the neighbour cell is subframe and SFN synchronized to the serving cell, has the same system bandwidth, UL/DL and special subframe configuration, and cyclic prefix length as the serving cell.

**p-aList**
Indicates the restricted subset of power offset for QPSK, 16QAM, and 64QAM PDSCH transmissions for the neighbouring cell by using the parameter $P_A$ , see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

**p-b**
Parameter: $P_b$, indicates the cell-specific ratio used by the signaled neighboring cell, see TS 36.213 [23, Table 5.2-1].

**pdcp-verChange**
Indicates that the PDCP version of the SRB is changed from NR PDCP to E-UTRA PDCP. Network only configures this version change for during handover, resume and first reconfiguration after re-establishment.

**physicalConfigDedicated**
The default dedicated physical configuration is specified in 9.2.4.

**resAllocGranularity**
Indicates the resource allocation and precoding granularity in PRB pair level of the signaled neighboring cell, see TS 36.213 [23, 7.1.6].

**rlc-BearerConfigDupl**
The configuration of the additional RLC bearer used in case of PDCP duplication using CA, comprising the additional RLC entity, the logical channel identity and the logical channel configuration. E-UTRAN may configure this for SRB1, SRB2 and DRBs. E-UTRAN configures the same RLC mode (AM/UM) as used for the original RLC entity.

**rlc-Config**
For SRBs a choice is used to indicate whether the RLC configuration is signalled explicitly or set to the values defined in the default RLC configuration for SRB1 in 9.2.1.1 or for SRB2 in 9.2.1.2. RLC AM is the only applicable RLC mode for SRB1 and SRB2. E-UTRAN does not reconfigure the RLC mode of DRBs except when a full configuration option is used, and may reconfigure the RLC SN field size and the AM RLC LI field size only upon handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment or upon SCG Change for SCG and split DRBs.

**servCellp-a**
Indicates the power offset for QPSK C-RNTI based PDSCH transmissions used by the serving cell, see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

**sps-Config**
The default SPS configuration is specified in 9.2.3. Except for handover or releasing SPS for MCG, E-UTRAN does not reconfigure sps-Config for MCG when there is a configured downlink assignment or a configured uplink grant for MCG (see TS 36.321 [6]). Except for SCG change or releasing SPS for SCG, E-UTRAN does not reconfigure sps-Config for SCG when there is a configured downlink assignment or a configured uplink grant for SCG (see TS 36.321 [6]).

**srb-Identity**
Value 1 is applicable for SRB1 only. Value 2 is applicable for SRB2 only. Value 4 is applicable for SRB4 only, if configured. For a split SRB the same identity is used for the MCG and NR SCG RLC bearer configurations. If srb-Identity-r1530 is received, the UE shall ignore srb-Identity (i.e. without suffix).

**srb-ToAddModList**
E-UTRAN configures the same RAT type (i.e. EUTRA or NR) for PDCP configuration of SRB1 and SRB2.

**srb-ToAddModListDupl**
Configuration of SRBs configured with PDCP duplication via dual connectivity.
RadioResourceConfigDedicated field descriptions

transmissionModeList
Indicates a subset of transmission mode 1, 2, 3, 4, 6, 8, 9, 10, for the signaled neighboring cell for which NeighCellsInfo applies. When TM10 is signaled, other signaled transmission parameters in NeighCellsInfo are not applicable to up to 8 layer transmission scheme of TM10. E-UTRAN may indicate TM9 when TM10 with QCL type A and DMRS scrambling with $h_{ID}^{(i)} = N_{Cell}^{ID}$ in TS 36.211 [21, 6.10.3.1] is used in the signalled neighbour cell and TM9 or TM10 with QCL type A and DMRS scrambling with $h_{ID}^{(i)} = N_{Cell}^{ID}$ in TS 36.211 [21, 6.10.3.1] is used in the serving cell. UE behaviour with NAICS when TM10 is used is only defined when QCL type A and DMRS scrambling with $h_{ID}^{(i)} = N_{Cell}^{ID}$ in TS 36.211 [21, 6.10.3.1] is used for the serving cell and all signalled neighbour cells. The first/ leftmost bit is for transmission mode 1, the second bit is for transmission mode 2, and so on.

NOTE 1: It is up to eNB to ensure that the field indicating LWA bearer type is set to FALSE when LWA bearer is no longer used (e.g. during handover or re-establishment where LWA configuration is released).
### Conditional presence

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL-LWA</td>
<td>The field is optionally present, need ON if ul-LWA-Config-r14 is present. Otherwise the field is not present.</td>
</tr>
<tr>
<td>CR-SIM</td>
<td>The field is optionally present, need ON, if neighCellsCRS-Info-r11 is not present; otherwise it is not present.</td>
</tr>
<tr>
<td>DRB-Setup</td>
<td>The field is mandatory present if the corresponding DRB is being set up and the UE is connected to EPC; otherwise it is not present.</td>
</tr>
<tr>
<td>DRB-SetupM</td>
<td>The field is mandatory present upon setup of MCG or split DRB; The field is optionally present, Need ON, upon change from SCG to MCG DRB, for EN-DC upon bearer type change of MCG RLC bearer with key change (i.e. bearer type change from MCG/split to MCG/split bearer with key change); otherwise it is not present.</td>
</tr>
<tr>
<td>DRB-SetupS</td>
<td>The field is mandatory present upon setup of SCG or split DRB, or upon change from MCG to split DRB; The field is optionally present, Need ON, upon change from MCG to SCG DRB; otherwise it is not present.</td>
</tr>
<tr>
<td>HO-Conn</td>
<td>The field is mandatory present in case of handover to E-UTRA or when the fullConfig is included in the RRCConnectionReconfiguration message or in case of RRC connection establishment (excluding RRCConnectionResume); otherwise the field is optionally present, need ON. Upon connection establishment/ re-establishment only SRB1 is applicable (excluding RRCConnectionResume).</td>
</tr>
<tr>
<td>HO-toEUTRA</td>
<td>The field is mandatory present in case of handover to E-UTRA or when the fullConfig is included in the RRCConnectionReconfiguration message; In case of RRC connection establishment (excluding RRCConnectionResume); and RRC connection re-establishment the field is not present; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>HO-toEUTRA2</td>
<td>The field is mandatory present in case of handover to E-UTRA or when the fullConfig is included in the RRCConnectionReconfiguration message; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>LWIP</td>
<td>The field is optionally present, Need ON, if drbTypeLWIP-r13 is not set to eutran; otherwise it is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>NR-PDCP</td>
<td>The field is optional present, Need ON, when the SRB is configured with NR-PDCP prior to reception of this reconfiguration message. Otherwise it is not present.</td>
</tr>
<tr>
<td>PDCP</td>
<td>For the bearers configured with E-UTRA PDCP, the field is mandatory present if the corresponding DRB is being setup; the field is optionally present, need ON, upon reconfiguration of the corresponding split DRB or LWA DRB, upon the corresponding DRB type change from split to MCG bearer, upon the corresponding DRB type change from MCG to split bearer or LWA bearer, upon the corresponding DRB type change from LWA to LTE only bearer, upon handover within E-UTRA and upon the first reconfiguration after re-establishment but in all these cases only when fullConfig is not included in the RRCConnectionReconfiguration message; otherwise it is not present.</td>
</tr>
<tr>
<td>PDCP-S</td>
<td>The field is mandatory present if the corresponding DRB is being setup; the field is optionally present, need ON, upon SCG change; otherwise it is not present.</td>
</tr>
<tr>
<td>RLC-Setup</td>
<td>This field is optionally present if the corresponding DRB is being setup, need ON; otherwise it is not present.</td>
</tr>
<tr>
<td>SCellAdd</td>
<td>The field is optionally present, need ON, upon SCell addition; otherwise it is not present.</td>
</tr>
<tr>
<td>Setup</td>
<td>The field is mandatory present if the corresponding SRB/DRB is being setup; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>SetupM</td>
<td>The field is mandatory present upon setup of an MCG or split DRB, for EN-DC upon setup of MCG RLC bearer; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>SetupS</td>
<td>The field is mandatory present upon setup of an SCG or split DRB, as well as upon change from MCG to split DRB; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>SetupS2</td>
<td>The field is mandatory present upon setup of an SCG or split DRB, as well as upon change from MCG to SCG DRB. For an SCG DRB the field is optionally present, need ON. Otherwise the field is not present.</td>
</tr>
<tr>
<td>SPS</td>
<td>The field is optionally present, need ON, if sps-Config (without suffix) is not configured; otherwise it is not present.</td>
</tr>
<tr>
<td>SPS2</td>
<td>The field is optionally present, need ON, if sps-Config-r12 is not configured; otherwise it is not present.</td>
</tr>
<tr>
<td>SPS3</td>
<td>The field is optionally present, need ON, if sps-Config (without suffix) is not configured and sps-Config-v1430 is not configured; otherwise it is not present.</td>
</tr>
<tr>
<td>SPS4</td>
<td>The field is optionally present, need ON, if sps-Config-r12 is not configured and sps-Config-v1430 is not configured; otherwise it is not present.</td>
</tr>
</tbody>
</table>

---

**RCLWI-Configuration**

The IE **RCLWI-Configuration** is used to add, modify or release the RCLWI configuration.

---

**ASN1START**
The IE **RLC-Config** is used to specify the RLC configuration of SRBs and DRBs.

**RLC-Config information element**

```plaintext
-- ASN1START

RLC-Config ::= CHOICE {
    am       SEQUENCE {
        ul-AM-RLC    UL-AM-RLC,
        dl-AM-RLC    DL-AM-RLC
    },
    um-Bi-Directional  SEQUENCE {
        ul-UM-RLC    UL-UM-RLC,
        dl-UM-RLC    DL-UM-RLC
    },
    um-Uni-Directional-UL  SEQUENCE {
        ul-UM-RLC    UL-UM-RLC
    },
    um-Uni-Directional-DL  SEQUENCE {
        dl-UM-RLC    DL-UM-RLC
    },
    ... 
}

-- ASN1STOP
```
mode-r15
  am-r15
    ul-AM-RLC-r15
    dl-AM-RLC-r15
  ,
  um-Bi-Directional-r15
    ul-UM-RLC-r15
    dl-UM-RLC-r15
  ,
  um-Uni-Directional-UL-r15
    ul-UM-RLC-r15
    dl-UM-RLC-r15
  ,
  um-Uni-Directional-DL-r15
    dl-UM-RLC-r15
    dl-UM-RLC-r15
}

reestablishRLC-r15 ENUMERATED {true} OPTIONAL, -- Need ON
rlc-OutOfOrderDelivery-r15 ENUMERATED {true} OPTIONAL, -- Need ON
...

UL-AM-RLC ::= SEQUENCE {
  t-PollRetransmit T-PollRetransmit,
  pollPDU PollPDU,
  poliByte PollByte,
  maxRetxThreshold ENUMERATED {
    t1, t2, t3, t4, t6, t8, t16, t32}
}

UL-AM-RLC-r15 ::= SEQUENCE {
  t-PollRetransmit-r15 T-PollRetransmit,
  pollPDU-r15 PollPDU-r15,
  poliByte-r15 PollByte-r14,
  maxRetxThreshold-r15 ENUMERATED {
    t1, t2, t3, t4, t6, t8, t16, t32},
  extended-RLC-LI-Field-r15 BOOLEAN
}

DL-AM-RLC ::= SEQUENCE {
  t-Reordering T-Reordering,
  t-StatusProhibit T-StatusProhibit
}

DL-AM-RLC-r15 ::= SEQUENCE {
  t-Reordering-r15 T-Reordering,
  t-StatusProhibit-r15 T-StatusProhibit,
  extended-RLC-LI-Field-r15 BOOLEAN
}

UL-UM-RLC ::= SEQUENCE {
  sn-FieldLength SN-FieldLength
}

DL-UM-RLC ::= SEQUENCE {
  sn-FieldLength SN-FieldLength,
  t-Reordering T-Reordering
}

DL-UM-RLC-r15 ::= SEQUENCE {
  sn-FieldLength-r15 SN-FieldLength-r15,
  t-Reordering-r15 T-Reordering
}

SN-FieldLength ::= ENUMERATED {size5, size10}

SN-FieldLength-r15 ::= ENUMERATED {size5, size10, size16-r15}

T-PollRetransmit ::= ENUMERATED {
  ms5, ms10, ms15, ms20, ms25, ms30, ms35, ms40, ms45, ms50, ms55, ms60, ms65, ms70, ms75, ms80, ms85, ms90, ms95, ms100, ms105, ms110, ms115, ms120, ms125, ms130, ms135, ms140, ms145, ms150, ms155, ms160, ms165, ms170, ms175, ms180, ms185, ms190, ms195, ms200, ms205, ms210, ms215, ms220, ms225, ms230, ms235, ms240, ms245, ms250, ms300, ms350, ms400, ms450, ms500, ms800-v1310, ms1000-v1310, ms2000-v1310, ms4000-v1310,
PollPDU ::= ENUMERATED {
    p4, p8, p16, p32, p64, p128, p256, pInfinity
}

PollPDU-v1310 ::= ENUMERATED {
    p512, p1024, p2048, p4096, p6144, p8192, p12288, p16384
}

PollPDU-r15 ::= ENUMERATED {
    p4, p8, p16, p32, p64, p128, p256, p512, p1024,
    p2048-r15, p4096-r15, p6144-r15, p8192-r15,
    p12288-r15, p16384-r15, pInfinity
}

PollByte ::= ENUMERATED {
    kB25, kB50, kB75, kB100, kB125, kB250, kB375,
    kB500, kB750, kB1000, kB1250, kB1500, kB2000,
    kB3000, kBInfinity, spare1
}

PollByte-r14 ::= ENUMERATED {
    kB1, kB2, kB5, kB8, kB10, kB15, kB3500,
    kB4000, kB4500, kB5000, kB5500, kB6000, kB6500,
    kB7000, kB7500, kB8000, kB9000, kB10000, kB11000, kB12000,
    kB13000, kB14000, kB15000, kB16000, kB17000, kB18000,
    kB19000, kB20000, kB25000, kB30000, kB35000, kB40000
}

T-Reordering ::= ENUMERATED {
    ms0, ms5, ms10, ms15, ms20, ms25, ms30, ms35,
    ms40, ms45, ms50, ms55, ms60, ms65, ms70,
    ms75, ms80, ms85, ms90, ms95, ms100, ms110,
    ms120, ms130, ms140, ms150, ms160, ms170,
    ms180, ms190, ms200, ms1600-v1310
}

T-StatusProhibit ::= ENUMERATED {
    ms0, ms5, ms10, ms15, ms20, ms25, ms30, ms35,
    ms40, ms45, ms50, ms55, ms60, ms65, ms70,
    ms75, ms80, ms85, ms90, ms95, ms100, ms105,
    ms110, ms115, ms120, ms125, ms130, ms135,
    ms140, ms145, ms150, ms155, ms160, ms165,
    ms170, ms175, ms180, ms185, ms190, ms195,
    ms200, ms205, ms210, ms215, ms220, ms225,
    ms230, ms235, ms240, ms245, ms250, ms300,
    ms350, ms400, ms450, ms500, ms800-v1310,
    ms1000-v1310, ms1200-v1310, ms1600-v1310, ms2000-v1310,
    ms2400-v1310, spare2,
    spare1
}

-- ASN1STOP
**RLC-Config field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dl-extended-RLC-LI-Field, ul-extended-RLC-LI-Field</td>
<td>Indicates the RLC LI field size. Value TRUE means that 15 bit LI length shall be used, otherwise 11 bit LI length shall be used; see TS 36.322 [7]. E-UTRAN enables this field only when RLC-Config (without suffix) is set to am.</td>
</tr>
<tr>
<td>maxRetxThreshold</td>
<td>Parameter for RLC AM in TS 36.322 [7]. Value t1 corresponds to 1 retransmission, t2 to 2 retransmissions and so on.</td>
</tr>
<tr>
<td>poliByte</td>
<td>Parameter for RLC AM in TS 36.322 [7]. Value kB25 corresponds to 25 kBytes, kB50 to 50 kBytes and so on. kBInfinity corresponds to an infinite amount of kBytes. In case poliByte-r14 is signalled, the UE shall ignore poliByte (i.e. without suffix).</td>
</tr>
<tr>
<td>poliPDU</td>
<td>Parameter for RLC AM in TS 36.322 [7]. Value p4 corresponds to 4 PDUs, p8 to 8 PDUs and so on. pInfinity corresponds to an infinite number of PDUs. In case poliPDU-v13 is signalled, the UE shall ignore poliPDU (i.e. without suffix). E-UTRAN enables poliPDU-v1310 field only when RLC-Config (without suffix) is set to am.</td>
</tr>
<tr>
<td>rlc-OutOfOrderDelivery</td>
<td>Indicates that out-of-order delivery from RLC to PDCP is configured for this RLC entity as specified in TS 36.322 [7].</td>
</tr>
<tr>
<td>sn-FieldLength</td>
<td>Indicates the UM RLC SN field size, see TS 36.322 [7], in bits. Value size5 means 5 bits, size10 means 10 bits.</td>
</tr>
<tr>
<td>t-PollRetransmit</td>
<td>Timer for RLC AM in TS 36.322 [7], in milliseconds. Value ms5 means 5ms, ms10 means 10ms and so on. EUTRAN configures values msX-v1310 (with suffix) only if UE supports CE.</td>
</tr>
<tr>
<td>t-Reordering</td>
<td>Timer for reordering in TS 36.322 [7], in milliseconds. Value ms0 means 0ms and behaviour as specified in 7.3.2 applies, ms5 means 5ms and so on.</td>
</tr>
<tr>
<td>t-StatusProhibit</td>
<td>Timer for status reporting in TS 36.322 [7], in milliseconds. Value ms0 means 0ms and behaviour as specified in 7.3.2 applies, ms5 means 5ms and so on. EUTRAN configures values msX-v1310 (with suffix) only if UE supports operation in CE.</td>
</tr>
<tr>
<td>ul-extended-RLC-AM-SN, dl-extended-RLC-AM-SN</td>
<td>Indicates whether or not the UE shall use the extended SN and SO length for AM bearer. Value TRUE means that 16 bit SN length and 16 bit SO length shall be used, otherwise 10 bit SN length and 15 bit SO length shall be used; see TS 36.322 [7].</td>
</tr>
</tbody>
</table>

---

**RLF-TimersAndConstants**

The IE RLF-TimersAndConstants contains UE specific timers and constants applicable for UEs in RRC_CONNECTED.

**RLF-TimersAndConstants information element**

```asn1
RLF-TimersAndConstants-r9 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    t301-r9 ENUMERATED {
      ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000,
    }
    t310-r9 ENUMERATED {
      ms0, ms50, ms100, ms200, ms500, ms1000, ms2000,
    }
    n310-r9 ENUMERATED {
      n1, n2, n3, n4, n6, n8, n10, n20,
    }
    t311-r9 ENUMERATED {
      ms1000, ms3000, ms5000, ms10000, ms15000, ms20000, ms30000,
    }
    n311-r9 ENUMERATED {
      n1, n2, n3, n4, n5, n6, n8, n10,
    }
  }
}

RLF-TimersAndConstants-r13 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    t301-v1310 ENUMERATED {
      ms2500, ms3000, ms3500, ms4000, ms5000, ms6000, ms8000, ms10000,
    }
    t310-v1330 ENUMERATED {ms4000, ms6000} OPTIONAL  -- Need ON
  }
}
```
**RLF-TimersAndConstants field descriptions**

**n3xy**
Constants are described in section 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on.

**t3xy**
Timers are described in section 7.3. Value ms0 corresponds with 0 ms, ms50 corresponds with 50 ms and so on. E-UTRAN configures RLF-TimersAndConstants-r13 only if UE supports ce-ModeB. UE shall use the extended values t3xy-v1310 and t3xy-v1330, if present, and ignore the values signaled by t3xy-r9.

---

**RN-SubframeConfig**

The IE **RN-SubframeConfig** is used to specify the subframe configuration for an RN.

**RN-SubframeConfig information element**

```asn1
RN-SubframeConfig-r10 ::=  SEQUENCE {
  subframeConfigPattern-r10  CHOICE {
    subframeConfigPatternFDD-r10  BIT STRING (SIZE(8)),
    subframeConfigPatternTDD-r10  INTEGER (0..31)  OPTIONAL,  -- Need ON
  }
  rpdcch-Config-r10    SEQUENCE {
    resourceAllocationType-r10  ENUMERATED {
      type0, type1, type2Localized, type2Distributed,
      spare4, spare3, spare2, spare1,
    },
    resourceBlockAssignment-r10  CHOICE {
      type01-r10       CHOICE {
        nrb6-r10       BIT STRING (SIZE(6)),
        nrb15-r10       BIT STRING (SIZE(8)),
        nrb25-r10       BIT STRING (SIZE(13)),
        nrb50-r10       BIT STRING (SIZE(17)),
        nrb75-r10       BIT STRING (SIZE(19)),
        nrb100-r10      BIT STRING (SIZE(25))
      },
      type2-r10       CHOICE {
        nrb6-r10       BIT STRING (SIZE(5)),
        nrb15-r10       BIT STRING (SIZE(7)),
        nrb25-r10       BIT STRING (SIZE(9)),
        nrb50-r10       BIT STRING (SIZE(11)),
        nrb75-r10       BIT STRING (SIZE(12)),
        nrb100-r10      BIT STRING (SIZE(13))
      },
    },
    demodulationRS-r10    CHOICE {
      interleaving-r10  ENUMERATED {crs},
      noInterleaving-r10  ENUMERATED {crs, dmrs}
    },
    pdsch-Start-r10     INTEGER (1..3),
    pucch-Config-r10    CHOICE {
      tdd        CHOICE {
        channelSelectionMultiplexingBundling  SEQUENCE {
          n1PUCCH-AN-List-r10  SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)
        },
      },
      fallbackForFormat3  SEQUENCE {
        n1PUCCH-AN-P0-r10    INTEGER (0..2047),
        n1PUCCH-AN-P1-r10    INTEGER (0..2047)  OPTIONAL  -- Need OR
      }
    }
  }
}
```
demodulationRS
Indicates which reference signals are used for R-PDCCH demodulation according to TS 36.216 [55, 7.4.1]. Value
interleaving corresponds to cross-interleaving and value noInterleaving corresponds to no cross-interleaving according
to TS 36.216 [55, 7.4.2 and 7.4.3].

n1PUCCH-AN-List
Parameter: $N_{\text{PUCCH}}^{(1)}$, see TS 36.216, [55, 7.5.1]. This parameter is only applicable for TDD. Configures PUCCH
HARQ-ACK resources if the RN is configured to use HARQ-ACK channel selection, HARQ-ACK multiplexing or
HARQ-ACK bundling.

n1PUCCH-AN-P0, n1PUCCH-AN-P1
Parameter: $N_{\text{PUCCH}}^{(P)}$, for antenna port P0 and for antenna port P1 respectively, see TS 36.216, [55, 7.5.1] for FDD
and [55, 7.5.2] for TDD.

pdsch-Start
Parameter: DL-StartSymbol, see TS 36.216 [55, Table 5.4-1].

resourceAllocationType
Represents the resource allocation used: type 0, type 1 or type 2 according to TS 36.213 [23, 7.1.6]. Value type0
corresponds to type 0, value type1 corresponds to type 1, value type2Localized corresponds to type 2 with localized
virtual resource blocks and type2Distributed corresponds to type 2 with distributed virtual resource blocks.

resourceBlockAssignment
Indicates the resource block assignment bits according to TS 36.213 [23, 7.1.6]. Value type01 corresponds to type 0
and type 1, and the value type2 corresponds to type 2. Value nrb6 corresponds to a downlink system bandwidth of
6 resource blocks, value nrb15 corresponds to a downlink system bandwidth of 15 resource blocks, and so on.

subframeConfigPatternFDD
Parameter: SubframeConfigurationFDD, see TS 36.216 [55, Table 5.2-1]. Defines the DL subframe configuration for
eNB-to-RN transmission, i.e. those subframes in which the eNB may indicate downlink assignments for the RN. The
radio frame in which the pattern starts (i.e. the radio frame in which the first bit of the subframeConfigPatternFDD
corresponds to subframe #0) occurs when SFN mod 4 = 0.

subframeConfigPatternTDD
Parameter: SubframeConfigurationTDD, see TS 36.216 [55, Table 5.2-2]. Defines the DL and UL subframe
configuration for eNB-RN transmission.

---

**RSS-Config**

The IE RSS-Config is used to specify the RSS configuration, see TS 36.211 [21].

**RSS-Config information element**

---

---

---
### RSS-Config field descriptions

**duration**
Duration of RSS in subframes. Value sf8 corresponds to 8 subframes, value sf16 corresponds to 16 subframes and so on.

**freqLocation**
Frequency location (lowest PRB number) of RSS.

**periodicity**
Periodicity of RSS. Value ms160 corresponds to 160 ms, value ms320 corresponds to 320 ms and so on.

**powerBoost**
Power offset of RSS relative to CRS in dB. Value dB0 corresponds to 0 dB, value dB3 corresponds to 3 dB, value dB4.8 corresponds to 4.8 dB and so on.

**timeOffset**
Time offset of RSS in frames. The actual value of time offset is based on the value of duration, as follows:
- For duration 160 ms, only value range 0 to 15 are applicable. Actual value = timeOffset * 1 frames.
- For duration 320 ms, actual value = timeOffset * 1 frames.
- For duration 640 ms, actual value = timeOffset * 2 frames.
- For duration 1280 ms, actual value = timeOffset * 4 frames.

---

### SchedulingRequestConfig

The IE `SchedulingRequestConfig` is used to specify the Scheduling Request related parameters

---

**SchedulingRequestConfig information element**

```
SchedulingRequestConfig ::=  CHOICE {
   release        NULL,
   setup        SEQUENCE {
      sr-PUCCH-ResourceIndex    INTEGER (0..2047),
      sr-ConfigIndex      INTEGER (0..157),
      dsr-TransMax      ENUMERATED {
         n4, n8, n16, n32, n64, spare3, spare2, spare1}
   }
}

SchedulingRequestConfig-v1020 ::= SEQUENCE {
   sr-PUCCH-ResourceIndexP1-r10  INTEGER (0..2047)   OPTIONAL  -- Need OR
}

SchedulingRequestConfigSCell-r13 ::=  CHOICE {
   release        NULL,
   setup        SEQUENCE {
      sr-PUCCH-ResourceIndex-r13   INTEGER (0..2047),
      sr-PUCCH-ResourceIndexP1-r13  INTEGER (0..2047)   OPTIONAL,  -- Need OR
      sr-ConfigIndex-r13     INTEGER (0..157),
      dsr-TransMax-r13     ENUMERATED {
         n4, n8, n16, n32, n64, spare3, spare2, spare1}
   }
}

SchedulingRequestConfig-v1530 ::= CHOICE {
   release        NULL,
   setup        SEQUENCE {
      sr-SlotSPUCCH-IndexFH-r15   INTEGER (0..1319)  OPTIONAL, -- Need OR
      sr-SlotSPUCCH-IndexNoFH-r15 INTEGER (0..3959)  OPTIONAL, -- Need OR
      sr-SubslotSPUCCH-ResourceList-r15 SR-SubslotSPUCCH-ResourceList-r15 OPTIONAL, -- Need OR
      sr-ConfigIndexSlot-r15    INTEGER (0..36)   OPTIONAL, -- Need OR
      dsr-TransMax-r15     ENUMERATED {
         n4, n8, n16, n32, n64, spare3, spare2, spare1}
   }
}

sr-SubslotSPUCCH-ResourceList-r15 ::= SEQUENCE (SIZE(1..4)) OF INTEGER (0..1319)
```

---
SchedulingRequestConfig field descriptions

- **dsr-TransMax**
  Parameter for SR transmission in TS 36.321 [6, 5.4.4]. The value n4 corresponds to 4 transmissions, n8 corresponds to 8 transmissions and so on. EUTRAN configures the same value for all serving cells for which this field is configured.

- **dssr-TransMax**
  Parameter for SPUCCH SR transmission in TS 36.321 [6], clause 5.4.4. EUTRAN configures the same value for all serving cells for which this field is configured.

- **sr-ConfigIndex, sr-ConfigIndexSlot, sr-ConfigIndexSubslot**
  Parameter $I_{\text{SR}}$. See TS 36.213 [23,10.1]. The values 156 and 157 are not applicable for Release 8.

- **sr-PUCCH-ResourceIndex, sr-PUCCH-ResourceIndexP1**
  Parameter $p_{\text{PUCCH,SR}}^{(l,p)}$ for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1]. E-UTRAN configures sr-PUCCH-ResourceIndexP1 only if sr-PUCCH-ResourceIndex is configured.

- **sr-SlotSPUCCH-IndexFH**
  Resource configuration for SR using slot-SPUCCH when frequency hopping is enabled, see TS 36.213 [23], clause 10.1.5.

- **sr-SlotSPUCCH-IndexNoFH**
  Resource configuration for SR using slot-SPUCCH when frequency hopping is disabled, see TS 36.213 [23], clause 10.1.5.

- **sr-SubslotSPUCCH-ResourceList**
  Resource configuration for SR using subslot-SPUCCH, see TS 36.213 [23], clause 10.1.5.

---

**SlotOrSubslotPDSCH-Config**

The IE *SlotOrSubslotPDSCH-Config* is used to specify the UE specific PDSCH configuration when sTTI is used.

**SlotOrSubslotPDSCH-Config** information element

```plaintext
-- ASN1START

SlotOrSubslotPDSCH-Config-r15 ::= CHOICE {
  release       NULL,
  setup       SEQUENCE {
    altCQI-TableSTTI-r15 ENUMERATED {
      allSubframes, csi-SubframeSet1,
      csi-SubframeSet2, spare1} OPTIONAL, -- Need OR
    altCQI-Table1024QAM-STTI-r15 ENUMERATED {
      allSubframes, csi-SubframeSet1,
      csi-SubframeSet2, spare1} OPTIONAL, -- Need OR
    resourceAllocation-r15 ENUMERATED {
      resourceAllocationType0,resourceAllocationType2} OPTIONAL, -- Need OR
    tbsIndexAlt-STTI-r15 ENUMERATED {a33} OPTIONAL, -- Need OR
    tbsIndexAlt2-STTI-r15 ENUMERATED {b33} OPTIONAL, -- Need OR
    tbsIndexAlt3-STTI-r15 ENUMERATED {a37} OPTIONAL, -- Need OR
    ...
  }
}

-- ASN1STOP
```
SlotOrSubslotPDSCH-Config field descriptions

\textbf{altCQI-TableSTTI, altCQI-Table1024QAM-STTI}

Indicates the applicability of the alternative CQI table (i.e. Table 7.2.3-2 and Table 7.2.3-4 in TS 36.213 [23]) for aperiodic CSI reporting for slot or subslot PDSCH for the concerned serving cell. Value \texttt{allSubframes} means the alternative CQI table applies to all the subframes and CSI processes, if configured, and value \texttt{csi-SubframeSet1} means the alternative CQI table applies to CSI subframe set1, and value \texttt{csi-SubframeSet2} means the alternative CQI table applies to CSI subframe set2. EUTRAN sets the value to \texttt{csi-SubframeSet1} or \texttt{csi-SubframeSet2} only if transmissionMode is set in range \texttt{tm1} to \texttt{tm9} and csi-SubframePatternConfig-r10 is configured for the concerned serving cell and different CQI tables apply to the two CSI subframe sets; otherwise EUTRAN sets the value to \texttt{allSubframes}. EUTRAN does not configure the same value for altCQI-TableSTTI-r15 and altCQI-Table-1024QAM-STTI-r15 in SlotOrSubslotPDSCH-Config-r15. EUTRAN does not configure altCQI-Table-1024QAM-STTI-r15 if the value of altCQI-TableSTTI-r15 is set to \texttt{allSubframes}. EUTRAN does not configure altCQI-TableSTTI-r15 and altCQI-Table-1024QAM-STTI-r15 are absent, the UE shall use Table 7.2.3-1 in TS 36.213 [23] for all subframes and CSI processes, if configured.

\textbf{resourceAllocation}

Parameter indicates resource allocation type for slot-PDSCH or subslot-PDSCH.

\textbf{tbsIndexAlt-STTI}

Indicates the applicability of the alternative TBS index for the $h_{33}$ (see TS 36.213 [23], Table 7.1.7.2.1-1) to all slots/subslots scheduled by DCI format 7-1F and 7-1G. Value \texttt{a33} refers to the alternative TBS index $h_{33}$A. If neither this field nor \texttt{tbsIndexAlt2-STTI} configures an alternative TBS index for $h_{33}$, the UE shall use $h_{33}$ specified in Table 7.1.7.2.1-1 in TS 36.213 [23] for all slots/subslots instead.

\textbf{tbsIndexAlt2-STTI}

Indicates the applicability of the alternative TBS index for the $h_{33}$ (see TS 36.213 [23], Table 7.1.7.2.1-1) to all slots/subslots scheduled by DCI format 7-1B/7-1C/7-1D. Value \texttt{b33} refers to the alternative TBS index $h_{33}$B. If neither this field nor \texttt{tbsIndexAlt-STTI} configures an alternative TBS index for $h_{33}$, the UE shall use $h_{33}$ specified in Table 7.1.7.2.1-1 in TS 36.213 [23] for all slots/subslots instead.

\textbf{tbsIndexAlt3-STTI}

Indicates the applicability of the alternative TBS index for the $h_{37}$ (see TS 36.213 [23], Table 7.1.7.2.1-1) to all slots/subslots scheduled by DCI format 7-1F/7-1G. Value \texttt{a37} refers to the alternative TBS index $h_{37}$A. If this field does not configure an alternative TBS index for $h_{37}$, the UE shall use $h_{37}$ specified in TS 36.213 [23], Table 7.1.7.2.1-1 for all slots/subslots instead.

\begin{table}[h]
\centering
\begin{tabular}{|l|}
\hline
\textbf{SlotOrSubslotPUSCH-Config} \tabularnewline \hline
\textbf{The IE \textit{SlotOrSubslotPUSCH-Config} is used to specify the UE specific PUSCH configuration when sTTI is used.} \tabularnewline \hline
\textbf{SlotOrSubslotPUSCH-Config information element} \tabularnewline \hline
\texttt{-- ASN1START} \tabularnewline
\texttt{SlotOrSubslotPUSCH-Config-r15 ::= CHOICE { release NULL, setup SEQUENCE { betaOffsetSlot-ACK-Index-r15 INTEGER(0..15) OPTIONAL, -- Need OR betaOffset2Slot-ACK-Index-r15 INTEGER(0..15) OPTIONAL, -- Need OR betaOffsetSubslot-ACK-Index-r15 SEQUENCE (SIZE(1..2)) OF INTEGER(0..15) OPTIONAL, -- Need OR betaOffset2Subslot-ACK-Index-r15 SEQUENCE (SIZE(1..2)) OF INTEGER(0..15) OPTIONAL, -- Need OR betaOffsetSlot-RI-Index-r15 INTEGER(0..15) OPTIONAL, -- Need OR betaOffsetSubslot-RI-Index-r15 SEQUENCE (SIZE(1..2)) OF INTEGER(0..15) OPTIONAL, -- Need OR betaOffsetSlot-CQI-Index-r15 INTEGER(0..15) OPTIONAL, -- Need OR betaOffsetSubslot-CQI-Index-r15 INTEGER(0..15) OPTIONAL, -- Need OR enable256QAM-SlotOrSubslot-r15 Enable256QAM-r14 OPTIONAL, -- Need ON resourceAllocationOffset-r15 INTEGER (1..2) OPTIONAL, -- Need OR ul-DMRS-IFDMA-SlotOrSubslot-r15 BOOLEAN, -- Need OR ... } \tabularnewline
\texttt{-- ASN1STOP} \tabularnewline
\end{tabular}
\end{table}
SlotOrSubslotPUSCH-Config field descriptions

betaOffsetSlot-ACK-Index, betaOffsetSubslot-ACK-Index, betaOffset2Slot-ACK-Index, betaOffset2Subslot-ACK-Index

Parameter: $I^{HARQ-ACK}_{\text{offset}}$ and $I^{HARQ-ACK}_{\text{offset,X}}$ for single codeword, see TS 36.213 [23], Table 8.6.3-1. If betaOffset2Slot-ACK-Index/betaOffset2Subslot-ACK-Index is configured; betaOffsetSlot-ACK-Index/betaOffsetSubslot-ACK-Index is used when up to 22 HARQ-ACK bits are transmitted otherwise betaOffset2Slot-ACK-Index/betaOffset2Subslot-ACK-Index is used. The values apply for all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send SPUCCH on the same cell in case SPUCCH SCell is configured) and not configured with uplink power control subframe sets. It is indicated in DCI format 7-0A/7-0B which of the two values taken by betaOffsetSubslot-ACK-Index-r15/betaOffset2Subslot-ACK-Index-r15/betaOffsetSubslot-RI-Index-r15 to use. The same value also applies for subframe set 1 of all serving cells with an uplink in that cell group and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell).

betaOffsetSlot-RI-Index, betaOffsetSubslot-RI-Index

Parameter: $I^{RI}_{\text{offset}}$, for single codeword, see TS 36.213 [23], Table 8.6.3-2. One value applies for subframe set 2 of all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send SPUCCH on the same cell in case SPUCCH SCell is configured) and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell configured with uplink power control subframe sets).

betaOffsetSlot-CQI-Index, betaOffsetSubslot-CQI-Index

Parameter: $I^{CQI}_{\text{offset}}$, for single codeword, see TS 36.213 [23], Table 8.6.3-3. One value applies for all serving cells with an uplink in a cell group (MCG or SCG or the group of cells configured to send SPUCCH on the same cell in case SPUCCH SCell is configured) and not configured with uplink power control subframe sets. The same value also applies for subframe set 1 of all serving cells with an uplink in that cell group and configured with uplink power control subframe sets (the associated functionality is common i.e. not performed independently for each cell).

enable256QAM-SlotOrSubslot

Indicates that 256QAM for slot or subslot is enabled, see TS 36.213 [23], clause 8.6.1.

resourceAllocationOffset

Indicates an RB resource allocation offset of 1 or 2 PRBs for slot-PUSCH or subslot-PUSCH. When the field is absent, the UE assumes no offset is used (i.e. offset = 0).

ul-DMRS-IFDMA-SlotOrSubslot

Value TRUE indicates that the UE is configured with enhanced UL DMRS.

### SoundingRS-UL-Config

The IE SoundingRS-UL-Config is used to specify the uplink Sounding RS configuration for periodic and aperiodic sounding.

#### SoundingRS-UL-Config information element

-- ASN1START

SoundingRS-UL-ConfigCommon ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    srs-BandwidthConfig ENUMERATED {bw0, bw1, bw2, bw3, bw4, bw5, bw6, bw7},
    srs-SubframeConfig ENUMERATED {sc0, sc1, sc2, sc3, sc4, sc5, sc6, sc7, sc8, sc9, sc10, sc11, sc12, sc13, sc14, sc15},
    ackNackSRS-SimultaneousTransmission BOOLEAN,
    srs-MaxUpPts ENUMERATED {true} OPTIONAL -- Cond TDD
  }
}

SoundingRS-UL-ConfigDedicated ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    srs-Bandwidth ENUMERATED {bw0, bw1, bw2, bw3},
    srs-HoppingBandwidth ENUMERATED {hbw0, hbw1, hbw2, hbw3},
    freqDomainPosition INTEGER (0..23),
    duration BOOLEAN,
    srs-ConfigIndex INTEGER (0..1023),
    transmissionComb INTEGER (0..1),
    cyclicShift ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
  }
}
SoundingRS-UL-ConfigDedicated-v1020 ::= SEQUENCE {
  srs-AntennaPort-r10     SRS-AntennaPort
}

SoundingRS-UL-ConfigDedicated-v1310 ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
    transmissionComb-v1310 INTEGER (2..3) OPTIONAL, -- Need OR
    cyclicShift-v1310   ENUMERATED {cs8, cs9, cs10, cs11} OPTIONAL, -- Need OR
    transmissionCombNum-r13 ENUMERATED {n2, n4} OPTIONAL -- Need OR
  }
}

SoundingRS-UL-ConfigDedicatedUpPTSExt-r13 ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
    srs-UpPTSAdd-r13     ENUMERATED {sym2, sym4},
    srs-HoppingBandwidth-r13 ENUMERATED {bw0, bw1, bw2, bw3},
    freqDomainPosition-r13 INTEGER (0..23),
    duration-r13 BOOLEAN,
    srs-ConfigIndex-r13  INTEGER (0..1023),
    transmissionComb-r13 INTEGER (0..3),
    cyclicShift-r13      ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, cs8, cs9, cs10, cs11},
    srs-AntennaPort-r13  SRS-AntennaPort,
    transmissionCombNum-r13 SRS-AntennaPort,
  }
}

SoundingRS-UL-ConfigDedicatedAperiodic-r10 ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
    srs-ActivateAp-r10    CHOICE {-- Need ON
      release        NULL,
      setup        SEQUENCE {
        srs-ConfigApDCI-Format0-r10 SRS-ConfigAp-r10,
        srs-ConfigApDCI-Format2-r10 SRS-ConfigAp-r10,
      }
    }
  }
}

SoundingRS-UL-ConfigDedicatedAperiodic-v1310 ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
    srs-ActivateAp-v1310  CHOICE {
      release        NULL,
      setup        SEQUENCE {
        srs-ConfigApDCI-Format0-v1310 SRS-ConfigAp-v1310,
        srs-ConfigApDCI-Format2-v1310 SRS-ConfigAp-v1310,
      }
    }
  }
}

SoundingRS-UL-ConfigDedicatedAperiodicUpPTSExt-r13 ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
    srs-UpPTSAdd-r13     ENUMERATED {sym2, sym4},
    srs-ConfigIndex-r13  INTEGER (0..31),
    srs-ConfigApDCI-Format4-r13 SEQUENCE (SIZE (1..3)) OF SRS-ConfigAp-r13 OPTIONAL,-- Need ON
    srs-ActivateAp-r13    CHOICE {
      release        NULL,
      setup        SEQUENCE {
        srs-ConfigApDCI-Format0-r13 SRS-ConfigAp-r13,
        srs-ConfigApDCI-Format2-r13 SRS-ConfigAp-r13,
      }
    }
  }
}
SoundingRS-UL-ConfigDedicatedAperiodic-v1430 ::= CHOICE{
  release NULL,
  setup SEQUENCE {
    srs-SubframeIndication-r14 INTEGER (1..4) OPTIONAL -- Need ON
  }
}

SRS-ConfigAp-r10 ::= SEQUENCE {
  srs-AntennaPortAp-r10 SRS-AntennaPort,
  srs-BandwidthAp-r10 ENUMERATED {bw0, bw1, bw2, bw3},
  freqDomainPositionAp-r10 INTEGER (0..23),
  transmissionCombAp-r10 INTEGER (0..1),
  cyclicShiftAp-r10 ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7}
}

SRS-ConfigAp-v1310 ::= SEQUENCE {
  transmissionCombAp-v1310 INTEGER (2..3) OPTIONAL, -- Need OR
  cyclicShiftAp-v1310 ENUMERATED {cs8, cs9, cs10, cs11} OPTIONAL, -- Need OR
  transmissionCombNum-r13 ENUMERATED {n2, n4} OPTIONAL -- Need OR
}

SRS-ConfigAp-r13 ::= SEQUENCE {
  srs-AntennaPortAp-r13 SRS-AntennaPort,
  srs-BandwidthAp-r13 ENUMERATED {bw0, bw1, bw2, bw3},
  freqDomainPositionAp-r13 INTEGER (0..23),
  transmissionCombAp-r13 INTEGER (0..3),
  cyclicShiftAp-r13 ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7, cs8, cs9, cs10, cs11},
  transmissionCombNum-r13 ENUMERATED {n2, n4}
}

SRS-AntennaPort ::= ENUMERATED {an1, an2, an4, spare1}

-- ASN1STOP
## SoundingRS-UL-Config field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Parameter Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ackNackSRS-SimultaneousTransmission</strong></td>
<td>Parameter: Simultaneous-AN-and-SRS, see TS 36.213 [23, 8.2]. For SCells without PUCCH configured, this field is not applicable and the UE shall ignore the value.</td>
</tr>
<tr>
<td><strong>cyclicShift, cyclicShiftAp</strong></td>
<td>Parameter: n, SRS for periodic and aperiodic sounding reference signal transmission respectively except for an LAA SCell. See TS 36.211 [21, 5.5.3.1], where cso corresponds to 0 etc.</td>
</tr>
<tr>
<td><strong>duration</strong></td>
<td>Parameter: Duration for periodic sounding reference signal transmission except for an LAA SCell. See TS 36.213 [21, 8.2]. FALSE corresponds to &quot;single&quot; and value TRUE to &quot;indefinite&quot;.</td>
</tr>
<tr>
<td><strong>freqDomainPosition, freqDomainPositionAp</strong></td>
<td>Parameter: nRC for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, 5.5.3.2].</td>
</tr>
<tr>
<td><strong>srs-AntennaPort, srs-AntennaPortAp</strong></td>
<td>Indicates the number of antenna ports used for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, 5.5.3]. UE shall release srs-AntennaPort if SoundingRS-UL-ConfigDedicated is released.</td>
</tr>
<tr>
<td><strong>srs-Bandwidth, srs-BandwidthAp</strong></td>
<td>Parameter: BRS for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, tables 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2-4]. For LAA SCell only bw0 is applied.</td>
</tr>
<tr>
<td><strong>srs-BandwidthConfig</strong></td>
<td>Parameter: SRS Bandwidth Configuration. See TS 36.211, [21, table 5.5.3.2-1, 5.5.3.2-2, 5.5.3.2-3 and 5.5.3.2-4]. Actual configuration depends on UL bandwidth. bw0 corresponds to value 0, bw1 to value 1 and so on.</td>
</tr>
<tr>
<td><strong>srs-HoppingBandwidth</strong></td>
<td>Parameter: SRS hopping bandwidth ( b_{hop} \in {0,1,2,3} ) for periodic sounding reference signal transmission except for an LAA SCell, see TS 36.211 [21, 5.5.3.2] where hbw0 corresponds to value 0, hbw1 to value 1 and so on.</td>
</tr>
<tr>
<td><strong>srs-MaxUpPts</strong></td>
<td>Parameter: srsMaxUpPts, see TS 36.211 [21, 5.5.3.2]. If this field is present, reconfiguration of ( m^\text{max}_{\text{SRS},0} ) applies for UpPts, otherwise reconfiguration does not apply.</td>
</tr>
<tr>
<td><strong>srs-SubframeConfig</strong></td>
<td>Parameter: SRS SubframeConfiguration except for an LAA SCell. See TS 36.211, [21, table 5.5.3.3-1] applies for FDD whereas TS 36.211 [21, table 5.5.3.3-2] applies for TDD. sc0 corresponds to value 0, sc1 corresponds to value 1 and so on.</td>
</tr>
<tr>
<td><strong>srs-SubframeIndication</strong></td>
<td>Parameter: SRS subframe indication in SRS parameter set configuration for aperiodic sounding reference signal transmission on an LAA SCell configured with uplink, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>srs-UpPtsAdd</strong></td>
<td>The field only applies for TDD and frame structure type 3, see TS 36.211 [21]. If E-UTRAN configures both soundingRS-UL-ConfigDedicatedUpPTEListExt and soundingRS-UL-ConfigDedicatedAperiodicPTEListExt srs-UpPtsAdd in both fields is set to the same value. If E-UTRAN configures soundingRS-UL-ConfigDedicatedUpPTEListExt r14 with a number of soundingRS-UL-ConfigDedicatedPTEListExt and/or soundingRS-UL-ConfigDedicatedAperiodicPTEListExt, srs-UpPtsAdd in all fields are set to the same value.</td>
</tr>
<tr>
<td><strong>transmissionComb, transmissionCombAp</strong></td>
<td>Parameter: ( \ell_{TC} \in {0..3} ) for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, 5.5.3.2].</td>
</tr>
</tbody>
</table>

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

**SPDCCH-Config**

The IE SPDCCH-Config is used to specify the UE specific SPDCCH configuration.
SPDCCH-Config information element

-- ASN1START

SPDCCH-Config-r15 ::= CHOICE {
  release     NULL,
  setup       SEQUENCE {
    spdcch-L1-ReuseIndication-r15 ENUMERATED {n0,n1,n2} OPTIONAL, -- Need OR
    spdcch-SetConfig-r15   SPDCCH-Set-r15 OPTIONAL -- Need OR
  }
}

SPDCCH-Set-r15 ::= SEQUENCE (SIZE (1..4)) OF SPDCCH-Elements-r15

SPDCCH-Elements-r15 ::= CHOICE {
  release     NULL,
  setup       SEQUENCE {
    spdcch-SetConfigId-r15    INTEGER (0..3)    OPTIONAL, -- Need OR
    spdcch-SetReferenceSig-r15 ENUMERATED {crs, dmrs} OPTIONAL, -- Need OR
    transmissionType-r15     ENUMERATED {localised, distributed} OPTIONAL, -- Need OR
    spdcch-NoOfSymbols-r15   INTEGER (1..2)     OPTIONAL, -- Need OR
    dmrs-ScramblingSequenceInt-r15 INTEGER (0..503) OPTIONAL, -- Need OR
    dci7-CandidatesPerAL-PDCCH-r15  DCI7-Candidates-r15 OPTIONAL, -- Need OR
    dci7-CandidateSetsPerAL-SPDCCH-r15 DCI7-CandidatesPerAL-SPDCCH-r15 OPTIONAL, -- Need OR
    resourceBlockAssignment-r15 numberRB-InFreq-domain-r15   INTEGER (2..100),
    resourceBlockAssignment-r15 BIT STRING (SIZE(98)) OPTIONAL, -- Need OR
  }
}

DCI7-Candidates-r15 ::=       INTEGER (0..6)

DCI7-CandidatesPerAL-SPDCCH-r15 ::=    SEQUENCE (SIZE(1..4)) OF DCI7-Candidates-r15

-- ASN1STOP
**SPDCCH-Config** field descriptions

**al-StartingPointSPDCCH**
Indicates the starting SCCE index for an aggregation level, see TS 36.213 [23], clause 9.1.6.

**dc7-Candidates**
Number of candidates in each aggregation level for DCI format 7. The number of PDCCH/SPDCCH candidate(s) M_DCI format 7^((L)) at aggregation level L for monitoring DCI format 7 in PDCCH and SPDCCH region shall conform to the following restriction:
- less than or equal to 2 for aggregation level 4 and 8,
- less than or equal to 6 for aggregation level 1 and 2

**dc7-CandidatesPerAL-SPDCCH**
SPDCCH candidates configured per aggregation level in SPDCCH region

**dmrs-ScramblingSeqSPDCCH**
The DMRS scrambling sequence initialization parameter A^{SPDCCH}_i defined in TS 36.211 [21], clause 6.10.3A.1.

**numberRB-InFreq-domain**
Indicates the number of resource-blocks in the frequency domain used for the SPDCCH set. There is no restriction on the number of RBs in the frequency domain that can be configured to an SPDCCH resource set (up to 100), but at least two need to be configured to contain at least one SCCE. The granularity of resource block allocation in frequency domain for configuring an SPDCCH resource set is one in case spdcch-SetReferenceSig-r15 is set to crs. The granularity of resource block allocation for configuring an SPDCCH resource set is two in case sPDCCH-SetReferenceSig-r15 is set to dmrs.

**rateMatchingMode**
Indicates, per resource-set, the mode of SPDCCH rate-matching operation
- Mode 1: UE rate-matches only around the DCI format 7 scheduling the slot or subslot PDSCH (if transmitted in thePDCCH resource-set), otherwise no rate-matching is performed for the RB set.
- Mode 2: UE rate-matches around the whole PDCCH resource set
- Mode 3: UE rate-matches around the whole SPDCCH resource set if DCI format 7 scheduling the slot or subslot PDSCH is found in the resource-set, otherwise no rate-matching is performed for the RB set.
- Mode 4: UE rate-matches around the whole SPDCCH resource set if DCI format 7 scheduling the slot or subslot PDSCH is not found in the resource-set, otherwise UE rate-matches only around the DCI format 7 scheduling the slot or subslot PDSCH (if transmitted in the SPDCCH resource-set)
If the DCI format 7 scheduling the slot or subslot PDSCH is found on a candidate belonging to two SPDCCH resource sets, the DCI format 7 is assumed to be found in both resource sets.

**spdcch-NoOfSymbols**
Indicates the number of OFDM symbols that the CRS based SPDCCH is mapped over.

**spdcch-L1-ReuseIndication**
For the up to two resource sets configured with the same subframeType applicability, the SPDCCH-L1-ReuselIndication defines the allowed combinations for the two resource sets: {1,1}, {2,0} or {0,2} corresponding to the values n0, n1 and n2 respectively. In case one resource set is configured, the allowed combinations are {2, 0} or {0,2} corresponding to n1 or n2. EUTRAN does not configure n0 in case one resource set is configured.

**spdcch-SetConfigId**
Indicates the ID of the SPDCCH set configured in SPDCCH-Elements. Maximum two sets can be configured for MBSFN and two for non-MBSFN.

**spdcch-SetReferenceSig**
Indicates CRS or DMRS based SPDCCH set.

**subframeType**
Indicates applicable subframe type(s) for the SPDCCH set. CRS-based SPDCCH is only applied to non-MBSFN subframe.

**subslotApplicability**
Indicates the set of subslots within the subframe where SPDCCH candidate set per aggregation levels applies, see DCI7-CandidateSetsPerAL-SPDCCH. The bitmap applies to the 5 DL subslot indices in a DL subframe. The first element in the sequence DCI7-CandidateSetsPerAL-SPDCCH applies to the indicated subslotApplicability. The second element in the sequence (if present) applies to the complement of the subslotApplicability.

**transmissionType**
Indicates whether distributed or localized SPDCCH transmission mode is used as defined in TS 36.211 [21], clause 6.8A.1.

---

**SPS-Config**
The IE SPS-Config is used to specify the semi-persistent scheduling configuration.
SPS-Config information element

-- ASN1START

SPS-Config ::= SEQUENCE {
    semiPersistSchedC-RNTI   C-RNTI     OPTIONAL,   -- Need OR
    sps-ConfigDL     SPS-ConfigDL   OPTIONAL,   -- Need ON
    sps-ConfigUL     SPS-ConfigUL   OPTIONAL   -- Need ON
}

SPS-Config-v1430 ::= SEQUENCE {
    ul-SPS-V-RNTI-r14     C-RNTI     OPTIONAL,   -- Need OR
    sl-SPS-V-RNTI-r14     C-RNTI     OPTIONAL,   -- Need OR
    sps-ConfigUL-STTI-ToAddModList-r14  SPS-ConfigUL-STTI-ToAddModList-r14 OPTIONAL, -- Need ON
    sps-ConfigUL-STTI-ToReleaseList-r14  SPS-ConfigUL-STTI-ToReleaseList-r14 OPTIONAL, -- Need ON
    sps-ConfigUL-ToAddModList-r14  SPS-ConfigUL-ToAddModList-r14  OPTIONAL, -- Need ON
    sps-ConfigUL-ToReleaseList-r14  SPS-ConfigUL-ToReleaseList-r14  OPTIONAL -- Need ON
}

SPS-ConfigUL-ToAddModList-r14 ::= SEQUENCE (SIZE (1..maxConfigSPS-r14)) OF SPS-ConfigUL

SPS-ConfigUL-ToReleaseList-r14 ::= SEQUENCE (SIZE (1..maxConfigSPS-r14)) OF SPS-ConfigUL-r14

SPS-ConfigUL-ToAddModList-r14 ::= SEQUENCE (SIZE (1..maxConfigSPS-r14)) OF SPS-ConfigIndex-r14

SPS-ConfigUL-ToReleaseList-r14 ::= SEQUENCE (SIZE (1..maxConfigSPS-r14)) OF SPS-ConfigIndex-r14

SPS-Config-v1530 ::= SEQUENCE {
    semiPersistSchedC-RNTI-r15  C-RNTI      OPTIONAL,   -- Need OR
    sps-ConfigDL     SPS-ConfigDL    OPTIONAL,   -- Need ON
    sps-ConfigUL-STTI-ToAddModList-r15 SPS-ConfigUL-STTI-ToAddModList-r15 OPTIONAL, -- Need ON
    sps-ConfigUL-STTI-ToReleaseList-r15 SPS-ConfigUL-STTI-ToReleaseList-r15 OPTIONAL, -- Need ON
    sps-ConfigUL-ToAddModList-r15  SPS-ConfigUL-ToAddModList-r15  OPTIONAL, -- Need ON
    sps-ConfigUL-ToReleaseList-r15  SPS-ConfigUL-ToReleaseList-r15  OPTIONAL -- Need ON
}

SPS-ConfigUL-STTI-ToAddModList-r15 ::= SEQUENCE (SIZE (1..maxConfigSPS-r15)) OF SPS-ConfigUL-STTI- r15

SPS-ConfigUL-STTI-ToReleaseList-r15 ::= SEQUENCE (SIZE (1..maxConfigSPS-r15)) OF SPS-ConfigUL-STTI- r15

SPS-ConfigUL-ToAddModList-r15 ::= SEQUENCE (SIZE (1..maxConfigSPS-r15)) OF SPS-ConfigUL-STTI- r15

SPS-ConfigUL-ToReleaseList-r15 ::= SEQUENCE (SIZE (1..maxConfigSPS-r15)) OF SPS-ConfigUL-STTI- r15

SPS-ConfigUL ::= CHOICE{
    release       NULL,
    setup       SEQUENCE {
        semiPersistSchedIntervalUL  ENUMERATED {
            sf10, sf20, sf32, sf40, sf64, sf80,
            sf128, sf160, sf320, sf640, spare4,
            spare5, spare6, spare7, spare8,
            spare9},
        numberOfConfSPS-Processes   INTEGER (1..8),
        n1PUCCH-AN-PersistentList   N1PUCCH-AN-PersistentList,
    }]
    [[ twoAntennaPortActivated-r10  CHOICE {
        release       NULL,
        setup       SEQUENCE {
            n1PUCCH-AN-PersistentListP1-r10 N1PUCCH-AN-PersistentList
        }
    }]
}

SPS-ConfigDL ::= CHOICE {
    release       NULL,
    setup       SEQUENCE {
        semiPersistSchedIntervalDL  ENUMERATED {
            sf10, sf20, sf32, sf40, sf64, sf80,
            sf128, sf160, sf320, sf640, spare4,
            spare5, spare6, spare7, spare8,
            spare9},
        numberOfConfSPS-Processes   INTEGER (1..8),
        n1PUCCH-AN-PersistentList   N1PUCCH-AN-PersistentList,
    }]
}
implicitReleaseAfter ENUMERATED {e2, e3, e4, e8},
p0-Persistent SEQUENCE {
p0-NominalPUSCH-Persistent INTEGER {-126..24},
p0-UE-PUSCH-Persistent INTEGER {-8..7}
} OPTIONAL, -- Need OP
twoIntervalsConfig ENUMERATED {true} OPTIONAL, -- Cond TDD
...[[ p0-PersistentSubframeSet2-r12 CHOICE {
release NULL,
setup SEQUENCE {
p0-NominalPUSCH-PersistentSubframeSet2-r12 INTEGER {-126..24},
p0-UE-PUSCH-PersistentSubframeSet2-r12 INTEGER {-8..7}
} OPTIONAL, -- Need OP
},
numberOfConfULSPS-Processes-r13 INTEGER (1..8) OPTIONAL -- Need OR
},
[[ fixedRV-NonAdaptive-r14 ENUMERATED {true} OPTIONAL, -- Need OR
semiPersistSchedIntervalUL-v1430 ENUMERATED {
sf50, sf100, sf200, sf300, sf400, sf500,
sf600, sf700, sf800, sf900, sf1000, spare5,
spare4, spare3, spare2, spare1} OPTIONAL -- Need OR
}],
[[ cyclicShiftSPS-r15 ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7} OPTIONAL, -- Need ON
-- eNote (TBC) that no separate STTI field is required (alike in merged CR)
haveProcID-Offset-r15 INTEGER (0..7) OPTIONAL, -- Need ON
rv-SPS-UL-Repetitions-r15 ENUMERATED {ulrvseq1, ulrvseq2, ulrvseq3} OPTIONAL, -- Need ON
totalNumberPUSCH-SPS-UL-Repetitions-r15 ENUMERATED {n2,n3,n4,n6} OPTIONAL, -- Need ON
sps-ConfigIndex-r15 SPS-ConfigIndex-r15 OPTIONAL -- Cond SPS
}]]
}
SPS-ConfigIndex-r14 ::= SEQUENCE {sps-ConfigIndex-r14,semiPersistSchedIntervalSL-r14 ENUMERATED {
sf20, sf50, sf100, sf200, sf300, sf400,
sf500, sf600, sf700, sf800, sf900, sf1000,
spare4, spare3, spare2, spare1}}SPS-ConfigIndex-r15 ::= INTEGER (1..maxConfigSPS-r15)N1PUCCH-AN-PersistentList ::= SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)N1SPUCCH-AN-PersistentList-r15 ::= SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)SPS-ConfigDL-STTI-r15 ::= CHOICE{
release NULL,
setup SEQUENCE {
semiPersistSchedIntervalDL-STTI-r15 ENUMERATED {
sTT16, sTT14, sTT13, sTT12, sTT18, sTT116,
sTT120, sTT140, sTT160, sTT180, sTT120, sTT1240,
spare2, spare1},
numberOfConfSPS-Processes-STTI-r15 INTEGER (1..12),
twoAntennaPortActivated-r15 CHOICE {
release NULL,
setup SEQUENCE {
N1SPUCCH-AN-PersistentListP1-r15 N1SPUCCH-AN-PersistentList-r15
} OPTIONAL, -- Need ON
sTT-StartTimeDL-r15 INTEGER (0..5),
tpc-PDCCH-ConfigPUCCH-SPS-r15 TPC-PDCCH-Config OPTIONAL, -- Need ON
}]
}
SPS-ConfigUL-STTI-r15 ::= CHOICE{
release NULL,
setup SEQUENCE {
}]}
semiPersistSchedIntervalUL-STTI-r15 ENUMERATED {
  sTTI1, sTTI2, sTTI3, sTTI4, sTTI6, sTTI8, sTTI12, sTTI16,
  sTTI20, sTTI40, sTTI60, sTTI80, sTTI120, sTTI240,
  spare2, spare1,
}
implicitReleaseAfter ENUMERATED {e2, e3, e4, e8},
p0-Persistent-r15 SEQUENCE {
p0-NominalSPUSCH-Persistent-r15 INTEGER (-126..24),
p0-UE-SPUSCH-Persistent-r15 INTEGER (-8..7)
} OPTIONAL, -- Need OP
twoIntervalsConfig-r15 ENUMERATED {true} OPTIONAL, -- Cond TDD
p0-PersistentSubframeSet2-r15 CHOICE {
  release NULL,
  setup SEQUENCE {
    p0-NominalSPUSCH-PersistentSubframeSet2-r15 INTEGER (-126..24),
    p0-UE-SPUSCH-PersistentSubframeSet2-r15 INTEGER (-8..7)
  } OPTIONAL, -- Need ON
}
numberOfConfUL-SPS-Processes-STTI-r15 INTEGER (1..12) OPTIONAL, -- Need OR
sTTI-StartSubframeUL-r15 INTEGER (0.5),
tpc-PDCCH-ConfigPUSCH-SPS-r15 TPC-PDCCH-Config OPTIONAL, -- Need ON
cyclicShiftSPS-sTTI-r15 ENUMERATED {cs0, cs1, cs2, cs3, cs4, cs5, cs6, cs7} OPTIONAL, -- Need ON
ifdma-Config-SPS-r15 BOOLEAN OPTIONAL, -- Need ON
harq-ProcID-offset-r15 INTEGER (0..15) OPTIONAL, -- Need ON
rv-SPS-STTI-UL-Repetitions-r15 ENUMERATED {ulrvseq1, ulrvseq2, ulrvseq3} OPTIONAL, -- Need ON
sps-ConfigIndex-r15 SPS-ConfigIndex-r15 OPTIONAL, -- Need OR
tbs-scalingFactorSubslotSPS-UL-Repetitions-r15 ENUMERATED {n6, n12} OPTIONAL, -- Need ON
totalNumberPUSCH-SPS-STTI-UL-Repetitions-r15 ENUMERATED {n2,n3,n4,n6} OPTIONAL, -- Need ON
...
SPS-Config field descriptions

cyclicShiftSPS, cyclicShiftSPS-sTTI,
Indicates the cyclic shift \( a^{(2)}_{\text{DMRS}} \) to be used for the UE-specific reference signal in case of UL SPS, see 3GPP TS 36.211 [5] clause 5.2.1.1.

fixedRV-NonAdaptive
If this field is present and skipUplinkTxSPS is configured, non-adaptive retransmissions on configured uplink grant uses redundancy version 0, otherwise the redundancy version for each retransmission is updated based on the sequence of redundancy versions as described in TS 36.321 [6].

harq-ProclD-offset
If configured, this field indicates the offset used in deriving the HARQ process IDs, see TS 36.321 [6], clause 5.4.1.

ldfma-Config-SPS
Indicates \( \sigma \) to be used for the UE-specific reference signal in case of UL SPS see 3GPP TS 36.211 [5], clause 5.2.1.1.

implicitReleaseAfter
Number of empty transmissions before implicit release, see TS 36.321 [6, 5.10.2]. Value e2 corresponds to 2 transmissions, e3 corresponds to 3 transmissions and so on. If skipUplinkTxSPS is configured, the UE shall ignore this field.

n1PUCCH-AN-PersistentList, n1PUCCH-AN-PersistentListP1
List of parameter: \( n^{(p)}_{\text{PUCCH}} \) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1]. Field n1-PUCCH-AN-PersistentListP1 is applicable only if the twoAntennaPortActivatedPUCCH-Format1a1b in PUCCH-ConfigDedicated-v1020 is set to true. Otherwise the field is not configured.

numberOfConfSPS-Processes
The number of configured HARQ processes for downlink Semi-Persistent Scheduling, see TS 36.321 [6].

numberOfConfSPS-Processes-sTTI
The number of configured HARQ processes for downlink Semi-Persistent Scheduling for sTTI in DL, see TS 36.321 [6].

numberOfConfUlSPS-Processes
The number of configured HARQ processes for uplink Semi-Persistent Scheduling, see TS 36.321 [6]. E-UTRAN always configures this field for asynchronous UL HARQ. Otherwise it does not configure this field.

numberOfConfUL-SPS-Processes-sTTI
The number of configured HARQ processes for uplink Semi-Persistent Scheduling for sTTI in UL, see TS 36.321 [6]. E-UTRAN always configures this field for asynchronous UL HARQ. Otherwise it does not configure this field.

p0-NominalPUSCH-Persistent, p0-NominalSPUSCH-Persistent
Parameter: \( P_{\text{LOPUSCH-NOMINAL}_P}^{(0)} \). See TS 36.213 [23, 5.1.1.1], unit dBm step 1. This field is applicable for persistent scheduling, only. If choice setup is used and p0-Persistent is absent, apply the value of p0-NominalPUSCH for p0-NominalPUSCH-Persistent. If uplink power control subframe sets are configured by tpc-SubframeSet, this field applies for uplink power control subframe set 1.

p0-NominalPUSCH-PersistentSubframeSet2, p0-NominalSPUSCH-PersistentSubframeSet2
Parameter: \( P_{\text{LOPUSCH-NOMINAL}_P}^{(0)} \). See TS 36.213 [23, 5.1.1.1], unit dBm step 1. This field is applicable for persistent scheduling, only. If p0-PersistentSubframeSet2-r12 is not configured, apply the value of p0-NominalPUSCH-SubframeSet2-r12 for p0-NominalPUSCH-PersistentSubframeSet2. E-UTRAN configures this field only if uplink power control subframe sets are configured by tpc-SubframeSet, in which case this field applies for uplink power control subframe set 2.

p0-UE-PUSCH-Persistent
Parameter: \( P_{\text{LOUE-PUSCH}}^{(0)} \). See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for persistent scheduling, only. If choice setup is used and p0-Persistent is absent, apply the value of p0-UE-PUSCH for p0-UE-PUSCH-Persistent. If uplink power control subframe sets are configured by tpc-SubframeSet, this field applies for uplink power control subframe set 1.

p0-UE-PUSCH-PersistentSubframeSet2
Parameter: \( P_{\text{LOUE-PUSCH}}^{(0)} \). See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for persistent scheduling, only. If p0-PersistentSubframeSet2-r12 is not configured, apply the value of p0-UE-PUSCH-SubframeSet2-r12 for p0-UE-PUSCH-PersistentSubframeSet2. E-UTRAN configures this field only if uplink power control subframe sets are configured by tpc-SubframeSet, in which case this field applies for uplink power control subframe set 2.

rv-SPS-sTTI-UL-Repetitions
Indicates the RV sequence of slot or subslot PUSCH for slot or subslot UL SPS repetitions. Value ulrvseq1= \( \{0, 0, 0, 0, 0, 0\} \), value ulrvseq2= \( \{0, 2, 3, 1, 0, 2\} \) and value ulrvseq3= \( \{0, 3, 0, 3, 0, 3\} \).

rv-SPS-UL-Repetitions
Indicates the RV sequence of PUSCH for subframe UL SPS repetitions. Value ulrvseq1= \( \{0, 0, 0, 0, 0, 0\} \), value ulrvseq2= \( \{0, 2, 3, 1, 0, 2\} \) and value ulrvseq3= \( \{0, 3, 0, 3, 0, 3\} \).

semiPersistSchedC-RNTI
Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].
### SPS-Config field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>semiPersistSchedIntervalDL</strong></td>
<td>Semi-persistent scheduling interval for downlink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames.</td>
</tr>
<tr>
<td><strong>semiPersistSchedIntervalDL-STTI</strong></td>
<td>Semi-persistent scheduling interval for sTTI in downlink, see TS 36.321 [6]. Value in number of sTTI. Value sTTI1 corresponds to a spacing of 1 sTTI interval, sTTI2 corresponds to 2 spacings of sTTI intervals and so on, e.g. sTTI1 equal to sub-slot of 2 symbols or 3 symbols when the type of 2OS sTTI is configured, or e.g. sTTI1 equal to slot of 7 symbols when type of 7OS sTTI is configured. For TDD, it is FFS.</td>
</tr>
<tr>
<td><strong>semiPersistSchedIntervalSL</strong></td>
<td>Semi-persistent scheduling interval in sidelink, see TS 36.321 [6]. Value in number of sub-frames. Value sf20 corresponds to 20 sub-frames, sf50 corresponds to 50 sub-frames and so on.</td>
</tr>
<tr>
<td><strong>semiPersistSchedIntervalUL</strong></td>
<td>Semi-persistent scheduling interval for uplink, see TS 36.321 [6]. Value in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. For TDD, when the configured Semi-persistent scheduling interval is greater than or equal to 10 sub-frames, the UE shall round this parameter down to the nearest integer (of 10 sub-frames), e.g. sf10 corresponds to 10 sub-frames, sf32 corresponds to 30 sub-frames, sf128 corresponds to 120 sub-frames. If <strong>semiPersistSchedIntervalUL-v1430</strong> is configured, the UE only considers this extension (and ignores <strong>semiPersistSchedIntervalUL</strong> i.e. without suffix).</td>
</tr>
<tr>
<td><strong>semiPersistSchedIntervalUL-STTI</strong></td>
<td>Semi-persistent scheduling interval for sTTI in uplink, see TS 36.321 [6]. Value in number of sTTI. Value sTTI1 corresponds to a spacing of 1 sTTI interval, sTTI2 corresponds to 2 spacings of sTTI intervals and so on, e.g. sTTI1 equal to sub-slot of 2 symbols or 3 symbols when the type of 2OS sTTI is configured, or e.g. sTTI1 equal to slot of 7 symbols when type of 7OS sTTI is configured. For TDD, it is FFS.</td>
</tr>
<tr>
<td><strong>sl-SPS-V-RNTI</strong></td>
<td>SL Semi-Persistent Scheduling V-RNTI for V2X sidelink communication, see TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>sps-ConfigIndex</strong></td>
<td>Indicates the index of one of multiple SL/UL SPS configurations.</td>
</tr>
<tr>
<td><strong>sps-ConfigDL-STTI</strong></td>
<td>If <strong>sps-ConfigDL-sTTI-r15</strong> is signalled, the UE ignores <strong>sps-ConfigDL</strong>.</td>
</tr>
<tr>
<td><strong>sps-ConfigSL-ToAddModList</strong></td>
<td>Indicates the SL SPS configurations to be added or modified, identified by <strong>SPS-ConfigIndex</strong>.</td>
</tr>
<tr>
<td><strong>sps-ConfigSL-ToReleaseList</strong></td>
<td>Indicates the SL SPS configurations to be released, identified by <strong>SPS-ConfigIndex</strong>.</td>
</tr>
<tr>
<td><strong>sps-ConfigUL-ToAddModList</strong></td>
<td>Indicates the UL SPS configurations to be added or modified, identified by <strong>SPS-ConfigIndex</strong>.</td>
</tr>
<tr>
<td><strong>sps-ConfigUL-ToReleaseList</strong></td>
<td>Indicates the UL SPS configurations to be released, identified by <strong>SPS-ConfigIndex</strong>.</td>
</tr>
<tr>
<td><strong>sTTI-StartTimeDL</strong></td>
<td>Indicates the DL sTTI index start of SPS (re-)initialization, see TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>sTTI-StartTimeUL</strong></td>
<td>Indicates the UL sTTI index start of SPS (re-)initialization, see TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>tbs-scalingFactorSubslotSPS-UL-Repetitions</strong></td>
<td>Indicates the TBS scaling factor of subslot PUSCH for UL SPS repetitions. Value n6 corresponds to 1/6 and value n12 corresponds to 1/12.</td>
</tr>
<tr>
<td><strong>totalNumberPUSCH-SPS-STTI-UL-Repetitions</strong></td>
<td>Indicates the total number of UL transmissions for slot or subslot UL SPS repetitions. If the UE is configured with UL SPS and the configured number of SPS PUSCH transmissions k&gt;1, simultaneous transmission of PUSCH and PUCCH is not configured.</td>
</tr>
<tr>
<td><strong>totalNumberPUSCH-SPS-UL-Repetitions</strong></td>
<td>Indicates the total number of UL transmissions for subframe UL SPS repetitions. If the UE is configured with UL SPS and the configured number of SPS PUSCH transmissions k&gt;1, simultaneous transmission of PUSCH and PUCCH is not configured.</td>
</tr>
<tr>
<td><strong>tpc-PDCCH-ConfigPUCCH-SPS</strong></td>
<td>PDCCH configuration for power control of slot/subslot-PUCCH using format 3/3A, see TS 36.212 [22], when <strong>SPS-ConfigDL-STTI</strong> is configured.</td>
</tr>
<tr>
<td><strong>tpc-PDCCH-ConfigPUSCH-SPS</strong></td>
<td>PDCCH configuration for power control of slot/subslot-PUSCH using format 3/3A, see TS 36.212 [22], when <strong>SPS-ConfigUL-STTI</strong> is configured. If a UE is configured with multiple UL SPS configurations in a serving cell, the same TPC index for DCI format 3/3A applies to all the UL SPS configurations in the serving cell.</td>
</tr>
</tbody>
</table>
SPS-Config field descriptions

twoIntervalsConfig
Trigger of two-intervals-Semi-Persistent Scheduling in uplink. See TS 36.321 [6, 5.10]. If this field is present and the configured Semi-persistent scheduling interval greater than or equal to 10 sub-frames, two-intervals-SPS is enabled for uplink. Otherwise, two-intervals-SPS is disabled.

ul-SPS-V-RNTI
UL Semi-Persistent Scheduling V-RNTI for UEs capable of multiple uplink SPS configurations and which support V2X communication, see TS 36.321 [6].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>This field is optional present for TDD, need OR; it is not present for FDD and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>SPS</td>
<td>This field is optional present if sps-ConfigIndex-r14 is not configured, need OR; otherwise it is not present.</td>
</tr>
</tbody>
</table>

-- SPUCCH-Config

The IE SPUCCH-Config is used to specify the UE specific SPUCCH configuration.

SPUCCH-Config information element

--- ASN1START

SPUCCH-Config-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    spucch-Set-r15 SPUCCH-Set-r15 OPTIONAL, -- Need ON
    twoAntennaPortActivatedSPUCCH-Format1ab-r15 ENUMERATED {true} OPTIONAL, -- Need OR
    twoAntennaPortActivatedSPUCCH-Format3-r15 SEQUENCE {
      n3SPUCCH-AN-List-r15 SEQUENCE (SIZE (1..4)) OF INTEGER (0..549)
    }
  }
}

SPUCCH-Elements-r15 ::= SEQUENCE (SIZE (1..4)) OF SPUCCH-Elements-r15

SPUCCH-Elements-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    n1SubslotSPUCCH-AN-List-r15 SEQUENCE (SIZE(1..4)) OF INTEGER (0..1319) OPTIONAL, -- Need OR
    n1SlotSPUCCH-AN-List-r15 INTEGER (0..1319) OPTIONAL, -- Need OR
    n1SlotSPUCCH-NoFH-AN-List-r15 INTEGER (0..3959) OPTIONAL, -- Need OR
    n3SPUCCH-AN-List-r15 INTEGER (0..549) OPTIONAL, -- Need OR
    n4SPUCCHSet-Resource-r15 SEQUENCE (SIZE (1..2)) OF N4SPUCCH-Resource-r15 OPTIONAL, -- Need OR
    n4SPUCCHSubslot-Resource-r15 SEQUENCE (SIZE (1..2)) OF N4SPUCCH-Resource-r15 OPTIONAL, -- Need OR
    n4maxCoderateSlotPUCCH-r15 INTEGER (0..7) OPTIONAL, -- Need OR
    n4maxCoderateSubslotPUCCH-r15 INTEGER (0..7) OPTIONAL, -- Need OR
    n4maxCoderateMultiResourceSlotPUCCH-r15 INTEGER (0..7) OPTIONAL, -- Need OR
    n4maxCoderateMultiResourceSubslotPUCCH-r15 INTEGER (0..7) OPTIONAL -- Need OR
  }
}

N4SPUCCH-Resource-r15 ::= SEQUENCE {
  n4startingPRB-r15 INTEGER (0..109),
  n4numberOfPRB-r15 INTEGER (0..7)
}

--- ASN1STOP
### S/PUCCH-Config field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_{1})SlotSPUCCH-FH-AN-List</td>
<td>Resource configuration for slot-SPUCCH format 1 when frequency hopping is enabled. Parameter: ( n_{SPUCCH}^{(1,p)} ) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23], section 10.1.</td>
</tr>
<tr>
<td>( n_{1})SlotSPUCCH-NoFH-AN-List</td>
<td>Resource configuration for slot-SPUCCH format 1 when frequency hopping is disabled. Parameter: ( n_{SPUCCH}^{(3,p)} ) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23], section 10.1.</td>
</tr>
<tr>
<td>( n_{1})SubslotSPUCCH-AN-List</td>
<td>Resource configuration for subslot-SPUCCH format 1. Parameter: ( n_{SPUCCH}^{(1)} ) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23], section 10.1.</td>
</tr>
<tr>
<td>( n_{3})SPUCCH-AN-List</td>
<td>Resource index for slot-SPUCCH format 3: ( n_{SPUCCH}^{(3)} ), see TS 36.213 [23], section 10.1.</td>
</tr>
<tr>
<td>( n_{max})CoderateSlotPUCCH, ( n_{max})CoderateSubslotPUCCH</td>
<td>Indicates the maximum coding rate for slot-PUCCH and subslot-PUCCH format 4 transmission.</td>
</tr>
<tr>
<td>( n_{max})CoderateMultiResourceSlotPUCCH, ( n_{max})CoderateMultiResourceSubslotPUCCH</td>
<td>Indicates the maximum coding rate for slot-PUCCH and subslot-PUCCH format 4 transmission in case of multiple resource configuration.</td>
</tr>
<tr>
<td>( n_{4})NumberOIPRB, ( n_{4})NumberOIPRBSubslot</td>
<td>Parameter ( n_{SPUCCH}^{(4)} ) see TS 36.213 [23], Table 10.1.1.2 for determining SPUCCH resource(s) of SPUCCH format 4.</td>
</tr>
<tr>
<td>( n_{4})StartingPRB</td>
<td>Parameter ( n_{SPUCCH}^{(4)} ) see TS 36.211 [21], section 5.4A.3 for determining SPUCCH resource(s) of SPUCCH format 4.</td>
</tr>
<tr>
<td>TwoAntennaPortActivatedSPUCCH-Format1a1b</td>
<td>Indicates whether two antenna ports are configured for SPUCCH format 1a/1b for HARQ-ACK, see TS 36.213 [23], section 10.1. The field also applies for SPUCCH format 1a/1b transmission when format3 is configured, see TS 36.213 [23], sections 10.1.2.2.2 and 10.1.3.2.2.</td>
</tr>
<tr>
<td>TwoAntennaPortActivatedSPUCCH-Format3</td>
<td>Indicates whether two antenna ports are configured for SPUCCH format 3 for HARQ-ACK, see TS 36.213 [23], section 10.1.</td>
</tr>
</tbody>
</table>

---

### SRS-TPC-PDCCH-Config

The IE \( SRS-TPC-PDCCH-Config \) is used to specify the RNTIs and indexes for A-SRS trigger and TPC according to TS 36.212 [22].

#### SRS-TPC-PDCCH-Config information element

```asn1
-- ASN1START
SRS-TPC-PDCCH-Config-r14 ::=     CHOICE {
    release        NULL,
    setup        SEQUENCE {
        srs-TPC-RNTI-r14         BIT STRING (SIZE (16)),
        startingBitOfFormat3B-r14       INTEGER (0..31),
        fieldTypeFormat3B-r14        INTEGER (1..4),
        srs-CC-SetIndexlist-r14     SEQUENCE (SIZE(1..4)) OF SRS-CC-SetIndex-r14 OPTIONAL -- Cond SRS-Trigger-TypeA
    } }

SRS-CC-SetIndex-r14 ::=     SEQUENCE { cc-SetIndex-r14 INTEGER (0..3),
                         cc-IndexInOneCC-Set-r14 INTEGER (0..7) }
-- ASN1STOP
```
### SRS-TPC-PDCCH-Config field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cc-IndexInOneCC-Set</td>
<td>Indicates the CC index in one CC set for Type A associated with the group DCI with SRS request field (optional) and TPC commands for a PUSCH-less SCell</td>
</tr>
<tr>
<td>cc-SetIndex</td>
<td>Indicates the CC set index for Type A associated with the group DCI with SRS request field (optional) and TPC commands for a PUSCH-less SCell.</td>
</tr>
<tr>
<td>fieldTypeFormat3B</td>
<td>The type of a field within the group DCI with SRS request fields (optional) and TPC commands for a PUSCH-less SCell, which indicates how many bits in the field are for SRS request (0 or 1/2) and how many bits in the field are for TPC (1 or 2). Note that for Type A, there is a common SRS request field for all SCells in the set, but each SCell has its own TPC command bits. See TS 36.212 [22, 5.3.3.1.7A]. EUTRAN configures this field with the same value for all PUSCH-less SCells.</td>
</tr>
<tr>
<td>srs-CC-SetIndexList</td>
<td>Indicates the index of the SRS-TPC-PDCCH-Config for Type A trigger by the group DCI with SRS request field (optional) and TPC commands for a PUSCH-less SCell. Each set may contain at most 8 CCs.</td>
</tr>
<tr>
<td>srs-TPC-RNTI</td>
<td>RNTI for SRS trigger and power control using DCI format 3B, see TS 36.212 [22, 5.1.3.1].</td>
</tr>
<tr>
<td>startingBitOfFormat3B</td>
<td>The starting bit position of a block within the group DCI with SRS request fields (optional) and TPC commands for a PUSCH-less SCell.</td>
</tr>
</tbody>
</table>

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRS-Trigger-TypeA</td>
<td>The field is mandatory present if typeA-SRS-TPC-PDCCH-Group-r14 is present. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

### TDD-Config

The IE TDD-Config is used to specify the TDD specific physical channel configuration.

#### TDD-Config information element

```asn1
-- ASN1START
TDD-Config ::= SEQUENCE {
  subframeAssignment ENUMERATED {
    sa0, sa1, sa2, sa3, sa4, sa5, sa6},
  specialSubframePatterns ENUMERATED {
    ssp0, ssp1, ssp2, ssp3, ssp4, ssp5, ssp6, ssp7, ssp8}
}
TDD-Config-v1130 ::= SEQUENCE {
  specialSubframePatterns-v1130 ENUMERATED {ssp7, ssp9}
}
TDD-Config-v1430 ::= SEQUENCE {
  specialSubframePatterns-v1430 ENUMERATED {ssp10}
}
TDD-Config-v1450 ::= SEQUENCE {
  specialSubframePatterns-v1450 ENUMERATED {ssp10-CRS-LessDwPTS}
}
TDD-ConfigSL-r12 ::= SEQUENCE {
  subframeAssignmentSL-r12 ENUMERATED {
    none, sa0, sa1, sa2, sa3, sa4, sa5, sa6}
}
SubframeAssignment-r15 ::= ENUMERATED {sa0, sa1, sa2, sa3, sa4, sa5, sa6}
-- ASN1STOP
```
**specialSubframePatterns**
Indicates Configuration as in TS 36.211 [21, table 4.2-1] where ssp0 points to Configuration 0, ssp1 to Configuration 1 etc. Value ssp7 points to Configuration 7 for extended cyclic prefix, value ssp9 points to Configuration 9 for normal cyclic prefix and value ssp10 points to Configuration 10 for normal cyclic prefix. Value ssp10-CRS-LessDwPTS corresponds to ssp10 without CRS transmission on the 5th symbol of DwPTS. E-UTRAN signals ssp7 only when setting specialSubframePatterns (without suffix i.e. the version defined in REL-8) to ssp4. E-UTRAN signals value ssp9 only when setting specialSubframePatterns (without suffix) to ssp5. E-UTRAN signals value ssp10 only when setting specialSubframePatterns (without suffix) to ssp0 or ssp5. If specialSubframePatterns-v1130, specialSubframePatterns-v1430, or specialSubframePatterns-v1450 is present, the UE shall ignore specialSubframePatterns (without suffix). If specialSubframePatterns-v1430 or specialSubframePatterns-v1450 is present, the UE shall ignore specialSubframePatterns-v1130. E-UTRAN does not simultaneously configure TDD-Config-v1430 and TDD-Config-v1450.

**subframeAssignment**
Indicates DL/UL subframe configuration where sa0 points to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2-2]. E-UTRAN configures the same value for serving cells residing on same frequency band.

**subframeAssignmentSL**
Indicates UL/ DL subframe configuration where sa0 points to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2-2]. The value none means that no TDD specific physical channel configuration is applicable (i.e. the carrier on which MasterInformationBlock-SL is transmitted is an FDD UL carrier or the carrier on which MasterInformationBlock-SL-V2X is transmitted is a carrier for V2X sidelink communication).

---

**TimeAlignmentTimer**
The IE **TimeAlignmentTimer** is used to control how long the UE considers the serving cells belonging to the associated TAG to be uplink time aligned. Corresponds to the Timer for time alignment in TS 36.321 [6]. Value in number of sub-frames. Value sf500 corresponds to 500 sub-frames, sf750 corresponds to 750 sub-frames and so on.

**TimeAlignmentTimer information element**

```plaintext
-- ASN1START
TimeAlignmentTimer ::= ENUMERATED { sf500, sf750, sf1280, sf1920, sf2560, sf5120, sf10240, infinity }
-- ASN1STOP
```

---

**TimeReferenceInfo**

**TimeReferenceInfo information elements**

```plaintext
-- ASN1START
TimeReferenceInfo-r15 ::= SEQUENCE {
  time-r15 ReferenceTime-r15, OPTIONAL, -- Need OR
  uncertainty-r15 INTEGER (0..12), OPTIONAL, -- Need OR
  timeInfoType-r15 ENUMERATED {localClock} OPTIONAL, -- Cond TimeRef
  referenceSFN-r15 INTEGER (0..1023) OPTIONAL
}

ReferenceTime-r15 ::= SEQUENCE {
  refDays-r15 INTEGER (0..72999),
  refSeconds-r15 INTEGER (0..86399),
  refMilliSeconds-r15 INTEGER (0..999),
  refQuarterMicroSeconds-r15 INTEGER (0..3999)
}

-- ASN1STOP
```
**TimeReferenceInfo field descriptions**

*referenceSFN*
This field indicates the reference SFN for time reference information. The *time* field indicates the time at the ending boundary of the SFN indicated by *referenceSFN*.

If the *time* field is included in *SystemInformationBlockType16* and the *referenceSFN* field is not included, the *time* field indicates the time at the SFN boundary at or immediately after the ending boundary of the SI-window in which *SystemInformationBlockType16* is transmitted.

*time, timeInfoType*
This field indicates time reference with 0.25 us granularity. The indicated time is referenced at the network, i.e., without compensating for RF propagation delay. The indicated time in 0.25 us unit from the origin is \( \text{refDays} \times 86400 \times 1000 \times 4000 + \text{refSeconds} \times 1000 \times 4000 + \text{refMilliseconds} \times 4000 + \text{refQuarterMicroSeconds} \). The *refDays* field specifies the sequential number of days (with day count starting at 0) from the origin of the *time* field. If *timeInfoType* is not included, the origin of the *time* field is 00:00:00 on Gregorian calendar date 6 January, 1980 (start of GPS time). If *timeInfoType* is set to *localClock*, the interpretation of the origin of the *time* is unspecified and left up to upper layers.

If *time* field is included in *SystemInformationBlockType16*, this field is excluded when estimating changes in system information, i.e. changes of *time* should neither result in system information change notifications nor in a modification of *systemInfoValueTag* in SIB1.

*uncertainty*
This field indicates the number of LSBs which may be inaccurate in the *refQuarterMicroSeconds* field. If *uncertainty* is absent, the uncertainty of *refQuarterMicroSeconds* is not specified.

---

### Conditional presence

<table>
<thead>
<tr>
<th>TimeRef</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The field is mandatory present if <em>TimeReferenceInfo</em> is included in <em>DLInformationTransfer</em> message; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**TPC-PDCCH-Config**

The IE *TPC-PDCCH-Config* is used to specify the RNTIs and indexes for PUCCH and PUSCH power control according to TS 36.212 [22]. The power control function can either be setup or released with the IE.

**TPC-PDCCH-Config information element**

```asn1
-- ASN1START
TPC-PDCCH-Config ::=     CHOICE {
  release       NULL,
  setup         SEQUENCE {
    tpc-RNTI      BIT STRING (SIZE (16)),
    tpc-Index     TPC-Index
  } }

TPC-PDCCH-ConfigSCell-r13 ::=     CHOICE {
  release       NULL,
  setup         SEQUENCE {
    tpc-Index-PUCCH-SCell-r13  TPC-Index
  } }

TPC-Index ::=     CHOICE {
  indexOfFormat3       INTEGER (1..15),
  indexOfFormat3A      INTEGER (1..31)
}  

-- ASN1STOP
```
TPC-PDCCH-Config field descriptions

indexOfFormat3
- Index of N when DCI format 3 is used. See TS 36.212 [22, 5.3.3.1.6].

IndexOfFormat3A
- Index of M when DCI format 3A is used. See TS 36.212 [22, 5.3.3.1.7].

tpc-Index
- Index of N or M, see TS 36.212 [22, 5.3.3.1.6 and 5.3.3.1.7], where N or M is dependent on the used DCI format (i.e. format 3 or 3a).

tpc-Index-PUCCH-SCell
- Index of N or M, see TS 36.212 [22, 5.3.3.1.6 and 5.3.3.1.7], where N or M is dependent on the used DCI format (i.e. format 3 or 3a).

tpc-RNTI
- RNTI for power control using DCI format 3/3A, see TS 36.212 [22].

TunnelConfigLWIP

The IE TunnelConfigLWIP is used to setup/release LWIP Tunnel.

-- ASN1START
TunnelConfigLWIP-r13 ::= SEQUENCE {
ip-Address-r13   IP-Address-r13,
ike-Identity-r13   IKE-Identity-r13,
...,
[ [ lwip-Counter-r13 INTEGER (0..65535)  OPTIONAL -- Cond LWIP-Setup ]]}
IKE-Identity-r13 ::= SEQUENCE {
idI-r13     OCTET STRING 
}
ip-Address-r13 ::= CHOICE {
ipv4-r13     BIT STRING (SIZE (32)),
ipv6-r13     BIT STRING (SIZE (128))
}
-- ASN1STOP

TunnelConfigLWIP field descriptions

ip-Address
- Parameter indicates the LWIP-SeGW IP Address to be used by the UE for initiating LWIP Tunnel establishment [32].

ike-Identity
- Parameter indicates the IKE Identity elements (IDi) to be used in IKE Authentication Procedures [32].

lwip-Counter
- Indicates the parameter used by UE for computing the security keys used in LWIP tunnel establishment, as specified in TS 33.401 [32].

Conditional presence

<table>
<thead>
<tr>
<th>LWIP-Setup</th>
<th>The field is mandatory present upon setup of LWIP tunnel. Otherwise the field is optional. Need ON.</th>
</tr>
</thead>
</table>

UplinkPowerControl

The IE UplinkPowerControlCommon and IE UplinkPowerControlDedicated are used to specify parameters for uplink power control in the system information and in the dedicated signalling, respectively.

UplinkPowerControl information elements

-- ASN1START
UplinkPowerControlCommon ::= SEQUENCE {
p0-NominalPUSCH      INTEGER (-126..24),
alpha        Alpha-r12,
p0-NominalPUCCH      INTEGER (-127..-96),
deltaFList-PUCCH     DeltaFList-PUCCH, 

--
deltaPreambleMsg3             INTEGER (-1..6)
}
UplinkPowerControlCommon-v1020 ::= SEQUENCE {
    deltaF-PUCCH-Format3-r10    ENUMERATED {deltaF-1, deltaF0, deltaF1, deltaF2, deltaF3, deltaF4, deltaF5, deltaF6},
    deltaF-PUCCH-Format1bCS-r10 ENUMERATED {deltaF1, deltaF2, spare2, spare1}
}

UplinkPowerControlCommon-v1310 ::= SEQUENCE {
    deltaF-PUCCH-Format4-r13    ENUMERATED {deltaF16, deltaF15, deltaF14, deltaF13, deltaF12, deltaF11, deltaF10, spare1},
    deltaF-PUCCH-Format5-13     ENUMERATED {deltaF13, deltaF12, deltaF11, deltaF10, deltaF9, deltaF8, deltaF7, spare1} OPTIONAL -- Need OR
}

UplinkPowerControlCommon-v1530 ::= SEQUENCE {
    deltaList-SPUCCH-r15       DeltaFlist-SPUCCH-r15
}

UplinkPowerControlCommonPSCell-r12 ::= SEQUENCE {
    deltaF-PUCCH-Format3-r12    ENUMERATED {deltaF-1, deltaF0, deltaF1, deltaF2, deltaF3, deltaF4, deltaF5, deltaF6},
    deltaF-PUCCH-Format1bCS-r12 ENUMERATED {deltaF1, deltaF2, spare2, spare1},
    p0-NominalPUCCH-r12         INTEGER (-127..-96),
    deltaList-PUCCH-r12         DeltaFlist-PUCCH
}

UplinkPowerControlCommonSCell-r10 ::= SEQUENCE {
    p0-NominalPUSCH-r10         INTEGER (-126..24),
    alpha-r10                  Alpha-r12
}

UplinkPowerControlCommonSCell-v1130 ::= SEQUENCE {
    deltaPreambleMsg3-r11       INTEGER (-1..6)
}

UplinkPowerControlCommonSCell-v1310 ::= SEQUENCE {
    -- For uplink power control the additional/ missing fields are signalled (compared to SCell)
    p0-NominalPUCCH              INTEGER (-127..-96),
    deltaList-PUCCH              DeltaFlist-PUCCH,
    deltaF-PUCCH-Format3-r12     ENUMERATED {deltaF-1, deltaF0, deltaF1, deltaF2, deltaF3, deltaF4, deltaF5, deltaF6} OPTIONAL, -- Need OR
    deltaF-PUCCH-Format1bCS-r12  ENUMERATED {deltaF1, deltaF2, spare2, spare1} OPTIONAL, -- Need OR
    deltaF-PUCCH-Format4-r13     ENUMERATED {deltaF16, deltaF15, deltaF14, deltaF13, deltaF12, deltaF11, deltaF10, spare1} OPTIONAL, -- Need OR
    deltaF-PUCCH-Format5-13      ENUMERATED {deltaF13, deltaF12, deltaF11, deltaF10, deltaF9, deltaF8, deltaF7, spare1} OPTIONAL -- Need OR
}

UplinkPowerControlCommonPUSCH-LessCell-v1430 ::= SEQUENCE {
    p0-Nominal-PeriodicSRS-r14    INTEGER (-126..24) OPTIONAL, -- Need OR
    p0-Nominal-AperiodicSRS-r14   INTEGER (-126..24) OPTIONAL, -- Need OR
    alpha-SRS-r14                Alpha-r12 OPTIONAL -- Need OR
}

UplinkPowerControlDedicated ::= SEQUENCE {
    p0-UE-PUSCH                  INTEGER (-8..7),
    deltaMCS-Enabled             ENUMERATED {en0, en1},
    accumulationEnabled          BOOLEAN,
    p0-UE-PUCCH                  INTEGER (-8..7),
    pSRS-Offset                  INTEGER (0..15),
    filterCoefficient            FilterCoefficient DEFAULT fc4
}

UplinkPowerControlDedicated-v1020 ::= SEQUENCE {
    deltaTx0-OffsetListPUSCH-r10 DeltaTx0-OffsetListPUSCH-r10 OPTIONAL, -- Need OR
    pSRS-OffsetAp-r10             INTEGER (0..15) OPTIONAL -- Need OR
}

UplinkPowerControlDedicated-v1130 ::= SEQUENCE {
    pSRS-Offset-v1130             INTEGER (16..31) OPTIONAL, -- Need OR
pSRS-OffsetAp-v1130 INTEGER (16..31) OPTIONAL, -- Need OR
deltaTxD-OffsetListPUCCH-v1130 DeltaTxD-OffsetListPUCCH-v1130 OPTIONAL -- Need OR

UplinkPowerControlDedicated-v1250 ::= SEQUENCE {
  setPowerControlParameter CHOICE {
    release NULL,
    setup SEQUENCE {
      tpc-SubframeSet-r12 BIT STRING (SIZE(10)),
      p0-NominalPUSCH-SubframeSet2-r12 INTEGER (-126..24),
      alpha-SubframeSet2-r12 Alpha-r12,
      p0-UE-PUSCH-SubframeSet2-r12 INTEGER (-8..7)
    }
  }
}

UplinkPowerControlDedicated-v1530 ::= SEQUENCE {
  alpha-UE-r15 Alpha-r12 OPTIONAL, -- Need OR
  p0-UE-PUSCH-r15 INTEGER (-16..15) OPTIONAL -- Need OR
}

UplinkPowerControlDedicatedSTTI-r15 ::= SEQUENCE {
  accumulationEnabledSTTI-r15 BOOLEAN,
  deltaTxD-OffsetListSPUCCH-r15 DeltaTxD-OffsetListSPUCCH-r15 OPTIONAL, -- Need OR
  uplinkPower-CSIPayload BOOLEAN
}

UplinkPUSCH-LessPowerControlDedicated-v1430 ::= SEQUENCE {
  p0-UE-PeriodicSRS-r14 INTEGER (-8..7) OPTIONAL, -- Need OR
  p0-UE-AperiodicSRS-r14 INTEGER (-8..7) OPTIONAL, -- Need OR
  accumulationEnabled-r14 BOOLEAN
}

UplinkPowerControlDedicatedSCell-r10 ::= SEQUENCE {
  p0-UE-PUSCH-r10 INTEGER (-8..7),
  deltaMCS-Enabled-r10 ENUMERATED (en0, en1),
  accumulationEnabled-r10 BOOLEAN,
  pSRS-Offset-r10 INTEGER (0..15),
  pSRS-OffsetAp-r10 INTEGER (0..15) OPTIONAL, -- Need OR
  filterCoefficient-r10 FilterCoefficient DEFAULT fc4,
  pathlossReferenceLinking-r10 ENUMERATED {pCell, sCell}
}

UplinkPowerControlDedicatedSCell-v1310 ::= SEQUENCE {
  -- Release 8
  p0-UE-PUSCH INTEGER (-8..7),
  -- Release 10
  deltaTxD-OffsetListPUSCH-r10 DeltaTxD-OffsetListPUSCH-r10 OPTIONAL -- Need OR
}

Alpha-r12 ::= ENUMERATED {a10, a104, a105, a106, a107, a108, a109, a11}

DeltaFlist-PUCCH ::= SEQUENCE {
  deltaF-PUCCH-Format1 ENUMERATED {deltaF-2, deltaF0, deltaF2},
  deltaF-PUCCH-Format1b ENUMERATED {deltaF1, deltaF3, deltaF5},
  deltaF-PUCCH-Format2 ENUMERATED {deltaF-2, deltaF0, deltaF1, deltaF2},
  deltaF-PUCCH-Format2a ENUMERATED {deltaF-2, deltaF0, deltaF2},
  deltaF-PUCCH-Format2b ENUMERATED {deltaF-2, deltaF0, deltaF2}
}

DeltaFlist-SPUCCH-r15 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    deltaF-slotSPUCCH-Format1-r15 ENUMERATED {deltaF-1, deltaF0, deltaF1, deltaF2},
    deltaF-slotSPUCCH-Format1b-r15 ENUMERATED {deltaF1, deltaF3, deltaF5, deltaF6} OPTIONAL, -- Need OR
    deltaF-slotSPUCCH-Format1a-r15 ENUMERATED {deltaF1, deltaF2, deltaF3, deltaF4},
    deltaF-slotSPUCCH-Format1b-r15 ENUMERATED {deltaF3, deltaF4, deltaF5, deltaF6} OPTIONAL, -- Need OR
    deltaF-slotSPUCCH-Format1c-r15 ENUMERATED {deltaF3, deltaF4, deltaF5, deltaF6} OPTIONAL, -- Need OR
    deltaF-slotSPUCCH-Format4-r15 ENUMERATED {deltaF13, deltaF14, deltaF15, deltaF16, deltaF17, deltaF18, deltaF19, deltaF20} OPTIONAL, -- Need OR
    deltaF-slotSPUCCH-TBCC-Format4-r15 ENUMERATED {deltaF10, deltaF11, deltaF12, deltaF13, deltaF14, deltaF15, deltaF16, deltaF17} OPTIONAL, -- Need OR
    deltaF-subslotSPUCCH-Format1a-r15 ENUMERATED {deltaF5, deltaF6, deltaF7, deltaF8,
deltaF9, deltaF10, deltaF11, deltaF12} OPTIONAL,

--Need OR
deltaF-subslotSPUCCH-Format1b-r15 ENUMERATED {deltaF6, deltaF7, deltaF8, deltaF9,
  deltaF10, deltaF11, deltaF12, deltaF13} OPTIONAL,

--Need OR
deltaF-subslotSPUCCH-RM-Format4-r15 ENUMERATED {deltaF15, deltaF16, deltaF17, deltaF18,
  deltaF19, deltaF20, deltaF21, deltaF22} OPTIONAL,

--Need OR
deltaF-subslotSPUCCH-TBCC-Format4-r15 ENUMERATED {deltaF10, deltaF11, deltaF12, deltaF13,
  deltaF14, deltaF15, deltaF16, deltaF17} OPTIONAL,

--Need OR
...
}
}

DeltaTxD-OffsetListPUCCH-r10 ::= SEQUENCE {
  deltaTxD-OffsetPUCCH-Format1-r10 ENUMERATED {dB0, dB-2},
  deltaTxD-OffsetPUCCH-Format1a1b-r10 ENUMERATED {dB0, dB-2},
  deltaTxD-OffsetPUCCH-Format22a2b-r10 ENUMERATED {dB0, dB-2},
  deltaTxD-OffsetPUCCH-Format3-r10 ENUMERATED {dB0, dB-2},
  ...
}

DeltaTxD-OffsetListPUCCH-v1130 ::= SEQUENCE {
  deltaTxD-OffsetPUCCH-Format1bCS-r11 ENUMERATED {dB0, dB-1}
}

DeltaTxD-OffsetListSPUCCH-r15 ::= SEQUENCE {
  deltaTxD-OffsetSPUCCH-Format1-r15 ENUMERATED {dB0, dB-2},
  deltaTxD-OffsetSPUCCH-Format1a-r15 ENUMERATED {dB0, dB-2},
  deltaTxD-OffsetSPUCCH-Format1b-r15 ENUMERATED {dB0, dB-2},
  deltaTxD-OffsetSPUCCH-Format3-r15 ENUMERATED {dB0, dB-2},
  ...
}

-- ASN1STOP
### UplinkPowerControl field descriptions

**accumulationEnabled, accumulationEnabledTTI**
Parameter: Accumulation-enabled, see TS 36.213 [23, 5.1.1.1, 5.1.3.1]. TRUE corresponds to "enabled" whereas FALSE corresponds to "disabled".

**alpha**
Parameter: α See TS 36.213 [23, 5.1.1.1] where a0 corresponds to 0, a04 corresponds to value 0.4, al05 to 0.5, al06 to 0.6, al07 to 0.7, al08 to 0.8, al09 to 0.9 and al1 corresponds to 1. This field applies for uplink power control subframe set 1 if uplink power control subframe sets are configured by tpc-SubframeSet.

**alpha-SRS**
Parameter: α SRS. See TS 36.213 [23, 5.1.3.1] where a0 corresponds to 0, a04 corresponds to value 0.4, al05 to 0.5, al06 to 0.6, al07 to 0.7, al08 to 0.8, al09 to 0.9 and al1 corresponds to 1. This field applies for SRS power control on a PUSCH-less SCell.

**alpha-SubframeSet2**
Parameter: α. See TS 36.213 [23, 5.1.1.1] where a0 corresponds to 0, a04 corresponds to value 0.4, al05 to 0.5, al06 to 0.6, al07 to 0.7, al08 to 0.8, al09 to 0.9 and al1 corresponds to 1. This field applies for uplink power control subframe set 2 if uplink power control subframe sets are configured by tpc-SubframeSet.

**alpha-UE**
Parameter: α UE See TS 36.213 [23], clause 5.1.1.1, where a0 corresponds to 0, a04 corresponds to value 0.4, al05 to 0.5, al06 to 0.6, al07 to 0.7, al08 to 0.8, al09 to 0.9 and al1 corresponds to 1.

**deltaF-PUCCH-FormatX**
Parameter: \( \Delta_{F_{PUCCH}}(F) \) for the PUCCH formats 1, 1b, 2a, 2b, 3, 4, 5 and 1b with channel selection. See TS 36.213 [23, 5.1.2] where deltaF-2 corresponds to -2 dB, deltaF0 corresponds to 0 dB and so on.

**deltaF-PUCCH-FormatX, deltaF-slotSPUCCH-FormatX, deltaF-subslotSPUCCH-FormatX**
Parameter: \( \Delta_{F_{PUCCH}}(F) \) for the SPUCCH formats 1, 1a, 1b, 3 and 4. See TS 36.213 [23], section 5.1.2 where deltaF-2 corresponds to -2 dB, deltaF0 corresponds to 0 dB and so on. In case both an A and a B configuration exist, configuration A is used in case SPUCCH carries ≤ 22 HARQ-ACK bits, and B otherwise.

**deltaMCS-Enabled**
Parameter: Ks See TS 36.213 [23, 5.1.1.1]. en0 corresponds to value 0 corresponding to state "disabled". en1 corresponds to value 1.25 corresponding to "enabled".

**deltaPreambleMsg3**
Parameter: \( \Delta_{PREAMBLE_{Msg3}} \) see TS 36.213 [23, 5.1.1.1]. Actual value = field value * 2 [dB].

**deltaTxD-OffsetPUCCH-FormatX**
Parameter: \( \Delta_{TxD}(F') \) for the PUCCH formats 1, 1a/1b, 1b with channel selection, 2/2a/2b and 3 when two antenna ports are configured for PUCCH transmission. See TS 36.213 [23, 5.1.2.1] where db0 corresponds to 0 dB, db-1 corresponds to -1 dB, db-2 corresponds to -2 dB. EUTRAN configures the field \( \delta_{TxD-OffsetPUCCH-Format1bCS-r11} \) for the PCell and/or the PSCell only.

**deltaTxD-OffsetSPUCCH-FormatX**
Parameter: \( \Delta_{TxD}(F') \) for the SPUCCH formats 1, 1a/1b, 1b with channel selection and 3 when two antenna ports are configured for SPUCCH transmission. See TS 36.213 [23], section 5.1.2.1 where db0 corresponds to 0 dB, db-1 corresponds to -1 dB, db-2 corresponds to -2 dB.

**filterCoefficient**
Specifies the filtering coefficient for RSRP measurements used to calculate path loss, as specified in TS 36.213 [23, 5.1.1.1]. The same filtering mechanism applies as for quantityConfig described in 5.5.3.2.

**p0-Nominal-AperiodicSRS**
Parameter: \( P_{O_{nominal SRS}, (m)} \) where m=1. See TS 36.213 [23, 5.1.3.1], unit dBm.

**p0-Nominal-PeriodicSRS**
Parameter: \( P_{O_{nominal SRS}, (m)} \) where m=0. See TS 36.213 [23, 5.1.3.1], unit dBm.

**p0-NominalPUCCH**
Parameter: \( P_{O_{nominal PUCCH}} \) See TS 36.213 [23, 5.1.2.1], unit dBm.

**p0-NominalPUSCH**
Parameter: \( P_{O_{nominal PUSCH}}(1) \) See TS 36.213 [23, 5.1.1.1], unit dBm. This field is applicable for non-persistent scheduling only. This field applies for uplink power control subframe set 1 if uplink power control subframe sets are configured by tpc-SubframeSet.

**p0-NominalPUSCH-SubframeSet2**
Parameter: \( P_{O_{nominal PUSCH}}(1) \). See TS 36.213 [23, 5.1.1.1], unit dBm. This field is applicable for non-persistent scheduling only. This field applies for uplink power control subframe set 2 if uplink power control subframe sets are configured by tpc-SubframeSet.

**p0-UE-AperiodicSRS**
Parameter: \( P_{O_{UE SRS}, (m)} \) where m=1. See TS 36.213 [23, 5.1.3.1], unit dB.
### UplinkPowerControl field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Parameter</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>p0-UE-PeriodicSRS</strong></td>
<td>$P_{O,UE,SRS,c}(m)$ where $m=0$. See TS 36.213 [23, 5.1.3.1], unit dB.</td>
<td></td>
</tr>
<tr>
<td><strong>p0-UE-PUCCH</strong></td>
<td>$P_{O,UE,PUCCH}$ See TS 36.213 [23, 5.1.2.1]. Unit dB</td>
<td></td>
</tr>
<tr>
<td><strong>p0-UE-PUSCH</strong></td>
<td>$P_{O,UE,PUSCH}$ (1) See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for non-persistent scheduling, only. This field applies for uplink power control subframe set 1 if uplink power control subframe sets are configured by tpc-SubframeSet. If $p0-UE-PUSCH-r15$ is included, the UE ignores $p0-UE-PUSCH$ (i.e., without suffix).</td>
<td></td>
</tr>
<tr>
<td><strong>p0-UE-PUSCH-SubframeSet2</strong></td>
<td>$P_{O,UE,PUSCH}$ (1) See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for non-persistent scheduling, only. This field applies for uplink power control subframe set 2 if uplink power control subframe sets are configured by tpc-SubframeSet.</td>
<td></td>
</tr>
<tr>
<td><strong>pathlossReferenceLinking</strong></td>
<td>Indicates whether the UE shall apply as pathloss reference either the downlink of the PCell or of the SCell that corresponds with this uplink (i.e. according to the cellIdentification within the field sCellToAddMod). For SCells part of an STAG E-UTRAN sets the value to sCell.</td>
<td></td>
</tr>
<tr>
<td><strong>pSRS-Offset, pSRS-OffsetAp</strong></td>
<td>Parameter: $PSRS_OFFSET$ for periodic and aperiodic sounding reference signal transmission repectively. See TS 36.213 [23, 5.1.3.1]. For $K_s=1.25$, the actual parameter value is $pSRS_Offset$ value $-3$. For $K_s=0$, the actual parameter value is $-10.5 + 1.5* pSRS_Offset$ value. If $pSRS_Offset-v1130$ is included, the UE ignores $pSRS_Offset$ (i.e., without suffix). Likewise, if $pSRS_OffsetAp-v1130$ is included, the UE ignores $pSRS_OffsetAp-v1130$. For $K_s=0$, E-UTRAN does not set values larger than 26.</td>
<td></td>
</tr>
<tr>
<td><strong>tpc-SubframeSet</strong></td>
<td>Indicates the uplink subframes (including UpPTS in special subframes) of the uplink power control subframe sets. Value 0 means the subframe belongs to uplink power control subframe set 1, and value 1 means the subframe belongs to uplink power control subframe set 2.</td>
<td></td>
</tr>
<tr>
<td><strong>uplinkPower-CSIPayload</strong></td>
<td>Indicates whether the UE shall derive BPRE based on the actual value of O_CQI for slot/subslot-PUSCH. If not present, the largest value of O_CQI across all RI values shall be used for the derivation of BPRE for slot/subslot-PUSCH.</td>
<td></td>
</tr>
</tbody>
</table>

---

### WLAN-Id-List

The IE WLAN-Id-List is used to list WLAN(s) for configuration of WLAN measurements and WLAN mobility set.

```
-- ASN1START
WLAN-Id-List-r13 ::= SEQUENCE SIZE (1..maxWLAN-Id-r13) OF WLAN-Identifiers-r12
-- ASN1STOP
```

---

### WLAN-MobilityConfig

The IE WLAN-MobilityConfig is used for configuration of WLAN mobility set and WLAN Status Reporting. E-UTRAN configures at least one WLAN identifier in the WLAN-MobilityConfig.

```
-- ASN1START
WLAN-MobilityConfig-r13 ::= SEQUENCE {
  wlan-ToReleaseList-r13   WLAN-Id-List-r13  OPTIONAL, -- Need ON
  wlan-ToAddList-r13      WLAN-Id-List-r13  OPTIONAL, -- Need ON
  associationTimer-r13    ENUMERATED {s10, s30, s60, s120, s240} OPTIONAL, -- Need OR
  successReportRequested-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  wlan-SuspendConfig-r14  WLAN-SuspendConfig-r14 OPTIONAL -- Need ON
  ...
  ...
}[[ wlan-SuspendConfig-r14 ]]}
-- ASN1STOP
```
WLAN-MobilityConfig field descriptions

**associationTimer**
Indicates the maximum time for connection to WLAN before connection failure reporting is initiated. Value s10 means 10 seconds, value s30 means 30 seconds and so on. E-UTRAN includes associationTimer only upon change in WLAN mobility set, lwa-WT-Counter or lwip-Counter.

**successReportRequested**
Indicates whether the UE shall report successful connection to WLAN. Applicable to LWA and LWIP.

**wlan-ToAddList**
Indicates the WLAN identifiers to be added to the WLAN mobility set.

**wlan-ToReleaseList**
Indicates the WLAN identifiers to be removed from the WLAN mobility set.

---

**WUS-Config**

The IE WUS-Config is used to specify the WUS configuration. For the UEs supporting WUS, E-UTRAN uses WUS to indicate that the UE shall attempt to receive paging in that cell, see TS 36.304 [4].

### WUS-Config information element

```asn1
WUS-Config-r15 ::= SEQUENCE {
  maxDurationFactor-r15     ENUMERATED {one32th, one16th, one8th, one4th},
  numP0s-r15      ENUMERATED {n1, n2, n4, spare1}  DEFAULT n1,
  freqLocation-r15     ENUMERATED {n0, n2, n4, spare1},
  timeOffsetDRX-r15    ENUMERATED {ms40, ms80, ms160, ms240},
  timeOffset-eDRX-Short-r15  ENUMERATED {ms40, ms80, ms160, ms240},
  timeOffset-eDRX-Long-r15 ENUMERATED {ms1000, ms2000}  OPTIONAL -- Need OP
}
```

### WUS-Config field descriptions

**freqLocation**
Frequency location of WUS within paging narrowband for BL UEs and UEs in CE. Value n0 corresponds to WUS in the 1st and 2nd PRB, value n2 represents the 3rd and 4th PRB, and value n4 represents the 5th and 6th PRB.

**maxDurationFactor**
Parameter "alpha" in TS 36.211 [21]. Maximum WUS duration, expressed as a ratio of Rmax associated with Type 1-CSS, see TS 36.211 [21]. Value one32th corresponds to Rmax * 1/32, value one16th corresponds to Rmax * 1/16 and so on.

The value considered by the UE is: maxDuration = Max (signalled value * Rmax, 1) where Rmax is the value of mpdcch-NumRepititionPaging for the carrier.

**numP0s**
Number of consecutive Paging Occasions (PO) mapped to one WUS, applicable to UEs configured to use extended DRX, see TS 36.304 [4]. Value n1 corresponds to 1 PO, value n2 corresponds to 2 POs and so on.

**timeOffsetDRX**
Minimum time gap in milliseconds from the end of the configured maximum WUS duration to the first associated PO, see TS 36.211 [21]. Value ms40 corresponds to 40 ms, value ms80 corresponds to 80 ms and so on.

**timeOffset-eDRX-Short**
When eDRX is used, the short non-zero gap in milliseconds from the end of the configured maximum WUS duration to the associated PO, see TS 36.211 [21]. Value ms40 corresponds to 40 ms, value ms80 corresponds to 80 ms and so on.

E-UTRAN configures timeOffset-eDRX-Short to a value longer than or equal to timeOffsetDRX.

**timeOffset-eDRX-Long**
When eDRX is used, the long non-zero gap in milliseconds from the end of the configured maximum WUS duration to the associated PO, see TS 36.211 [21]. Value ms1000 corresponds to 1000 ms and value ms2000 corresponds to 2000 ms.

If the field is absent, UE uses timeOffset-eDRX-Short for monitoring WUS.

6.3.3 Security control information elements

---

**NextHopChainingCount**

The IE NextHopChainingCount is used to update the K_{NB} key and corresponds to parameter NCC: See TS 33.401 [32, 7.2.8.4].
NextHopChainingCount information element

```
NextHopChainingCount ::= INTEGER (0..7)
```

SecurityAlgorithmConfig

The IE SecurityAlgorithmConfig is used to configure AS integrity protection algorithm (SRBs) and AS ciphering algorithm (SRBs and DRBs). For RNs, the IE SecurityAlgorithmConfig is also used to configure AS integrity protection algorithm for DRBs between the RN and the E-UTRAN.

SecurityAlgorithmConfig information element

```
SecurityAlgorithmConfig ::= SEQUENCE {
    cipheringAlgorithm CipheringAlgorithm-r12,
    integrityProtAlgorithm ENUMERATED {
        eia0-v920, eia1, eia2, eia3-v1130, spare4, spare3, spare2, spare1, ...}
}
```

CipheringAlgorithm-r12 ::= ENUMERATED {
    eea0, eea1, eea2, eea3-v1130, spare4, spare3, spare2, spare1, ...}

SecurityAlgorithmConfig field descriptions

- **cipheringAlgorithm**
  Indicates the ciphering algorithm to be used for SRBs and DRBs, as specified in TS 33.401 [32, 5.1.3.2].

- **integrityProtAlgorithm**
  Indicates the integrity protection algorithm to be used for SRBs, as specified in TS 33.401 [32, 5.1.4.2]. For RNs, also indicates the integrity protection algorithm to be used for integrity protection-enabled DRB(s).

ShortMAC-I

The IE ShortMAC-I is used to identify and verify the UE at RRC connection re-establishment. The 16 least significant bits of the MAC-I calculated using the security configuration of the source PCell, as specified in 5.3.7.4.

ShortMAC-I information element

```
ShortMAC-I ::= BIT STRING (SIZE (16))
```

6.3.4 Mobility control information elements

- **AdditionalSpectrumEmission**

If an extension is signalled using the extended value range (as defined by IE AdditionalSpectrumEmission-v10l0), the corresponding original field, using the value range as defined by IE AdditionalSpectrumEmission i.e. without suffix) shall be set to value 32, if signalled. UE supporting an LTE band assigned NS values larger than 32 as defined in TS 36.101 [42, 6.2.4], needs to support extension signaling (as defined by IE AdditionalSpectrumEmission-v10l0).

AdditionalSpectrumEmission information element

```
AdditionalSpectrumEmission ::= INTEGER (1..32)
AdditionalSpectrumEmission-v10l0 ::= INTEGER (33..288)
```
The IE **AdditionalSpectrumEmissionNR** is used to indicate NR emission requirements to be fulfilled by the UE (see TS 38.101 [85], section FFS_Section)

*AdditionalSpectrumEmissionNR information element*

```asn1
AdditionalSpectrumEmissionNR-r15 ::= INTEGER (0..7)
```

-- ASN1STOP

The IE **ARFCN-ValueCDMA2000** is used to indicate the CDMA2000 carrier frequency within a CDMA2000 band, see C.S0002 [12].

*ARFCN-ValueCDMA2000 information element*

```asn1
ARFCN-ValueCDMA2000 ::= INTEGER (0..2047)
```

-- ASN1STOP

The IE **ARFCN-ValueEUTRA** is used to indicate the ARFCN applicable for a downlink, uplink or bi-directional (TDD) E-UTRA carrier frequency, as defined in TS 36.101 [42]. If an extension is signalled using the extended value range (as defined by IE **ARFCN-ValueEUTRA-v9e0**), the UE shall only consider this extension (and hence ignore the corresponding original field, using the value range as defined by IE **ARFCN-ValueEUTRA** i.e. without suffix, if signalled). In dedicated signalling, E-UTRAN only provides an EARFCN corresponding to an E-UTRA band supported by the UE.

*ARFCN-ValueEUTRA information element*

```asn1
ARFCN-ValueEUTRA ::= INTEGER (0..maxEARFCN)
ARFCN-ValueEUTRA-v9e0 ::= INTEGER (maxEARFCN-Plus1..maxEARFCN2)
ARFCN-ValueEUTRA-r9 ::= INTEGER (0..maxEARFCN2)
```

-- ASN1STOP

**NOTE:** For fields using the original value range, as defined by IE **ARFCN-ValueEUTRA** i.e. without suffix, value `maxEARFCN` indicates that the E-UTRA carrier frequency is indicated by means of an extension. In such a case, UEs not supporting the extension consider the field to be set to a not supported value.

The IE **ARFCN-ValueGERAN** is used to specify the ARFCN value applicable for a GERAN BCCH carrier frequency, see TS 45.005 [20].

*ARFCN-ValueGERAN information element*

```asn1
ARFCN-ValueGERAN ::= INTEGER (0..1023)
```

-- ASN1STOP
The IE ARFCN-ValueNR is used to indicate the ARFCN applicable for a downlink, uplink or bi-directional (TDD) NR carrier frequency, as defined in TS 38.101 [85].

**ARFCN-ValueNR information element**

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARFCN-ValueNR-r15 ::= INTEGER (0..3279165)</td>
<td>-- ASN1STOP</td>
</tr>
</tbody>
</table>

The IE ARFCN-ValueUTRA is used to indicate the ARFCN applicable for a downlink (Nd, FDD) or bi-directional (Nt, TDD) UTRA carrier frequency, as defined in TS 25.331 [19].

**ARFCN-ValueUTRA information element**

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARFCN-ValueUTRA ::= INTEGER (0..16383)</td>
<td>-- ASN1STOP</td>
</tr>
</tbody>
</table>

The IE BandclassCDMA2000 is used to define the CDMA2000 band in which the CDMA2000 carrier frequency can be found, as defined in C.80057 [24, table 1.5-1].

**BandclassCDMA2000 information element**

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>BandclassCDMA2000 ::= ENUMERATED { bc0, bc1, bc2, bc3, bc4, bc5, bc6, bc7, bc8, bc9, bc10, bc11, bc12, bc13, bc14, bc15, bc16, bc17, bc18-v9a0, bc19-v9a0, bc20-v9a0, bc21-v9a0, spare10, spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1, ...}</td>
<td>-- ASN1STOP</td>
</tr>
</tbody>
</table>

The IE BandIndicatorGERAN indicates how to interpret an associated GERAN carrier ARFCN, see TS 45.005 [20]. More specifically, the IE indicates the GERAN frequency band in case the ARFCN value can concern either a DCS 1800 or a PCS 1900 carrier frequency. For ARFCN values not associated with one of these bands, the indicator has no meaning.

**BandIndicatorGERAN information element**

<table>
<thead>
<tr>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>BandIndicatorGERAN ::= ENUMERATED {dcs1800, pcs1900}</td>
<td>-- ASN1STOP</td>
</tr>
</tbody>
</table>

The IE CarrierFreqCDMA2000 used to provide the CDMA2000 carrier information.
CarrierFreqCDMA2000 information element

```asn1
CarrierFreqCDMA2000 ::= SEQUENCE {
  bandClass BandclassCDMA2000,
  arfcn ARFCN-ValueCDMA2000
}
```

---

CarrierFreqGERAN

The IE CarrierFreqGERAN is used to provide an unambiguous carrier frequency description of a GERAN cell.

CarrierFreqGERAN information element

```asn1
CarrierFreqGERAN ::= SEQUENCE {
  arfcn ARFCN-ValueGERAN,
  bandIndicator BandIndicatorGERAN
}
```

---

CarrierFreqGERAN field descriptions

- `arfcn`
  GERAN ARFCN of BCCH carrier.

- `bandIndicator`
  Indicates how to interpret the ARFCN of the BCCH carrier.

---

CarrierFreqsGERAN

The IE CarrierFreqListGERAN is used to provide one or more GERAN ARFCN values, as defined in TS 45.005 [43], which represents a list of GERAN BCCH carrier frequencies.

CarrierFreqsGERAN information element

```asn1
CarrierFreqsGERAN ::= SEQUENCE {
  startingARFCN ARFCN-ValueGERAN,
  bandIndicator BandIndicatorGERAN,
  followingARFCNs CHOICE {
    explicitListOfARFCNs ExplicitListOfARFCNs,
    equallySpacedARFCNs SEQUENCE {
      arfcnSpacing INTEGER (1..8),
      numberOfFollowingARFCNs INTEGER (0..31)
    },
    variableBitMapOfARFCNs OCTET STRING (SIZE (1..16))
  }
}

ExplicitListOfARFCNs ::= SEQUENCE (SIZE (0..31)) OF ARFCN-ValueGERAN
```

---

ETSI
CarrierFreqsGERAN field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>arfcn-Spacing</td>
<td>Space, d, between a set of equally spaced ARFCN values.</td>
</tr>
<tr>
<td>bandIndicator</td>
<td>Indicates how to interpret the ARFCN of the BCCH carrier.</td>
</tr>
<tr>
<td>explicitListOFARFCNs</td>
<td>The remaining ARFCN values in the set are explicitly listed one by one.</td>
</tr>
<tr>
<td>followingARFCNs</td>
<td>Field containing a representation of the remaining ARFCN values in the set.</td>
</tr>
<tr>
<td>numberOfFollowingARFCNs</td>
<td>The number, n, of the remaining equally spaced ARFCN values in the set. The complete set of (n+1) ARFCN values is defined as: {s, ((s + d) mod 1024), ((s + 2<em>d) mod 1024) ... ((s + n</em>d) mod 1024)}.</td>
</tr>
<tr>
<td>startingARFCN</td>
<td>The first ARFCN value, s, in the set.</td>
</tr>
<tr>
<td>variableBitMapOfARFCNs</td>
<td>Bitmap field representing the remaining ARFCN values in the set. The leading bit of the first octet in the bitmap corresponds to the ARFCN = ((s + 1) mod 1024), the next bit to the ARFCN = ((s + 2) mod 1024), and so on. If the bitmap consist of N octets, the trailing bit of octet N corresponds to ARFCN = ((s + 8*N) mod 1024). The complete set of ARFCN values consists of ARFCN = s and the ARFCN values, where the corresponding bit in the bitmap is set to &quot;1&quot;.</td>
</tr>
</tbody>
</table>

– CarrierFreqListMBMS

The IE CarrierFreqListMBMS is used to indicate the E-UTRA ARFCN values of the one or more MBMS frequencies the UE is interested to receive.

CarrierFreqListMBMS information element

```
-- ASN1START
CarrierFreqListMBMS-r11 ::= SEQUENCE (SIZE (1..maxFreqMBMS-r11)) OF ARFCN-ValueEUTRA-r9
-- ASN1STOP
```

– CDMA2000-Type

The IE CDMA2000-Type is used to describe the type of CDMA2000 network.

CDMA2000-Type information element

```
-- ASN1START
CDMA2000-Type ::= ENUMERATED {type1XRTT, typeHRPD}
-- ASN1STOP
```

– CellIdentity

The IE CellIdentity is used to unambiguously identify a cell within a PLMN.

CellIdentity information element

```
-- ASN1START
CellIdentity ::= BIT STRING (SIZE (28))
-- ASN1STOP
```

– CellIndexList

The IE CellIndexList concerns a list of cell indices, which may be used for different purposes.

CellIndexList information element

```
-- ASN1START
```
-- CellReselectionPriority

The IE `CellReselectionPriority` concerns the absolute priority of the concerned carrier frequency/set of frequencies (GERAN)/bandclass (CDMA2000), as used by the cell reselection procedure. Corresponds with parameter "priority" in TS 36.304 [4]. Value 0 means: lowest priority. The UE behaviour for the case the field is absent, if applicable, is specified in TS 36.304 [4].

`CellReselectionPriority` information element

-- ASN1START

CellReselectionPriority ::= INTEGER (0..7)

-- ASN1STOP

-- CellSelectionInfoCE

The IE `CellSelectionInfoCE` contains cell selection information for CE. The `q-RxLevMinCE` corresponds to parameter Qrxlevmin_CE in TS 36.304 [4]. The `q-QualMinRSRQ-CE` corresponds to parameter Qqualmin_CE in TS 36.304 [4]. If `q-QualMinRSRQ-CE` is not present, the UE applies the (default) value of negative infinity for Qqualmin.

`CellSelectionInfoCE` information element

-- ASN1START

CellSelectionInfoCE := SEQUENCE {
  q-RxLevMinCE, Q-RxLevMin,
  q-QualMinRSRQ-CE, Q-QualMin-r9
}

CellSelectionInfoCE-v1530 ::= SEQUENCE {
  powerClass14dBm-Offset-r15, ENUMERATED {dB-6, dB-3, dB3, dB6, dB9, dB12}
}

-- ASN1STOP

`CellSelectionInfoCE` field descriptions

`powerClass14dBm-Offset`
Parameter "Poffset" in TS 36.304 [4], only applicable for UE supporting `powerClass-14dBm`. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the field is absent, the UE applies the (default) value of 0 dB for "Poffset" in TS 36.304 [4].

-- CellSelectionInfoCE1

The IE `CellSelectionInfoCE1` contains cell selection information for BL UEs or UEs in CE supporting CE Mode B. The `q-RxLevMinCE1` corresponds to parameter Qrxlevmin_CE1 in TS 36.304 [4]. If `delta-RxLevMinCE1` is not included, actual value Qrxlevmin_CE1 = q-RxLevMinCE1 * 2 [dBm]. If `delta-RxLevMinCE1` is included, the actual value Qrxlevmin_CE1 = (q-RxLevMinCE1 + delta-RxLevMinCE1) * 2 [dBm]. The `q-QualMinRSRQ-CE1` corresponds to parameter Qqualmin_CE1 in TS 36.304 [4]. If `q-QualMinRSRQ-CE1` is not present, the UE applies the (default) value of negative infinity for Qqualmin.

`CellSelectionInfoCE1` information element

-- ASN1START

CellSelectionInfoCE1 := SEQUENCE {
  q-RxLevMinCE1, Q-RxLevMin,
  q-QualMinRSRQ-CE1, Q-QualMin-r9
}

CellSelectionInfoCE1-v1360 ::= SEQUENCE {
}

-- ASN1STOP
δ-RxLevMinCE1-v1360  INTEGER {-8..-1}
}  -- ASN1STOP

-- CellReselectionSubPriority

The IE CellReselectionSubPriority indicates a fractional value to be added to the value of cellReselectionPriority to obtain the absolute priority of the concerned carrier frequency for E-UTRA. Value oDot2 corresponds to 0.2, oDot4 corresponds to 0.4 and so on.

CellReselectionSubPriority information element

-- ASN1START
CellReselectionSubPriority-r13 ::=  ENUMERATED {oDot2, oDot4, oDot6, oDot8}
-- ASN1STOP

-- CSFB-RegistrationParam1XRTT

The IE CSFB-RegistrationParam1XRTT is used to indicate whether or not the UE shall perform a CDMA2000 1xRTT pre-registration if the UE does not have a valid / current pre-registration.

-- ASN1START
CSFB-RegistrationParam1XRTT ::=  SEQUENCE {
  sid         BIT STRING (SIZE (15)),
  nid         BIT STRING (SIZE (16)),
  multipleSID  BOOLEAN,
  multipleNID  BOOLEAN,
  homeReg     BOOLEAN,
  foreignSIDReg BOOLEAN,
  foreignNIDReg BOOLEAN,
  parameterReg BOOLEAN,
  powerUpReg  BOOLEAN,
  registrationPeriod BIT STRING (SIZE (7)),
  registrationZone BIT STRING (SIZE (12)),
  totalZone   BIT STRING (SIZE (3)),
  zoneTimer   BIT STRING (SIZE (3))
}
CSFB-RegistrationParam1XRTT-v920 ::= SEQUENCE {
  powerDownReg-r9 ENUMERATED {true}
}
-- ASN1STOP
### CSFB-RegistrationParam1XRTT field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>foreignNIDReg</td>
<td>The CDMA2000 1xRTT NID roamer registration indicator.</td>
</tr>
<tr>
<td>foreignSIDReg</td>
<td>The CDMA2000 1xRTT SID roamer registration indicator.</td>
</tr>
<tr>
<td>homeReg</td>
<td>The CDMA2000 1xRTT Home registration indicator.</td>
</tr>
<tr>
<td>multipleNID</td>
<td>The CDMA2000 1xRTT Multiple NID storage indicator.</td>
</tr>
<tr>
<td>multipleSID</td>
<td>The CDMA2000 1xRTT Multiple SID storage indicator.</td>
</tr>
<tr>
<td>nid</td>
<td>Used along with the sid as a pair to control when the UE should Register or Re-Register with the CDMA2000 1xRTT network.</td>
</tr>
<tr>
<td>parameterReg</td>
<td>The CDMA2000 1xRTT Parameter-change registration indicator.</td>
</tr>
<tr>
<td>powerDownReg</td>
<td>The CDMA2000 1xRTT Power-down registration indicator.</td>
</tr>
<tr>
<td>powerUpReg</td>
<td>The CDMA2000 1xRTT Power-up registration indicator.</td>
</tr>
<tr>
<td>registrationPeriod</td>
<td>The CDMA2000 1xRTT Registration period.</td>
</tr>
<tr>
<td>registrationZone</td>
<td>The CDMA2000 1xRTT Registration zone.</td>
</tr>
<tr>
<td>sid</td>
<td>Used along with the nid as a pair to control when the UE should Register or Re-Register with the CDMA2000 1xRTT network.</td>
</tr>
<tr>
<td>totalZone</td>
<td>The CDMA2000 1xRTT Number of registration zones to be retained.</td>
</tr>
<tr>
<td>zoneTimer</td>
<td>The CDMA2000 1xRTT Zone timer length.</td>
</tr>
</tbody>
</table>

---

### CellGlobalIdEUTRA

The IE `CellGlobalIdEUTRA` specifies the Evolved Cell Global Identifier (ECGI), the globally unique identity of a cell in E-UTRA.

#### CellGlobalIdEUTRA information element

```asn1
CellGlobalIdEUTRA ::= SEQUENCE {
  plmn-Identity       PLMN-Identity,
  cellIdentity        CellIdentity
}
```

#### CellGlobalIdEUTRA field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellIdentity</td>
<td>Identity of the cell within the context of the PLMN.</td>
</tr>
<tr>
<td>plmn-Identity</td>
<td>Identifies the PLMN of the cell as given by the first PLMN entry in the plmn-IdentityList in SystemInformationBlockType1.</td>
</tr>
</tbody>
</table>

---

### CellGlobalIdUTRA

The IE `CellGlobalIdUTRA` specifies the global UTRAN Cell Identifier, the globally unique identity of a cell in UTRA.

#### CellGlobalIdUTRA information element

```asn1
CellGlobalIdUTRA ::= SEQUENCE {
  plmn-Identity       PLMN-Identity,
}
```
CellIdentity

UTC Cell Identifier which is unique within the context of the identified PLMN as defined in TS 25.331 [19].

plmn-Identity

Identifies the PLMN of the cell as given by the common PLMN broadcast in the MIB, as defined in TS 25.331 [19].

---

**CellGlobalIdGERAN**

The IE `CellGlobalIdGERAN` specifies the Cell Global Identification (CGI), the globally unique identity of a cell in GERAN.

**CellGlobalIdGERAN** information element

---

CellGlobalIdGERAN ::= SEQUENCE {
    plmn-Identity PLMN-Identity,
    locationAreaCode BIT STRING (SIZE (16)),
    cellIdentity BIT STRING (SIZE (16))
}

---

**CellGlobalIdGERAN field descriptions**

CellIdentity

Cell Identifier which is unique within the context of the GERAN location area as defined in TS 23.003 [27].

locationAreaCode

A fixed length code identifying the location area within a PLMN as defined in TS 23.003 [27].

plmn-Identity

Identifies the PLMN of the cell, as defined in TS 23.003 [27].

---

**CellGlobalIdCDMA2000**

The IE `CellGlobalIdCDMA2000` specifies the Cell Global Identification (CGI), the globally unique identity of a cell in CDMA2000.

**CellGlobalIdCDMA2000** information element

---

CellGlobalIdCDMA2000 ::= CHOICE {
    cellGlobalId1XRTT BIT STRING (SIZE (47)),
    cellGlobalIdHRPD BIT STRING (SIZE (128))
}

---

**CellGlobalIdCDMA2000 field descriptions**

cellGlobalId1XRTT

Unique identifier for a CDMA2000 1xRTT cell, corresponds to BASEID, SID and NID parameters (in that order) defined in C.S0005 [25].

cellGlobalIdHRPD

Unique identifier for a CDMA2000 HRPD cell, corresponds to SECTOR ID parameter defined in C.S0024 [26, 14.9].
The IE `CellSelectionInfoNFreq` includes the parameters used for cell selection on a neighbouring frequency, see TS 36.304 [4].

**CellSelectionInfoNFreq information element**

```asn1
CellSelectionInfoNFreq-r13 ::= SEQUENCE {
  q-RxLevMin-r13     Q-RxLevMin,  
  q-RxLevMinOffset     INTEGER (1..8)   OPTIONAL, -- Need OP 
  q-Hyst-r13       ENUMERATED {
                    dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, 
                    dB12, dB14, dB16, dB18, dB20, dB22, dB24}, 
  q-RxLevMinReselection-r13   Q-RxLevMin,  
  t-ReselectionEUTRA-r13    T-Reselection
}
```

The IE `CSG-Identity` is used to identify a Closed Subscriber Group.

**CSG-Identity information element**

```asn1
CSG-Identity ::=     BIT STRING (SIZE (27))
```

The IE `FreqBandIndicator` indicates the E-UTRA operating band as defined in TS 36.101 [42, table 5.5-1]. If an extension is signalled using the extended value range (as defined by IE `FreqBandIndicator-v9e0`), the UE shall only consider this extension (and hence ignore the corresponding original field, using the value range as defined by IE `FreqBandIndicator` i.e. without suffix, if signalled).

**FreqBandIndicator information element**

```asn1
FreqBandIndicator ::=     INTEGER (1..maxFBI) 
FreqBandIndicator-v9e0 ::=    INTEGER (maxFBI-Plus1..maxFBI2) 
FreqBandIndicator-r11 ::=    INTEGER (1..maxFBI2)
```

**FreqBandIndicatorNR**

The IE `FreqBandIndicatorNR` indicates the NR operating band as defined in TS 38.101 [85].
FreqBandIndicatorNR information element

```
FreqBandIndicatorNR-r15 ::= INTEGER (1.. maxFBI-NR-r15)
```

--- MobilityControlInfo

The IE MobilityControlInfo includes parameters relevant for network controlled mobility to/within E-UTRA.

**MobilityControlInfo information element**

```
MobilityControlInfo ::= SEQUENCE {
    targetPhysCellId     PhysCellId, OPTIONAL, -- Cond HO-
toEUTRA2               CarrierFreqEUTRA OPTIONAL, -- Cond HO-
    carrierBandwidth     CarrierBandwidthEUTRA OPTIONAL, -- Cond HO-
toEUTRA2               AdditionalSpectrumEmission OPTIONAL, -- Cond HO-
toEUTRA2               t304 ENUMERATED {
        ms50, ms100, ms150, ms200, ms500, ms1000,
        ms2000, ms10000-v1310},
    newUE-Identity        C-RNTI, OPTIONAL, -- Cond HO-
    radioResourceConfigCommon RadioResourceConfigCommon, OPTIONAL, -- Need OP
    ...,
    [[ carrierFreq-v9e0    CarrierFreqEUTRA-v9e0 OPTIONAL -- Need ON
    ]],
    [[ drb-ContinueROHC-r11 ENUMERATED {true} OPTIONAL -- Cond HO
    ]],
    [[ mobilityControlInfoV2X-r14 MobilityControlInfoV2X-r14 OPTIONAL, -- Need ON
    handoverWithoutWT-Change-r14 ENUMERATED {keepLWA-Config, sendEndMarker} OPTIONAL, -- Cond HO
    makeBeforeBreak-r14 ENUMERATED {true} OPTIONAL, -- Cond HO
    rach-Skip-r14    RACH-Skip-r14 OPTIONAL, -- Need ON
    sameSFN-Indication-r14 ENUMERATED {true} OPTIONAL, -- Cond HO-
    SFNsynced[]},
    [[ mib-RepetitionStatus-r14 BOOLEAN OPTIONAL, -- Cond HO-
    schedulingInfoSIB1-BR-r14 INTEGER (0..31) OPTIONAL, -- Cond HO-
    SFNsynced[]}
}
```

```
MobilityControlInfo-v10l0 ::= SEQUENCE {
    additionalSpectrumEmission-v10l0 AdditionalSpectrumEmission-v10l0 OPTIONAL, -- Cond HO-
}
```

```
MobilityControlInfoSCG-r12 ::= SEQUENCE {
    t307-r12       ENUMERATED {
        ms50, ms100, ms150, ms200, ms500, ms1000,
        ms2000, spare1},
    ue-IdentitySCG-r12     C-RNTI OPTIONAL, -- Cond SCGEst,
    rach-ConfigDedicated-r12 RACH-ConfigDedicated OPTIONAL, -- Need ON
    cipheringAlgorithmSCG-r12 CipheringAlgorithm-r12 OPTIONAL, -- Need ON
    ...,
    [[ makeBeforeBreakSCG-r14 ENUMERATED {true} OPTIONAL, -- Cond HO-
    rach-SkipSCG-r14    RACH-Skip-r14 OPTIONAL, -- Need ON
    sameSFN-Indication-r14 ENUMERATED {true} OPTIONAL, -- Cond HO-
    SFNsynced[]}
}
```

```
MobilityControlInfoV2X-r14 ::= SEQUENCE {
    v2x-CommTxPoolExceptional-r14  SL-CommResourcePool1V2X-r14 OPTIONAL, -- Cond HO-
    v2x-CommRxPool-r14               SL-CommRxPoolListV2X-r14 OPTIONAL, -- Need ON
    v2x-CommSyncConfig-r14           SL-SyncConfigListV2X-r14 OPTIONAL, -- Need ON
    cbr-MobilityTxConfigList-r14    SL-CBR-CommonTxConfigList-r14 OPTIONAL, -- Need ON
}
```

```
CarrierBandwidthEUTRA ::= SEQUENCE {
    dl-Bandwidth ENUMERATED {
        ...}}
```

CarrierFreqEUTRA ::= SEQUENCE {
  dl-CarrierFreq      ARFCN-ValueEUTRA,
  ul-CarrierFreq      ARFCN-ValueEUTRA    OPTIONAL -- Cond FDD
}

CarrierFreqEUTRA-v9e0 ::= SEQUENCE {
  dl-CarrierFreq-v9e0      ARFCN-ValueEUTRA-r9,
  ul-CarrierFreq-v9e0      ARFCN-ValueEUTRA-r9   OPTIONAL -- Cond FDD
}

RACH-Skip-r14 ::= SEQUENCE {
  targetTA-r14   CHOICE {
    ta0-r14       NULL,
    mcg-PTAG-r14  NULL,
    scg-PTAG-r14  NULL,
    mcg-STAG-r14  STAG-Id-r11,
    scg-STAG-r14  STAG-Id-r11
  },
  ul-ConfigInfo-r14 SEQUENCE {
    numberOfConfUL-Processes-r14   INTEGER (1..8),
    ul-SchedInterval-r14   ENUMERATED {sf2, sf5, sf10},
    ul-StartSubframe-r14   INTEGER (0..9),
    ul-Grant-r14     BIT STRING (SIZE (16))
  } OPTIONAL -- Need OR
}

-- ASN1STOP
**MobilityControlInfo field descriptions**

- **additionalSpectrumEmission**
  For a UE with no SCells configured for UL in the same band as the PCell, the UE shall apply the value for the PCell instead of the corresponding value from `SystemInformationBlockType2` or `SystemInformationBlockType1`. For a UE with SCell(s) configured for UL in the same band as the PCell, the UE shall, in case all SCells configured for UL in that band are released after handover completion, apply the value for the PCell instead of the corresponding value from `SystemInformationBlockType2` or `SystemInformationBlockType1`. The UE requirements related to IE `AdditionalSpectrumEmission` are defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs.

- **carrierBandwidth**
  Provides the parameters Downlink bandwidth, and Uplink bandwidth, see TS 36.101 [42].

- **carrierFreq**
  Provides the EARFCN to be used by the UE in the target cell.

- **cbr-MobilityTxConfigList**
  Indicates the list of CBR ranges and the list of PSSCH transmission parameter configurations available to configure congestion control to the UE for V2X sidelink communication during handover.

- **cipheringAlgorithmSCG**
  Indicates the ciphering algorithm to be used for SCG DRBs. E-UTRAN includes the field upon SCG change when one or more SCG DRBs are configured. Otherwise E-UTRAN does not include the field.

- **d1-Bandwidth**
  Parameter: Downlink bandwidth, see TS 36.101 [42].

- **drb-ContinueROHC**
  This field indicates whether to continue or reset, for this handover, the header compression protocol context for the RLC UM bearers configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues while absence indicates that the header compression protocol context is reset. E-UTRAN includes the field only in case of a handover within the same eNB.

- **handoverWithoutWT-Change**
  Indicates whether UE performs handover where LWA configuration is retained with the same WT If sendEndMarker is configured, the LWA end-marker for PDCP key change indication is used as defined in [8]. If value keepLWA-Config is configured, LWA end marker is not used and UE shall only retain the LWA configuration.

- **makeBeforeBreak**
  Indicates that the UE shall continue uplink transmission/ downlink reception with the source cell(s) before performing the first transmission through PRACH to the target intra-frequency PCell, or performing initial PUSCH transmission to the target intra-frequency PCell while `rach-Skip` is configured.

- **makeBeforeBreakSCG**
  Indicates that the UE shall continue uplink transmission/ downlink reception with the source cell(s) before performing the first transmission through PRACH to the target intra-frequency PSCell, or performing initial PUSCH transmission to the target intra-frequency PSCell while `rach-SkipSCG` is configured.

- **mib-RepetitionStatus**
  Indicates whether additional MIB repetition is enabled in the target cell or not. Value TRUE indicates additional MIB repetition is enabled in the target cell. Value FALSE indicates additional MIB repetition is not enabled in the target cell. The absence of this field indicates additional MIB repetition may or may not be enabled in the target cell. See 5.2.1.2 and TS 36.211 [21, 6.4.1]. This field is applicable to BL UE or UE in CE.

- **mobilityControlInfoV2X**
  Indicates the sidelink configurations of the target cell for V2X sidelink communication during handover.

- **numberOfConfUL-Processes**
  The number of configured HARQ processes for preallocated uplink grant, see TS 36.321 [6], clause 5.20. This field is applicable if a UE is configured with asynchronous HARQ, otherwise it shall be ignored.

- **rach-ConfigDedicated**
  The dedicated random access parameters. If absent the UE applies contention based random access as specified in TS 36.321 [6].

- **rach-Skip**
  This field indicates whether random access procedure for the target PCell is skipped.

- **rach-SkipSCG**
  This field indicates whether random access procedure for the target PSCell is skipped.

- **sameSFN-Indication**
  This field indicates that the target cell has the same SFN as the source cell and that the BL UE or UE in CE is not required to acquire `MasterInformationBlock` in the target PCell during handover to obtain the SFN of the target cell, as specified in section 5.3.5.4.

- **schedulingInfoSIB1-BR**
  Indicates the index to the tables that define `SystemInformationBlockType1-BR` scheduling information. The tables are specified in TS 36.213 [23, Table 7.1.6-1 and Table 7.1.7.2.7-1]. Value 0 means `SystemInformationBlockType1-BR` is not scheduled. If absent when `sameSFN-Indication` is present, UE assumes that `SystemInformationBlockType1-BR` scheduling information in target cell may be different from source cell.

- **T304**
  Timer T304 as described in section 7.3. ms50 corresponds with 50 ms, ms100 corresponds with 100 ms and so on. EUTRAN includes extended value ms10000-v1310 only when UE supports CE.
additionalSpectrumEmission

For a UE with no SCells configured for UL in the same band as the PCell, the UE shall apply the value for the PCell instead of the corresponding value from SystemInformationBlockType2 or SystemInformationBlockType1. For a UE with SCell(s) configured for UL in the same band as the PCell, the UE shall, in case all SCells configured for UL in that band are released after handover completion, apply the value for the PCell instead of the corresponding value from SystemInformationBlockType2 or SystemInformationBlockType1. The UE requirements related to IE AdditionalSpectrumEmission are defined in TS 36.101 [42, table 6.2.4E-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs.

**Timer T307**

Timer T307 as described in section 7.3. ms50 corresponds with 50 ms, ms100 corresponds with 100 ms and so on.

**targetTA**

This field refers to the timing adjustment indication, see TS 36.213 [23], indicating the NTA value which the UE shall use for the target PTAG of handover or the target PSTAG of SCG change. ta0 corresponds to NTA=0. mcg-PTAG corresponds to the latest NTA value of the PTAG associated with MCG. scg-PTAG corresponds to the latest NTA value of the PTAG associated with SCG. mcs-PTAG corresponds to the latest NTA value of a MCG STAG indicated by the STAG-Id. scg-STAG corresponds to the latest NTA value of a SCG STAG indicated by the STAG-Id.

**ul-Bandwidth**

Parameter: Uplink bandwidth, see TS 36.101 [42, table 5.6-1]. For TDD, the parameter is absent and it is equal to downlink bandwidth. If absent for FDD, apply the same value as applies for the downlink bandwidth.

**ul-Grant**

Indicates the resources of the target PCell/PSCell to be used for the uplink transmission of PUSCH [23, 8.8].

**ul-SchedInterval**

Indicates the scheduling interval in uplink, see TS 36.321 [6, 5.20]. Value in number of sub-frames. Value sf2 corresponds to 2 subframes, sf5 corresponds to 5 subframes and so on.

**ul-StartSubframe**

Indicates the subframe in which the UE may initiate the uplink transmission, see TS 36.321 [6, 5.20]. Value 0 corresponds to subframe number 0, 1 corresponds to subframe number 1 and so on. The subframe indicating a valid uplink grant according to the calculation of UL grant configured by ul-StartSubframe and ul-SchedInterval, see TS 36.321 [6, 5.20], is the same across all radio frames.

**v2x-CommRxPool**

Indicates reception pools for receiving V2X sidelink communication during handover.

**v2x-CommSyncConfig**

Indicates synchronization configurations for performing V2X sidelink communication during handover.

**v2x-CommTxPoolExceptional**

Indicates the transmission resources by which the UE is allowed to transmit V2X sidelink communication during handover.

### Conditional presence

<table>
<thead>
<tr>
<th></th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDD</td>
<td>The field is mandatory with default value (the default duplex distance defined for the concerned band, as specified in TS 36.101 [42]) in case of &quot;FDD&quot;; otherwise the field is not present.</td>
</tr>
<tr>
<td>HO</td>
<td>This field is optionally present, need OP, in case of handover within E-UTRA when the fullConfig is not included; otherwise the field is not present.</td>
</tr>
<tr>
<td>HO-SFNsynced</td>
<td>This field is optionally present, need OP, in case of source E-UTRA and target E-UTRA cells are SFN synchronised.</td>
</tr>
<tr>
<td>HO-toEUTRA</td>
<td>The field is mandatory present in case of inter-RAT handover to E-UTRA; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>HO-toEUTRA2</td>
<td>The field is absent if carrierFreq-v9e0 is present. Otherwise it is mandatory present in case of inter-RAT handover to E-UTRA and optionally present, need ON, in all other cases.</td>
</tr>
<tr>
<td>SCGEst</td>
<td>This field is mandatory present in case of SCG establishment; otherwise the field is optionally present, need ON.</td>
</tr>
</tbody>
</table>

---

### MobilityParametersCDMA2000 (1xRTT)

The MobilityParametersCDMA2000 contains the parameters provided to the UE for handover and (enhanced) CSFB to 1xRTT support, as defined in C.S0097 [53].

---

**MobilityParametersCDMA2000 information element**

```asn1
MobilityParametersCDMA2000 ::= OCTET STRING
```

```asn1
-- ASN1START
MobilityParametersCDMA2000 ::= OCTET STRING
-- ASN1STOP
```
– **MobilityStateParameters**

The IE *MobilityStateParameters* contains parameters to determine UE mobility state.

**MobilityStateParameters** information element

```asn
MobilityStateParameters ::= SEQUENCE {
    t-Evaluation      ENUMERATED {
        s30, s60, s120, s180, s240, spare3, spare2, spare1},
    t-HystNormal      ENUMERATED {
        s30, s60, s120, s180, s240, spare3, spare2, spare1},
    n-CellChangeMedium     INTEGER (1..16),
    n-CellChangeHigh     INTEGER (1..16)
}
```

**MobilityStateParameters field descriptions**

*n-CellChangeHigh*
The number of cell changes to enter high mobility state. Corresponds to NCR_H in TS 36.304 [4].

*n-CellChangeMedium*
The number of cell changes to enter medium mobility state. Corresponds to NCR_M in TS 36.304 [4].

*t-Evaluation*
The duration for evaluating criteria to enter mobility states. Corresponds to TCRmax in TS 36.304 [4]. Value in seconds, s30 corresponds to 30 s and so on.

*t-HystNormal*
The additional duration for evaluating criteria to enter normal mobility state. Corresponds to TCRmaxHyst in TS 36.304 [4]. Value in seconds, s30 corresponds to 30 s and so on.

– **MultiBandInfoList**

**MultiBandInfoList** information element

```asn
MultiBandInfoList ::= SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator
MultiBandInfoList-v9e0 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF MultiBandInfo-v9e0
MultiBandInfoList-v10j0 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF NS-PmaxList-r10
MultiBandInfoList-v10l0 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF NS-PmaxList-v10l0
MultiBandInfoList-r11 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator-r11
MultiBandInfo-v9e0 ::= SEQUENCE {
    freqBandIndicator-v9e0    FreqBandIndicator-v9e0  OPTIONAL -- Need OP
}
```

– **MultiFrequencyBandListNR**

The IE *MultiFrequencyBandListNR* is used to configure a list of one or multiple NR frequency bands.

**MultiFrequencyBandListNR** information element

```asn
MultiFrequencyBandListNR-r15 ::= SEQUENCE (SIZE (1..maxMultiBandsNR-r15)) OF FreqBandIndicatorNR-r15
```

-- ASN1STOP
The IE \texttt{NS-PmaxList} concerns a list of \texttt{additionalPmax} and \texttt{additionalSpectrumEmission}, as defined in TS 36.101 [42, table 6.2.4-1] for UEs neither in CE nor BL UEs and TS 36.101 [42, table 6.2.4E-1] for UEs in CE or BL UEs, for a given frequency band. E-UTRAN does not include the same value of \texttt{additionalSpectrumEmission} in \texttt{SystemInformationBlockType2} within this list.

\textbf{NS-PmaxList information element}

\begin{verbatim}
--- ASN1START

NS-PmaxList-r10 ::= SEQUENCE (SIZE (1..maxNS-Pmax-r10)) OF NS-PmaxValue-r10
NS-PmaxList-v1010 ::= SEQUENCE (SIZE (1..maxNS-Pmax-r10)) OF NS-PmaxValue-v1010
NS-PmaxValue-r10 ::= SEQUENCE {
  additionalPmax-r10  P-Max       OPTIONAL, -- Need OP
  additionalSpectrumEmission   AdditionalSpectrumEmission
}
NS-PmaxValue-v1010 ::= SEQUENCE {
  additionalSpectrumEmission-v1010 AdditionalSpectrumEmission-v1010 OPTIONAL -- Need OP
}
--- ASN1STOP

---

NS-PmaxListNR

The IE \texttt{NS-PmaxListNR} concerns a list of \texttt{additionalPmax} and \texttt{additionalSpectrumEmission}, as defined in TS 38.101 [85], table 6.2.3-1 for a given frequency band.

\textbf{NS-PmaxListNR information element}

\begin{verbatim}
--- ASN1START

NS-PmaxListNR-r15 ::= SEQUENCE (SIZE (1..8)) OF NS-PmaxValueNR-r15
NS-PmaxValueNR-r15 ::= SEQUENCE {
  additionalPmaxNR-r15     P-MaxNR-r15     OPTIONAL, -- Need ON
  additionalSpectrumEmissionNR-r15 AdditionalSpectrumEmissionNR-r15
}
--- ASN1STOP

---

PhysCellId

The IE \texttt{PhysCellId} is used to indicate the physical layer identity of the cell, as defined in TS 36.211 [21].

\textbf{PhysCellId information element}

\begin{verbatim}
--- ASN1START

PhysCellId ::= INTEGER (0..503)
--- ASN1STOP

---

PhysCellIdRange

The IE \texttt{PhysCellIdRange} is used to encode either a single or a range of physical cell identities. The range is encoded by using a \texttt{start} value and by indicating the number of consecutive physical cell identities (including \texttt{start}) in the range. For fields comprising multiple occurrences of \texttt{PhysCellIdRange}, E-UTRAN may configure overlapping ranges of physical cell identities.

\textbf{PhysCellIdRange information element}

\begin{verbatim}
--- ASN1START

PhysCellIdRange ::= SEQUENCE {
  start     PhysCellId,
}
### PhysCellIdRange field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>range</strong></td>
<td>Indicates the number of physical cell identities in the range (including start). Value n4 corresponds with 4, n8 corresponds with 8 and so on. The UE shall apply value 1 in case the field is absent, in which case only the physical cell identity value indicated by start applies.</td>
</tr>
<tr>
<td><strong>start</strong></td>
<td>Indicates the lowest physical cell identity in the range.</td>
</tr>
</tbody>
</table>

### PhysCellIdRangeUTRA-FDDList

The IE `PhysCellIdRangeUTRA-FDDList` is used to encode one or more of `PhysCellIdRangeUTRA-FDD`. While the IE `PhysCellIdRangeUTRA-FDD` is used to encode either a single physical layer identity or a range of physical layer identities, i.e. primary scrambling codes. Each range is encoded by using a `start` value and by indicating the number of consecutive physical cell identities (including `start`) in the range.

#### PhysCellIdRangeUTRA-FDDList information element

```asciidoc
PhysCellIdRangeUTRA-FDDList-r9::=  SEQUENCE (SIZE (1..maxPhysCellIdRange-r9)) OF
  PhysCellIdRangeUTRA-FDD-r9
PhysCellIdRangeUTRA-FDD-r9 ::=   SEQUENCE {
    start-r9       PhysCellIdUTRA-FDD,
    range-r9       INTEGER (2..512)    OPTIONAL -- Need OP
  }
```

### PhysCellIdRangeUTRA-FDDList field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>range</strong></td>
<td>Indicates the number of primary scrambling codes in the range (including start). The UE shall apply value 1 in case the field is absent, in which case only the primary scrambling code value indicated by start applies.</td>
</tr>
<tr>
<td><strong>start</strong></td>
<td>Indicates the lowest primary scrambling code in the range.</td>
</tr>
</tbody>
</table>

### PhysCellIdCDMA2000

The IE `PhysCellIdCDMA2000` identifies the PNOffset that represents the "Physical cell identity" in CDMA2000.

#### PhysCellIdCDMA2000 information element

```asciidoc
PhysCellIdCDMA2000 ::=    INTEGER (0..maxPNOffset)
```

### PhysCellIdGERAN

The IE `PhysCellIdGERAN` contains the Base Station Identity Code (BSIC).

#### PhysCellIdGERAN information element

```asciidoc
PhysCellIdGERAN ::=    SEQUENCE {
  networkColourCode     BIT STRING (SIZE (3)),
}
- **PhysCellIdGERAN**

Base station Colour Code as defined in TS 23.003 [27].

Network Colour Code as defined in TS 23.003 [27].

---

### PhysCellIdNR

The IE PhysCellIdNR indicates the physical layer identity (PCI) of an NR cell.

---

#### PhysCellIdNR information element

---

### PhysCellIdUTRA-FDD

The IE PhysCellIdUTRA-FDD is used to indicate the physical layer identity of the cell, i.e. the primary scrambling code, as defined in TS 25.331 [19].

---

#### PhysCellIdUTRA-FDD information element

---

### PhysCellIdUTRA-TDD

The IE PhysCellIdUTRA-TDD is used to indicate the physical layer identity of the cell, i.e. the cell parameters ID (TDD), as specified in TS 25.331 [19]. Also corresponds to the Initial Cell Parameter Assignment in TS 25.223 [46].

---

#### PhysCellIdUTRA-TDD information element

---

### PLMN-Identity

The IE PLMN-Identity identifies a Public Land Mobile Network. Further information regarding how to set the IE are specified in TS 23.003 [27].

---

#### PLMN-Identity information element

---
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---

**PLMN-Identity field descriptions**

**mcc**
The first element contains the first MCC digit, the second element the second MCC digit and so on. If the field is absent, it takes the same value as the mcc of the immediately preceding IE PLMN-Identity. See TS 23.003 [27].

**mnc**
The first element contains the first MNC digit, the second element the second MNC digit and so on. See TS 23.003 [27].

---

### Conditional presence Explanation

| MCC       | This IE is mandatory when PLMN-Identity is included in CellGlobalIdEUTRA, in CellGlobalIdUTRA, in CellGlobalIdGERAN or in RegisteredMME. This IE is also mandatory in the first occurrence of the IE PLMN-Identity within the IE PLMN-IdentityList. Otherwise it is optional, need OP. |

---

**PLMN-IdentityList3**

Includes a list of PLMN identities.

**PLMN-IdentityList3 information element**

---

**PmaxNR**
The IE \textit{PmaxNR} concerns a list of \textit{additionalPmax} and \textit{additionalSpectrumEmission}, as defined in TS 38.101 [85], table 6.2.3-1 for a given frequency band.

**PmaxNR information element**

---

**PreRegistrationInfoHRPD**

---

---

---
<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PreRegAllowed</strong></td>
<td>The field is mandatory in case the <code>preRegistrationAllowed</code> is set to <code>true</code>. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

### Q-QualMin

The IE `Q-QualMin` is used to indicate for cell selection/re-selection the required minimum received RSRQ level in the (E-UTRA) cell. Corresponds to parameter \( Q_{\text{qualmin}} \) in TS 36.304 [4]. Actual value \( Q_{\text{qualmin}} = \text{field value \[dB\]} \).

**Q-QualMin information element**

```asn1
Q-QualMin-r9 ::=  INTEGER (-34..-3)
```

### Q-RxLevMin

The IE `Q-RxLevMin` is used to indicate for cell selection/re-selection the required minimum received RSRP level in the (E-UTRA) cell. Corresponds to parameter \( Q_{\text{rxlevmin}} \) in TS 36.304 [4]. Actual value \( Q_{\text{rxlevmin}} = \text{field value \* 2 \[dBm\]} \).

**Q-RxLevMin information element**

```asn1
Q-RxLevMin ::=  INTEGER (-70..-22)
```

### Q-OffsetRange

The IE `Q-OffsetRange` is used to indicate a cell, CSI-RS resource or frequency specific offset to be applied when evaluating candidates for cell re-selection or when evaluating triggering conditions for measurement reporting. The value in dB. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.

**Q-OffsetRange information element**

```asn1
Q-OffsetRange ::=  ENUMERATED { dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-4, dB-3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24 }
```
– **Q-OffsetRangeInterRAT**

The IE **Q-OffsetRangeInterRAT** is used to indicate a frequency specific offset to be applied when evaluating triggering conditions for measurement reporting. The value in dB.

### Q-OffsetRangeInterRAT information element

```asn1
Q-OffsetRangeInterRAT ::= INTEGER (-15..15)
```

– **ReselectionThreshold**

The IE **ReselectionThreshold** is used to indicate an Rx level threshold for cell reselection. Actual value of threshold = field value * 2 [dB].

### ReselectionThreshold information element

```asn1
ReselectionThreshold ::= INTEGER (0..31)
```

– **ReselectionThresholdQ**

The IE **ReselectionThresholdQ** is used to indicate a quality level threshold for cell reselection. Actual value of threshold = field value [dB].

### ReselectionThresholdQ information element

```asn1
ReselectionThresholdQ-r9 ::= INTEGER (0..31)
```

– **SCellIndex**

The IE **SCellIndex** concerns a short identity, used to identify an SCell.

### SCellIndex information element

```asn1
SCellIndex-r10 ::= INTEGER (1..7)
SCellIndex-r13 ::= INTEGER (1..31)
```

– **ServCellIndex**

The IE **ServCellIndex** concerns a short identity, used to identify a serving cell (i.e. the PCell or an SCell). Value 0 applies for the PCell, while the **SCellIndex** that has previously been assigned applies for SCells.

### ServCellIndex information element

```asn1
ServCellIndex-r10 ::= INTEGER (0..7)
ServCellIndex-r13 ::= INTEGER (0..31)
```
---

**SpeedStateScaleFactors**

The IE **SpeedStateScaleFactors** concerns factors, to be applied when the UE is in medium or high speed state, used for scaling a mobility control related parameter.

**SpeedStateScaleFactors** information element

-- ASN1START

| SpeedStateScaleFactors ::= SEQUENCE {
|                      sf-Medium ENUMERATED {oDot25, oDot5, oDot75, lDot0},
|                      sf-High  ENUMERATED {oDot25, oDot5, oDot75, lDot0}
| }                              -- ASN1STOP

**SpeedStateScaleFactors** field descriptions

- **sf-High**
  The concerned mobility control related parameter is multiplied with this factor if the UE is in High Mobility state as defined in TS 36.304 [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5, oDot75 corresponds to 0.75 and so on.

- **sf-Medium**
  The concerned mobility control related parameter is multiplied with this factor if the UE is in Medium Mobility state as defined in TS 36.304 [4]. Value oDot25 corresponds to 0.25, oDot5 corresponds to 0.5, oDot75 corresponds to 0.75 and so on.

---

**SystemInfoListGERAN**

The IE **SystemInfoListGERAN** contains system information of a GERAN cell.

**SystemInfoListGERAN** information element

-- ASN1START

| SystemInfoListGERAN ::= SEQUENCE (SIZE (1..maxGERAN-SI)) OF OCTET STRING (SIZE (1..23))
| }                              -- ASN1STOP

**SystemInfoListGERAN** field descriptions

- Each OCTET STRING contains one System Information (SI) message as defined in TS 44.018 [45, table 9.1.1] excluding the L2 Pseudo Length, the RR management Protocol Discriminator and the Skip Indicator or a complete Packet System Information (PSI) message as defined in TS 44.060 [36, table 11.2.1].

---

**SystemTimeInfoCDMA2000**

The IE **SystemTimeInfoCDMA2000** informs the UE about the absolute time in the current cell. The UE uses this absolute time knowledge to derive the CDMA2000 Physical cell identity, expressed as PNOffset, of neighbour CDMA2000 cells.

**SystemTimeInfoCDMA2000** information element

-- ASN1START

| SystemTimeInfoCDMA2000 ::= SEQUENCE {
|                         cdma-EUTRA-Synchronisation BOOLEAN,
|                         cdma-SystemTime CHOICE {
|                           synchronousSystemTime BIT STRING (SIZE (39)),
|                           asynchronousSystemTime BIT STRING (SIZE (49))
| }                              -- ASN1STOP

**SystemTimeInfoCDMA2000** field descriptions

- **NOTE**: The UE needs the CDMA2000 system time with a certain level of accuracy for performing measurements as well as for communicating with the CDMA2000 network (HRPD or 1xRTT).
**SystemTimeInfoCDMA2000 field descriptions**

**asynchronousSystemTime**
The CDMA2000 system time corresponding to the SFN boundary at or after the ending boundary of the SI-Window in which SystemInformationBlockType8 is transmitted. E-UTRAN includes this field if the E-UTRA frame boundary is not aligned to the start of CDMA2000 system time. This field size is 49 bits and the unit is 8 CDMA chips based on 1.2288 Mcps.

**cdma-EUTRA-Synchronisation**
TRUE indicates that there is no drift in the timing between E-UTRA and CDMA2000. FALSE indicates that the timing between E-UTRA and CDMA2000 can drift. NOTE 1

**synchronousSystemTime**
CDMA2000 system time corresponding to the SFN boundary at or after the ending boundary of the SI-window in which SystemInformationBlockType8 is transmitted. E-UTRAN includes this field if the E-UTRA frame boundary is aligned to the start of CDMA2000 system time. This field size is 39 bits and the unit is 10 ms based on a 1.2288 Mcps chip rate.

NOTE 1: The following table shows the recommended combinations of the **cdma-EUTRA-Synchronisation** field and the choice of cdma-SystemTime included by E-UTRAN for FDD and TDD:

<table>
<thead>
<tr>
<th>FDD/TDD</th>
<th>cdma-EUTRA-Synchronisation</th>
<th>synchronousSystemTime</th>
<th>asynchronousSystemTime</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDD</td>
<td>FALSE</td>
<td>Not Recommended</td>
<td>Recommended</td>
</tr>
<tr>
<td>FDD</td>
<td>TRUE</td>
<td>Recommended</td>
<td>Recommended</td>
</tr>
<tr>
<td>TDD</td>
<td>FALSE</td>
<td>Not Recommended</td>
<td>Recommended</td>
</tr>
<tr>
<td>TDD</td>
<td>TRUE</td>
<td>Recommended</td>
<td>Recommended</td>
</tr>
</tbody>
</table>

---

**ThresholdNR**
The IE **ThresholdNR** contains thresholds for NR related inter-RAT measurements.

**ThresholdNR information element**

-- ASN1START

```
ThresholdNR-r15 ::=  CHOICE{
  nr-RSRP-r15       RSRP-RangeNR-r15,
  nr-RSRQ-r15       RSRQ-RangeNR-r15,
  nr-SINR-r15       RS-SINR-RangeNR-r15
}
ThresholdListNR-r15 ::=  SEQUENCE{
  nr-RSRP-r15       RSRP-RangeNR-r15 OPTIONAL, -- Need OR
  nr-RSRQ-r15       RSRQ-RangeNR-r15 OPTIONAL, -- Need OR
  nr-SINR-r15       RS-SINR-RangeNR-r15 OPTIONAL -- Need OR
}
```

-- ASN1STOP

---

**TrackingAreaCode**
The IE **TrackingAreaCode** is used to identify a tracking area within the scope of a PLMN, see TS 24.301 [35].

**TrackingAreaCode information element**

-- ASN1START

```
TrackingAreaCode ::=  BIT STRING (SIZE (16))
TrackingAreaCode-5GC-r15 ::=  BIT STRING (SIZE (24))
```

-- ASN1STOP
### T-Reselection

The IE **T-Reselection** concerns the cell reselection timer \( T_{\text{Reselection}} \) for E-UTRA, UTRA, GERAN or CDMA2000. Value in seconds. For value 0, behaviour as specified in 7.3.2 applies.

**T-Reselection information element**

```asn1
T-Reselection ::=     INTEGER (0..7)
```

### T-ReselectionEUTRA-CE

The IE **T-ReselectionEUTRA-CE** concerns the cell reselection timer \( T_{\text{ReselectionEUTRA-CE}} \) as specified in TS 36.304 [4]. Value in seconds. For value 0, behaviour as specified in 7.3.2 applies.

**T-ReselectionEUTRA-CE information element**

```asn1
T-ReselectionEUTRA-CE-r13 ::=    INTEGER (0..15)
```

### 6.3.5 Measurement information elements

#### AllowedMeasBandwidth

The IE **AllowedMeasBandwidth** is used to indicate the maximum allowed measurement bandwidth on a carrier frequency as defined by the parameter Transmission Bandwidth Configuration "\( \text{Nrb} \)" TS 36.104 [47]. The values mbw6, mbw15, mbw25, mbw50, mbw75, mbw100 indicate 6, 15, 25, 50, 75 and 100 resource blocks respectively.

**AllowedMeasBandwidth information element**

```asn1
AllowedMeasBandwidth ::=    ENUMERATED {mbw6, mbw15, mbw25, mbw50, mbw75, mbw100}
```

#### BT-NameList

The IE **BT-NameList** is used to indicate the names of the Bluetooth beacon which the UE is configured to measure.

**BT-NameList information element**

```asn1
BT-NameListConfig-r15 ::=  CHOICE{
   release      NULL,
   setup      BT-NameList-r15
}
BT-NameList-r15 ::=   SEQUENCE (SIZE (1..maxBT-Name-r15)) OF BT-Name-r15
BT-Name-r15 ::=  OCTET STRING (SIZE (1..248))
```

**BT-NameList field descriptions**

- **bt-Name**

  If configured, the UE only performs Bluetooth measurements according to the names identified. For each name, it refers to LOCAL NAME defined in Bluetooth specification [93].

---

**ETSI**
CSI-RSRP-Range

The IE CSI-RSRP-Range specifies the value range used in CSI-RSRP measurements and thresholds. Integer value for CSI-RSRP measurements according to mapping table in TS 36.133 [16].

CSI-RSRP-Range information element

```asn1
CSI-RSRP-Range-r12 ::= INTEGER(0..97)
```

Hysteresis

The IE Hysteresis is a parameter used within the entry and leave condition of an event triggered reporting condition. The actual value is field value * 0.5 dB, except if included in reportConfigEUTRA and associated to eventV1 or eventV2. If included in reportConfigEUTRA and associated to eventV1 or eventV2, the actual value is field value divided by 100.

Hysteresis information element

```asn1
Hysteresis ::= INTEGER (0..30)
```

LocationInfo

The IE LocationInfo is used to transfer detailed location information available at the UE to correlate measurements and UE position information.

LocationInfo information element

```asn1
LocationInfo-r10 ::= SEQUENCE {
  locationCoordinates-r10 CHOICE {
    ellipsoid-Point-r10 OCTET STRING,
    ellipsoidPointWithAltitude-r10 OCTET STRING,
    ...,
    ellipsoidPointWithUncertaintyCircle-r11 OCTET STRING,
    ellipsoidPointWithUncertaintyEllipse-r11 OCTET STRING,
    ellipsoidPointWithAltitudeAndUncertaintyEllipsoid-r11 OCTET STRING,
    ellipsoidArc-r11 OCTET STRING,
    polygon-r11 OCTET STRING,
  },
  horizontalVelocity-r10 OCTET STRING OPTIONAL,
  gnss-70D-msec-r10 OCTET STRING OPTIONAL,
  ...
  [[ verticalVelocityInfo-r15 CHOICE {
    verticalVelocity-r15 OCTET STRING,
    verticalVelocityAndUncertainty-r15 OCTET STRING
  } OPTIONAL ]]
}
```

-- ASN1STOP
LocationInfo field descriptions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ellipsoidArc</td>
<td>Parameter EllipsoidArc defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>ellipsoidPoint</td>
<td>Parameter Ellipsoid-Point defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>ellipsoidPointWithAltitude</td>
<td>Parameter EllipsoidPointWithAltitude defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>ellipsoidPointWithAltitudeAndUncertaintyEllipsoid</td>
<td>Parameter EllipsoidPointWithAltitudeAndUncertaintyEllipsoid defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>ellipsoidPointWithUncertaintyCircle</td>
<td>Parameter EllipsoidPointWithUncertaintyCircle defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>ellipsoidPointWithUncertaintyEllipse</td>
<td>Parameter EllipsoidPointWithUncertaintyEllipse defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>gnss-TOD-msec</td>
<td>Parameter Gnss-TOD-msec defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>horizontalVelocity</td>
<td>Parameter HorizontalVelocity defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>polygon</td>
<td>Parameter Polygon defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>verticalVelocityAndUncertainty</td>
<td>Parameter verticalVelocityAndUncertainty corresponds to horizontalWithVerticalVelocityAndUncertainty defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
<tr>
<td>verticalVelocity</td>
<td>Parameter verticalVelocity corresponds to horizontalWithVerticalVelocity defined in TS36.355 [54]. The first/leftmost bit of the first octet contains the most significant bit.</td>
</tr>
</tbody>
</table>

LogMeasResultListBT

The IE LogMeasResultListBT covers measured results for Bluetooth.

LogMeasResultListBT information element

```asn1
LogMeasResultListBT-r15 ::= SEQUENCE (SIZE (1..maxBT-IdReport-r15)) OF LogMeasResultBT-r15
LogMeasResultBT-r15 ::= SEQUENCE {
  bt-Addr-r15      BIT STRING (SIZE (48)),
  rssi-BT-r15      INTEGER (-128..127)   OPTIONAL,
  ...
}
```

LogMeasResultListBT field descriptions

- **bt-Addr**
  This field indicates the Bluetooth public address of the Bluetooth beacon as defined in TS 36.355 [54].

- **rssi-BT**
  This field provides the beacon received signal strength indicator (RSSI) in dBm as defined in TS 36.355 [54].

LogMeasResultListWLAN

The IE LogMeasResultListWLAN covers measured results for WLAN.

LogMeasResultListWLAN information element

```asn1
```
LogMeasResultListWLAN-r15 ::= SEQUENCE (SIZE (1..maxWLAN-Id-Report-r14)) OF LogMeasResultWLAN-r15

LogMeasResultWLAN-r15 ::= SEQUENCE {
  wlan-Identifiers-r15   WLAN-Identifiers-r12,
  rssiWLAN-r15     WLAN-RSSI-Range-r13    OPTIONAL,
  rtt-WLAN-r15     WLAN-RTT-r15      OPTIONAL,
  ...
}
-- ASN1STOP

--- LogMeasResultListWLAN field descriptions

rssiWLAN
Measured WLAN RSSI result in dBm.

rtt-WLAN
This field provides the measured round trip time between the target device and WLAN AP and optionally the accuracy expressed as the standard deviation of the delay. Units for each of these are 1000ns, 100ns, 10ns, 1ns, and 0.1ns as defined in TS 36.355 [54].

wlan-Identifiers
Indicates the WLAN parameters used for identification of the WLAN for which the measurement results are applicable.

--- MBSFN-RSRQ-Range

The IE MBSFN-RSRQ-Range specifies the value range used in MBSFN RSRQ measurements. Integer value for MBSFN RSRQ measurements according to mapping table in TS 36.133 [16].

MBSFN-RSRQ-Range information element

-- ASN1START
MBSFN-RSRQ-Range-r12 ::= INTEGER(0..31)
-- ASN1STOP

--- MeasConfig

The IE MeasConfig specifies measurements to be performed by the UE, and covers intra-frequency, inter-frequency and inter-RAT mobility as well as configuration of measurement gaps.

MeasConfig information element

-- ASN1START
MeasConfig ::= SEQUENCE {
  -- Measurement objects
  measObjectToRemoveList    MeasObjectToRemoveList    OPTIONAL, -- Need ON
  measObjectToAddModList    MeasObjectToAddModList    OPTIONAL, -- Need ON
  -- Reporting configurations
  reportConfigToRemoveList   ReportConfigToRemoveList   OPTIONAL, -- Need ON
  reportConfigToAddModList   ReportConfigToAddModList   OPTIONAL, -- Need ON
  -- Measurement identities
  measIdToRemoveList     MeasIdToRemoveList     OPTIONAL, -- Need ON
  measIdToAddModList     MeasIdToAddModList     OPTIONAL, -- Need ON
  -- Other parameters
  quantityConfig     QuantityConfig     OPTIONAL, -- Need ON
  measGapConfig     MeasGapConfig     OPTIONAL, -- Need ON
  s-Measure     RSRP-Range     OPTIONAL, -- Need ON
  preRegistrationInfoHRPD    PreRegistrationInfoHRPD    OPTIONAL, -- Need OP
  speedStatePars   CHOICE {
    release              NULL,
    setup                SEQUENCE {
      mobilityStateParameters    MobilityStateParameters,
      timeToTrigger-SF         SpeedStateScaleFactors
    }              OPTIONAL, -- Need ON
  },
  ...
}
-- ASN1STOP
[[ measScaleFactor-r12  
   release
   setup
   NULL,
   MeasScaleFactor-r12
 }] 
measIdToRemoveList-r12  MeasIdToRemoveList-r12  OPTIONAL, -- Need ON 
measIdToAddModListExt-r12  MeasIdToAddModListExt-r12  OPTIONAL, -- Need ON 
measRSRQ-OnAllSymbols-r12  BOOLEAN  OPTIONAL -- Need ON 
]], 
[ [ measObjectToRemoveList-r13  MeasObjectToRemoveList-r13  OPTIONAL, -- Need ON 
measObjectToAddModListExt-r13  MeasObjectToAddModList-r13  OPTIONAL, -- Need ON 
measObjectToAddModList-v1310  MeasObjectToAddModList-v1310  OPTIONAL, -- Need ON 
measObjectToAddModListExt-v1310  MeasObjectToAddModList-v1310  OPTIONAL, -- Need ON 
]], 
[ [ measGapConfigPerCC-List-r14  MeasGapConfigPerCC-List-r14  OPTIONAL, -- Need ON 
measGapSharingConfig-r14  MeasGapSharingConfig-r14  OPTIONAL, -- Need ON 
]], 
[ [ fr1-Gap-r15  BOOLEAN  OPTIONAL, -- Need ON 
mgta-r15  BOOLEAN  OPTIONAL -- Need ON 
]], 
[ [ measGapConfigDensePRS-r15  MeasGapConfigDensePRS-r15  OPTIONAL, -- Need ON 
heightThreshRef-r15  CHOICE  
   release
   setup
   NULL,
   INTEGER (0..31)
] ]
] 
MeasIdToRemoveList ::=  SEQUENCE (SIZE (1..maxMeasId)) OF MeasId 
MeasIdToRemoveListExt-r12 ::=  SEQUENCE (SIZE (1..maxMeasId)) OF MeasId-v1250 
MeasObjectToRemoveList ::=  SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectId 
MeasObjectToRemoveListExt-r13 ::=  SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectId-v1310 
ReportConfigToRemooveList ::=  SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigId 
-- ASN1STOP
### MeasConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>allowInterruptions</td>
<td>Value TRUE indicates that the UE is allowed to cause interruptions to serving cells when performing measurements of deactivated SCell carriers for measCycleSCell of less than 640ms, as specified in TS 36.133 [16]. E-UTRAN enables this field only when an SCell is configured.</td>
</tr>
<tr>
<td>fr1-Gap</td>
<td>Indicates whether the gap is only applicable for measurements on FR1. E-UTRAN includes this field only when the UE is configured with EN-DC.</td>
</tr>
<tr>
<td>heightThreshRef</td>
<td>Reference height threshold for eventH1 and eventH2 in reportConfig. Value 0 refers to -420m, value 1 refers to –120m, and so on until value 30 refers to 8880m. The actual value is height in meters relative to sea level. Value 31 is reserved.</td>
</tr>
<tr>
<td>measGapConfig</td>
<td>Used to setup and release measurement gaps. E-UTRAN includes either measGapConfig or measGapConfigPerCC-List, if any.</td>
</tr>
<tr>
<td>measGapConfigDensePRS</td>
<td>Used to setup and release additional measurement gap pattern with densePRS configuration as specified in TS 36.133 [16], Table 8.1.2.1-3.</td>
</tr>
<tr>
<td>measGapConfigPerCC-List</td>
<td>Used to setup and release serving cell specific measurement gaps. E-UTRAN includes either measGapConfig or measGapConfigPerCC-List, if any.</td>
</tr>
<tr>
<td>measGapSharingConfig</td>
<td>Used to setup and release measurement gap sharing for intra- and inter-frequency measurement as specified in TS 36.133 [16].</td>
</tr>
<tr>
<td>measIdToAddModList</td>
<td>List of measurement identities. Field measIdToAddModListExt includes additional measurement identities i.e. extends the size of the measurement identity list using the general principles specified in 5.1.2. If E-UTRAN includes measIdToAddModList-v1310 it includes the same number of entries, and listed in the same order, as in measIdToAddModList (i.e. without suffix). If E-UTRAN includes measIdToAddModListExt-v1310, it includes the same number of entries, and listed in the same order, as in measIdToAddModListExt-r12.</td>
</tr>
<tr>
<td>measIdToRemoveList</td>
<td>List of measurement identities. Field measIdToRemoveListExt includes additional measurement identities i.e. extends the size of the measurement identity list using the general principles specified in 5.1.2.</td>
</tr>
<tr>
<td>measObjectToAddModList</td>
<td>If E-UTRAN includes measObjectToAddModList-v9e0 it includes the same number of entries, and listed in the same order, as in measObjectToAddModList (i.e. without suffix). Field measObjectToAddModListExt includes additional measurement object identities i.e. extends the size of the measurement object identity list using the general principles specified in 5.1.2.</td>
</tr>
<tr>
<td>measObjectToRemoveList</td>
<td>List of measurement objects. Field measObjectToRemoveListExt includes additional measurement object identities i.e. extends the size of the measurement object identity list using the general principles specified in 5.1.2.</td>
</tr>
<tr>
<td>measRSRQ-OnAllSymbols</td>
<td>Value TRUE indicates that the UE shall, when performing RSRQ measurements, perform RSRQ measurement on all OFDM symbols in accordance with TS 36.214 [48]. If widebandRSRQ-Meas is enabled for the frequency in MeasObjectEUTRA, the UE shall, when performing RSRQ measurements, perform RSRQ measurement on all OFDM symbols with wider bandwidth for concerned frequency in accordance with TS 36.214 [48].</td>
</tr>
<tr>
<td>measScaleFactor</td>
<td>Even if reducedMeasPerformance is not included in any measObjectEUTRA or measObjectUTRA, E-UTRAN may configure this field. The UE behavior is specified in TS 36.133 [16].</td>
</tr>
<tr>
<td>mgta</td>
<td>Indicates whether a timing advance value of 0.5 ms is applicable to the measurement gap configuration provided by E-UTRAN according to TS 38.133 [16]. E-UTRAN configures mgta only when the UE is configured to perform NR measurements.</td>
</tr>
<tr>
<td>preRegistrationInfoHRPD</td>
<td>The CDMA2000 HRPD Pre-Registration Information tells the UE if it should pre-register with the CDMA2000 HRPD network and identifies the Pre-registration zone to the UE.</td>
</tr>
<tr>
<td>reportConfigToRemoveList</td>
<td>List of measurement reporting configurations to remove.</td>
</tr>
<tr>
<td>s-Measure</td>
<td>PCell quality threshold controlling whether or not the UE is required to perform measurements of intra-frequency, inter-frequency and inter-RAT neighbouring cells. Value “0” indicates to disable s-Measure.</td>
</tr>
<tr>
<td>timeToTrigger-SF</td>
<td>The timeToTrigger in ReportConfigEUTRA and in ReportConfigInterRAT are multiplied with the scaling factor applicable for the UE's speed state.</td>
</tr>
</tbody>
</table>
---

**MeasDS-Config**

The IE *MeasDS-Config* specifies information applicable for discovery signals measurement.

**MeasDS-Config information elements**

```
-- ASN1START

MeasDS-Config-r12 ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    dmtc-PeriodOffset-r12 CHOICE {
      ms40-r12 INTEGER(0..39),
      ms80-r12 INTEGER(0..79),
      ms160-r12 INTEGER(0..159),
      ... }
    ds-OccasionDuration-r12 CHOICE {
      durationFDD-r12 INTEGER(1..maxDS-Duration-r12),
      durationTDD-r12 INTEGER(2..maxDS-Duration-r12)
    },
    measCSI-RS-ToRemoveList-r12 MeasCSI-RS-ToRemoveList-r12 OPTIONAL, -- Need ON
    measCSI-RS-ToAddModList-r12 MeasCSI-RS-ToAddModList-r12 OPTIONAL, -- Need ON
    ... }
}

MeasCSI-RS-ToRemoveList-r12 ::= SEQUENCE (SIZE (1..maxCSI-RS-Meas-r12)) OF MeasCSI-RS-Id-r12

MeasCSI-RS-ToAddModList-r12 ::= SEQUENCE (SIZE (1..maxCSI-RS-Meas-r12)) OF MeasCSI-RS-Config-r12

MeasCSI-RS-Config-r12 ::= INTEGER (1..maxCSI-RS-Meas-r12)

MeasCSI-RS-Id-r12 ::= SEQUENCE {
  measCSI-RS-Id-r12 MeasCSI-RS-Id-r12,
  physCellId-r12 INTEGER (0..503),
  scramblingIdentity-r12 INTEGER (0..503),
  resourceConfig-r12 INTEGER (0..31),
  subframeOffset-r12 INTEGER (0..4),
  csi-RS-IndividualOffset-r12 Q-OffsetRange,
  ... }

-- ASN1STOP
```
**MeasDS-Config field descriptions**

**csi-RS-IndividualOffset**
CSI-RS individual offset applicable to a specific CSI-RS resource. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.

**dmtc-PeriodOffset**
Indicates the discovery signals measurement timing configuration (DMTC) periodicity (dmtc-Periodicity) and offset (dmtc-Offset) for this frequency. For DMTC periodicity, value ms40 corresponds to 40ms, ms80 corresponds to 80ms and so on. The value of DMTC offset is in number of subframe(s). The duration of a DMTC occasion is 6ms.

**ds-OccasionDuration**
Indicates the duration of discovery signal occasion for this frequency. Discovery signal occasion duration is common for all cells transmitting discovery signals on one frequency. If the carrierFreq in the measurement object is on an unlicensed band as specified in [42], the UE shall ignore the field ds-OccasionDuration for the carrier frequency and apply a value 1 instead.

**measCSI-RS-ToAddModList**
List of CSI-RS resources to add/ modify in the CSI-RS resource list for discovery signals measurement.

**measCSI-RS-ToRemoveList**
List of CSI-RS resources to remove from the CSI-RS resource list for discovery signals measurement.

**physCellId**
Indicates the physical cell identity where UE may assume that the CSI-RS and the PSS/SSS/CRS corresponding to the indicated physical cell identity are quasi co-located with respect to average delay and doppler shift.

**resourceConfig**
Parameter: CSI reference signal configuration, see TS 36.211 [21, table 6.10.5.2-1 and 6.10.5.2-2]. If the carrierFreq in the measurement object is on an unlicensed band as specified in [42], E-UTRAN does not configure the values {0, 4, 5, 9, 10, 11, 18, 19}.

**scramblingIdentity**
Parameter: Pseudo-random sequence generator parameter, $nID$, see TS 36.213 [23, 7.2.5].

**subframeOffset**
Indicates the subframe offset between SSS of the cell indicated by physCellId and the CSI-RS resource in a discovery signal occasion. The field subframeOffset is set to values 0 if the carrierFreq in the measurement object is on an unlicensed band as specified in [42].

---

**MeasGapConfig**

The IE MeasGapConfig specifies the measurement gap configuration and controls setup/release of measurement gaps.

**MeasGapConfig information element**

```asn1
MeasGapConfig ::= CHOICE {
  release        NULL,
  setup        SEQUENCE {
    gapOffset       CHOICE {
      gp0         INTEGER (0..39),
      gp1         INTEGER (0..79),
      ...
      gp2-r14       INTEGER (0..39),
      gp3-r14       INTEGER (0..79),
      gp-ncsg0-r14  INTEGER (0..39),
      gp-ncsg1-r14  INTEGER (0..79),
      gp-ncsg2-r14  INTEGER (0..39),
      gp-ncsg3-r14  INTEGER (0..79),
      gp-nonUniform1-r14 INTEGER (0..1279),
      gp-nonUniform2-r14 INTEGER (0..2559),
      gp-nonUniform3-r14 INTEGER (0..5119),
      gp-nonUniform4-r14 INTEGER (0..10239),
      gp4-r15       INTEGER (0..19),
      gp5-r15       INTEGER (0..159),
      gp6-r15       INTEGER (0..19),
      gp7-r15       INTEGER (0..39),
      gp8-r15       INTEGER (0..79),
      gp9-r15       INTEGER (0..159),
      gp10-r15      INTEGER (0..19),
      gp11-r15      INTEGER (0..159)
    }
  }
}
```
MeasGapConfig field descriptions

gapOffset
Value gapOffset of gp0 corresponds to gap offset of Gap Pattern Id "0" with MGRP = 40ms, gapOffset of gp1 corresponds to gap offset of Gap Pattern Id "1" with MGRP = 80ms, gapOffset of gp2 corresponds to gap offset of Gap Pattern Id "2" with MGRP = 40ms and MGL = 3ms, gapOffset of gp3 Gap Pattern Id "3" with MGRP = 80ms and MGL = 3ms, gapOffset of gp-ncsg0 corresponds to gap offset of NCSG Pattern Id "0" with VIRP = 40ms and ML = 4ms, gapOffset of gp-ncsg1 corresponds to gap offset of of NCSG Pattern Id "1" with VIRP = 80ms and ML = 4ms, gapOffset of gp-ncsg2 corresponds to gap offset of NCSG Pattern Id "2" with VIRP = 40ms and ML = 3ms, gapOffset of gp-ncsg3 corresponds to gap offset of of NCSG Pattern Id "3" with VIRP = 80ms and ML =3ms, gapOffset of gp-nonUniform1 corresponds to gap offset of non uniform gap pattern Id "1" with LMGRP = 1280ms, gapOffset of gp-nonUniform2 corresponds to gap offset of non uniform gap pattern Id "2" with LMGRP = 2560ms, gapOffset of gp-nonUniform3 corresponds to gap offset of non uniform gap pattern Id "3" with LMGRP = 5120ms, gapOffset of gp-nonUniform4 corresponds to gap offset of non uniform gap pattern Id "4" with LMGRP = 10240ms. Also used to specify the measurement gap pattern to be applied, as defined in TS 36.133 [16]. For Gap Patterns (including non-uniform gap patterns, but excluding NCSG patterns), E-UTRAN includes the same gapOffset value (gap pattern id and gap offset) for all serving cells that are configured with a Gap Pattern. For NCSG Patterns, E-UTRAN includes gapOffset value indicating VIRP and gap offset consistent with the Gap Pattern configuration (MGRP and gap offset). Value gapOffset of gp4, gp5, ..., gp11 are corresponding to gap pattern with Gap Pattern ID 4, 5,..11 respectively, see TS 38.133 [84, Table 9.1.2-1]. Value gp4, gp5, ..., gp11 can be applied for EN-DC, see TS 38.133 [84, Table 9.1.2-2].
servCellId
Identifies the serving cell for which measurement gap configuration is provided (setup) or deleted (release).

---

MeasGapConfigDensePRS

The IE MeasGapConfigDensePRS specifies the additional measurement gap pattern configuration for RSTD measurements with dense PRS configuration, see TS 36.133 [16], Table 8.1.2.1-3. Measurement gaps are configured according to applicability rules specified in 36.133 [16], Table 8.1.2.1-3.

MeasGapConfigDensePRS information element

---

-- ASN1START

MeasGapConfigDensePRS-r15 ::= CHOICE {
  release NULL,
  setup  SEQUENCE {
    gapOffsetDensePRS-r15 CHOICE {
      rstd0-r15 INTEGER (0..79),
      rstd1-r15 INTEGER (0..159),
      rstd2-r15 INTEGER (0..319),
      rstd3-r15 INTEGER (0..639),
      rstd4-r15 INTEGER (0..1279),
      rstd5-r15 INTEGER (0..159),
      rstd6-r15 INTEGER (0..319),
      rstd7-r15 INTEGER (0..639),
      rstd8-r15 INTEGER (0..1279),
      rstd9-r15 INTEGER (0..319),
      rstd10-r15 INTEGER (0..639),
      rstd11-r15 INTEGER (0..1279),
      rstd12-r15 INTEGER (0..319),
      rstd13-r15 INTEGER (0..639),
      rstd14-r15 INTEGER (0..1279),
      rstd15-r15 INTEGER (0..639),
      rstd16-r15 INTEGER (0..1279),
      rstd17-r15 INTEGER (0..639),
      rstd18-r15 INTEGER (0..1279),
      rstd19-r15 INTEGER (0..639),
      rstd20-r15 INTEGER (0..1279),
      ...
    }
  }
}

-- ASN1STOP
**MeasGapConfigDensePRS field descriptions**

*gapOffsetDensePRS*

Indicates the gap offset for performing RSTD measurements with dense PRS configurations as specified in 5.5.2.9a corresponding to measurement gap pattern ID specified in TS 36.133 [16].

---

**MeasGapConfigPerCC-List**

The IE **MeasGapConfigPerCC-List** specifies the measurement gap configuration and controls setup/ release of measurement gaps.

**MeasGapConfigPerCC-List information element**

```asn1
MeasGapConfigPerCC-List-r14 ::= CHOICE {
  release      NULL,
  setup      SEQUENCE {
   _measGapConfigToRemoveList-r14 MeasGapConfigToRemoveList-r14 OPTIONAL, -- Need ON
    measGapConfigToAddModList-r14 MeasGapConfigToAddModList-r14 OPTIONAL -- Need ON
  }
}
```

**MeasGapConfigPerCC-List field descriptions**

*measGapConfigToAddModList*

List of serving cells and corresponding serving cell specific measurement gap configuration to add /modify.

*measGapConfigToRemoveList*

List of serving cells for which measurement gap configuration is removed.

---

**MeasGapSharingConfig**

The IE **MeasGapSharingConfig** specifies the measurement gap sharing scheme and controls setup/ release of measurement gap sharing.

**MeasGapSharingConfig information element**

```asn1
MeasGapSharingConfig-r14 ::= CHOICE {
  release      NULL,
  setup      SEQUENCE {
    measGapSharingScheme-r14 ENUMERATED {scheme00, scheme01, scheme10, scheme11}
  }
}
```

**MeasGapSharingConfig field descriptions**

*measGapSharingScheme*

Indicates the measurement gaps sharing scheme for BL UEs in CE mode A and CE mode B and for EN-DC (for the measurement gap configured by E-UTRAN). For BL UEs, see TS 36.133 [16, Table 8.13.2.1.1.1-2 and Table 8.13.3.1.1.1-3]. For EN-DC, see TS 36.133 [16, Table FFS]. Value "scheme00" corresponds to "00", value "scheme01" corresponds to "01", and so on.
— **MeasId**

The IE **MeasId** is used to identify a measurement configuration, i.e., linking of a measurement object and a reporting configuration.

**MeasId** information element

```asn1
MeasId ::= INTEGER (1..maxMeasId)
MeasId-v1250 ::= INTEGER (maxMeasId-Plus1..maxMeasId-r12)
```

— **MeasIdleConfig**

The IE **MeasIdleConfig** is used to convey information to UE about measurements requested to be done while in RRC_IDLE.

**MeasIdleConfig** information element

```asn1
MeasIdleConfigSIB-r15 ::= SEQUENCE {
  measIdleCarrierListEUTRA-r15     EUTRA-CarrierList-r15,
  ...
}
MeasIdleConfigDedicated-r15 ::= SEQUENCE {
  measIdleCarrierListEUTRA-r15     EUTRA-CarrierList-r15  OPTIONAL,  -- Need OR
  measIdleDuration-r15     ENUMERATED {sec10, sec30, sec60, sec120,
                                     sec180, sec240, sec300, spare},
  ...
}
EUTRA-CarrierList-r15 ::= SEQUENCE (SIZE (1..maxFreqIdle-r15)) OF MeasIdleCarrierEUTRA-r15
MeasIdleCarrierEUTRA-r15 ::= SEQUENCE {
  carrierFreq-r15     ARFCN-ValueEUTRA-r9,
  allowedMeasBandwidth-r15     AllowedMeasBandwidth,
  validityArea-r15     CellList-r15  OPTIONAL,  -- Need OR
  measCellList-r15     CellList-r15  OPTIONAL,  -- Need OR
  reportQuantities     ENUMERATED {rsrp, rsrq, both},
  qualityThreshold-r15     SEQUENCE {
    idleRSRP-Threshold-r15     RSRP-Range  OPTIONAL,  -- Need OR
    idleRSRQ-Threshold-r15     RSRQ-Range-r13  OPTIONAL,  -- Need OR
  },
  ...
}
CellList-r15 ::= SEQUENCE (SIZE (1.. maxCellMeasIdle-r15)) OF PhysCellIdRange
```

---

---
MeasIdleConfig field descriptions

allowedMeasBandwidth
If absent, the value corresponding to the downlink bandwidth indicated by the dl-Bandwidth included in MasterInformationBlock of serving cell applies.

carrierFreq
Indicates the E-UTRA carrier frequency to be used for measurements during IDLE mode.

measIdleCarrierListEUTRA
Indicates the E-UTRA carriers to be measured during IDLE mode.

measIdleDuration
Indicates the duration for performing measurements during IDLE mode for measurements assigned via RRCConnectionRelease. Value sec10 correspond to 10 seconds, value sec30 to 30 seconds and so on.

qualityThreshold
Indicates the quality thresholds for reporting the measured cells for IDLE mode measurements.

reportQuantities
Indicates which measurement quantities UE is requested to report in the IDLE mode measurement report.

measCellList
Indicates the list of cells which the UE is requested to measure and report for IDLE mode measurements.

validityArea
Indicates the list of cells within which UE is requested to do IDLE mode measurements. If the UE reselects to a cell outside this list, the measurements are no longer required.

MeasIdToAddModList
The IE MeasIdToAddModList concerns a list of measurement identities to add or modify, with for each entry the measId, the associated measObjectId and the associated reportConfigId. Field measIdToAddModListExt includes additional measurement identities i.e. extends the size of the measurement identity list using the general principles specified in 5.1.2.

MeasIdToAddModList information element

-- ASN1START

MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddMod
MeasIdToAddModList-v1310 ::= SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddMod-v1310
MeasIdToAddModListExt-r12 ::= SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddModExt-r12
MeasIdToAddModListExt-v1310 ::= SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddMod-v1310

MeasIdToAddMod ::= SEQUENCE {
  measId        MeasId,
  measObjectId      MeasObjectId,
  reportConfigId      ReportConfigId
}

MeasIdToAddModExt-r12 ::= SEQUENCE {
  measId-v1250      MeasId-v1250,
  measObjectId-r12     MeasObjectId-r12,
  reportConfigId-r12     ReportConfigId-r12
}

MeasIdToAddMod-v1310 ::= SEQUENCE {
  measObjectId-v1310   MeasObjectId-v1310  OPTIONAL
}

-- ASN1STOP

MeasIdToAddModList field descriptions

measObjectId
If the measObjectId-v1310 is included, the measObjectId or measObjectId-r12 is ignored by the UE.

MeasObjectCDMA2000
The IE MeasObjectCDMA2000 specifies information applicable for inter-RAT CDMA2000 neighbouring cells.
MeasObjectCDMA2000 information element

```asn
MeasObjectCDMA2000 ::= SEQUENCE {
  cdma2000-Type      CDMA2000-Type, -- Need ON
  carrierFreq       CarrierFreqCDMA2000, -- Need ON
  searchWindowSize   INTEGER (0..15) OPTIONAL, -- Need ON
  offsetFreq        Q-OffsetRangeCDMA2000 DEFAULT 0, -- Need ON
  cellsToRemoveList  CellIndexList OPTIONAL, -- Need ON
  cellsToAddModList  CellsToAddModListCDMA2000 OPTIONAL, -- Need ON
  cellForWhichToReportCGI PhysCellIdCDMA2000 OPTIONAL, -- Need ON
  ...
}
```

CellsToAddModListCDMA2000 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModCDMA2000

CellsToAddModCDMA2000 ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellIdCDMA2000
}

MeasObjectCDMA2000 field descriptions

- **carrierFreq**
  Identifies CDMA2000 carrier frequency for which this configuration is valid.

- **cdma2000-Type**
  The type of CDMA2000 network: CDMA2000 1xRTT or CDMA2000 HRPD.

- **cellIndex**
  Entry index in the neighbouring cell list.

- **cellsToAddModList**
  List of cells to add/modify in the neighbouring cell list.

- **cellsToRemoveList**
  List of cells to remove from the neighbouring cell list.

- **physCellId**
  CDMA2000 Physical cell identity of a cell in the neighbouring cell list expressed as PNoffset.

- **searchWindowSize**
  Provides the search window size to be used by the UE for the neighbouring pilot, see C.S0005 [25].

---

MeasObjectEUTRA

The IE MeasObjectEUTRA specifies information applicable for intra-frequency or inter-frequency E-UTRA cells.

MeasObjectEUTRA information element

```asn
MeasObjectEUTRA ::= SEQUENCE {
  carrierFreq       ARFCN-ValueEUTRA, -- Need ON
  allowedMeasBandwidth AllowedMeasBandwidth, -- Need ON
  presenceAntennaPort1 PresenceAntennaPort1, -- Need ON
  neighCellConfig    NeighCellConfig, -- Need ON
  offsetFreq        Q-OffsetRangeLte DEFAULT dB0, -- Need ON
  -- Cell list
  cellsToRemoveList  CellIndexList OPTIONAL, -- Need ON
  cellsToAddModList  CellsToAddModList OPTIONAL, -- Need ON
  -- Black list
  blackCellsToRemoveList CellIndexList OPTIONAL, -- Need ON
  blackCellsToAddModList BlackCellsToAddModList OPTIONAL, -- Need ON
  cellForWhichToReportCGI PhysCellId OPTIONAL, -- Need ON
  ...
  [measCycleSCell-r10    MeasCycleSCell-r10 OPTIONAL, -- Need ON
   measSubframePatternConfigNeigh-r10 MeasSubframePatternConfigNeigh-r10 OPTIONAL, -- Need ON]
  [widebandRSRQ-Meas-r11  BOOLEAN OPTIONAL  -- Cond WB-RSRQ
   [altTTT-CellsToRemoveList-r12 CellIndexList OPTIONAL, -- Need ON
    altTTT-CellsToAddModList-r12 AltTTT-CellsToAddModList-r12 OPTIONAL, -- Need ON
    t312-r12 release      CHOICE {
      NULL,
      ...
    }]
}
```

---

ETSI
MeasObjectEUTRA-v9e0 ::= SEQUENCE {
  carrierFreq-v9e0     ARFCN-ValueEUTRA-v9e0
}

CellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod

CellsToAddMod ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellId,
  cellIndividualOffset    Q-OffsetRange
}

BlackCellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF BlackCellsToAddMod

BlackCellsToAddMod ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellIdRange      PhysCellIdRange
}

MeasCycleSCell-r10 ::= ENUMERATED (sf160, sf256, sf320, sf512, sf640, sf1024, sf1280, spare1)

MeasSubframePatternConfigNeigh-r10 ::= CHOICE {
  release        NULL,
  setup         SEQUENCE {
    measSubframePatternNeigh-r10   MeasSubframePattern-r10,
    measSubframeCellList-r10    MeasSubframeCellList-r10 OPTIONAL -- Cond always
  }
}

MeasSubframeCellList-r10 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF PhysCellIdRange

AltTTT-CellsToAddModList-r12 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF AltTTT-CellsToAddMod-r12

AltTTT-CellsToAddMod-r12 ::= SEQUENCE {
  cellIndex-r12       INTEGER (1..maxCellMeas),
  physCellIdRange-r12      PhysCellIdRange
}

WhiteCellsToAddModList-r13 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF WhiteCellsToAddMod-r13

WhiteCellsToAddMod-r13 ::= SEQUENCE {
  cellIndex-r13       INTEGER (1..maxCellMeas),
  physCellIdRange-r13      PhysCellIdRange
}

RMTC-Config-r13 ::= CHOICE {
  release        NULL,
  setup         SEQUENCE {
    rmtc-Period-r13     ENUMERATED (ms40, ms80, ms160, ms320, ms640),
    rmtc-SubframeOffset-r13   INTEGER (0..639)     OPTIONAL,  -- Need ON
    measDuration-r13    ENUMERATED {sym1, sym14, sym28, sym42, sym70},
    ...          }
}

MeasSensing-Config-r15 ::= SEQUENCE {
  measSensing-Config-r15 OPTIONAL -- Need ON
}

MeasDS-Config-r12 ::= MeasDS-Config-r12 OPTIONAL -- Need ON

reducedMeasPerformance-r12 BOOLEAN OPTIONAL,  -- Need ON

MeasObjectEUTRA-v9e0 ::= SEQUENCE {
  carrierFreq-v9e0     ARFCN-ValueEUTRA-v9e0
}

CellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod

CellsToAddMod ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellId,
  cellIndividualOffset    Q-OffsetRange
}

BlackCellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF BlackCellsToAddMod

BlackCellsToAddMod ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellIdRange      PhysCellIdRange
}

MeasCycleSCell-r10 ::= ENUMERATED (sf160, sf256, sf320, sf512, sf640, sf1024, sf1280, spare1)

MeasSubframePatternConfigNeigh-r10 ::= CHOICE {
  release        NULL,
  setup         SEQUENCE {
    measSubframePatternNeigh-r10   MeasSubframePattern-r10,
    measSubframeCellList-r10    MeasSubframeCellList-r10 OPTIONAL -- Cond always
  }
}

MeasSubframeCellList-r10 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF PhysCellIdRange

AltTTT-CellsToAddModList-r12 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF AltTTT-CellsToAddMod-r12

AltTTT-CellsToAddMod-r12 ::= SEQUENCE {
  cellIndex-r12       INTEGER (1..maxCellMeas),
  physCellIdRange-r12      PhysCellIdRange
}

WhiteCellsToAddModList-r13 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF WhiteCellsToAddMod-r13

WhiteCellsToAddMod-r13 ::= SEQUENCE {
  cellIndex-r13       INTEGER (1..maxCellMeas),
  physCellIdRange-r13      PhysCellIdRange
}

RMTC-Config-r13 ::= CHOICE {
  release        NULL,
  setup         SEQUENCE {
    rmtc-Period-r13     ENUMERATED (ms40, ms80, ms160, ms320, ms640),
    rmtc-SubframeOffset-r13   INTEGER (0..639)     OPTIONAL,  -- Need ON
    measDuration-r13    ENUMERATED {sym1, sym14, sym28, sym42, sym70},
    ...          }
}

MeasObjectEUTRA-v9e0 ::= SEQUENCE {
  carrierFreq-v9e0     ARFCN-ValueEUTRA-v9e0
}

CellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod

CellsToAddMod ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellId,
  cellIndividualOffset    Q-OffsetRange
}

BlackCellsToAddModList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF BlackCellsToAddMod

BlackCellsToAddMod ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellIdRange      PhysCellIdRange
}

MeasCycleSCell-r10 ::= ENUMERATED (sf160, sf256, sf320, sf512, sf640, sf1024, sf1280, spare1)

MeasSubframePatternConfigNeigh-r10 ::= CHOICE {
  release        NULL,
  setup         SEQUENCE {
    measSubframePatternNeigh-r10   MeasSubframePattern-r10,
    measSubframeCellList-r10    MeasSubframeCellList-r10 OPTIONAL -- Cond always
  }
}

MeasSubframeCellList-r10 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF PhysCellIdRange

AltTTT-CellsToAddModList-r12 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF AltTTT-CellsToAddMod-r12

AltTTT-CellsToAddMod-r12 ::= SEQUENCE {
  cellIndex-r12       INTEGER (1..maxCellMeas),
  physCellIdRange-r12      PhysCellIdRange
}

WhiteCellsToAddModList-r13 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF WhiteCellsToAddMod-r13

WhiteCellsToAddMod-r13 ::= SEQUENCE {
  cellIndex-r13       INTEGER (1..maxCellMeas),
  physCellIdRange-r13      PhysCellIdRange
}

RMTC-Config-r13 ::= CHOICE {
  release        NULL,
  setup         SEQUENCE {
    rmtc-Period-r13     ENUMERATED (ms40, ms80, ms160, ms320, ms640),
    rmtc-SubframeOffset-r13   INTEGER (0..639)     OPTIONAL,  -- Need ON
    measDuration-r13    ENUMERATED {sym1, sym14, sym28, sym42, sym70},
    ...          }
}
Tx-ResourcePoolMeasList-r14 ::= SEQUENCE (SIZE (1..maxSL-PoolToMeasure-r14)) OF SL-V2X-TxPoolReportIdentity-r14

-- ASN1STOP
### MeasObjectEUTRA field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>altTTT-CellsToAddModList</td>
<td>List of cells to add/modify in the cell list for which the alternative time to trigger specified by alternativeTimeToTrigger in reportConfigEUTRA, if configured, applies.</td>
</tr>
<tr>
<td>altTTT-CellsToRemoveList</td>
<td>List of cells to remove from the list of cells for alternative time to trigger.</td>
</tr>
<tr>
<td>blackCellsToAddModList</td>
<td>List of cells to add/modify in the black list of cells.</td>
</tr>
<tr>
<td>blackCellsToRemoveList</td>
<td>List of cells to remove from the black list of cells.</td>
</tr>
<tr>
<td>carrierFreq</td>
<td>Identifies E-UTRA carrier frequency for which this configuration is valid. E-UTRAN does not configure more than one measurement object for the same physical frequency regardless of the E-ARFCN used to indicate this. CarrierFreq-r13 is included only when the extension list measObjectToAddModListExt-r13 is used. If carrierFreq-r13 is present, carrierFreq (i.e., without suffix) shall be set to value maxEARFCN.</td>
</tr>
<tr>
<td>cellIndex</td>
<td>Entry index in the cell list. An entry may concern a range of cells, in which case this value applies to the entire range.</td>
</tr>
<tr>
<td>cellIndividualOffset</td>
<td>Cell individual offset applicable to a specific cell. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.</td>
</tr>
<tr>
<td>cellsToAddModList</td>
<td>List of cells to add/modify in the cell list.</td>
</tr>
<tr>
<td>cellsToRemoveList</td>
<td>List of cells to remove from the cell list.</td>
</tr>
<tr>
<td>fembms-MixedCarrier</td>
<td>If this field is set to TRUE, the cells on the carrier frequency indicated by the measObject are FeMBMS/Unicast-mixed cells.</td>
</tr>
<tr>
<td>measCycleSCell</td>
<td>The parameter is used only when an SCell is configured on the frequency indicated by the measObject and is in deactivated state, see TS 36.133 [16, 8.3.3]. E-UTRAN configures the parameter whenever an SCell is configured on the frequency indicated by the measObject, but the field may also be signalled when an SCell is not configured. Value $s160$ corresponds to 160 sub-frames, $s256$ corresponds to 256 sub-frames and so on.</td>
</tr>
<tr>
<td>measDS-Config</td>
<td>Parameters applicable to discovery signals measurement on the carrier frequency indicated by carrierFreq.</td>
</tr>
<tr>
<td>measDuration</td>
<td>Number of consecutive symbols for which the Physical Layer reports samples of RSSI, see TS 36.214 [48]. Value sym1 corresponds to one symbol, sym14 corresponds to 14 symbols, and so on.</td>
</tr>
<tr>
<td>measSubframeCellList</td>
<td>List of cells for which measSubframePatternNeigh is applied.</td>
</tr>
<tr>
<td>measSubframePatternNeigh</td>
<td>Time domain measurement resource restriction pattern applicable to neighbour cell RSRP and RSRQ measurements on the carrier frequency indicated by carrierFreq. For cells in measSubframeCellList the UE shall assume that the subframes indicated by measSubframePatternNeigh are non-MBSFN subframes, and have the same special subframe configuration as PCell.</td>
</tr>
<tr>
<td>offsetFreq</td>
<td>Offset value applicable to the carrier frequency. Value dB-24 corresponds to -24 dB, dB-22 corresponds to -22 dB and so on.</td>
</tr>
<tr>
<td>physCellId</td>
<td>Physical cell identity of a cell in the cell list.</td>
</tr>
<tr>
<td>physCellIdRange</td>
<td>Physical cell identity or a range of physical cell identities.</td>
</tr>
<tr>
<td>reducedMeasPerformance</td>
<td>If set to TRUE, the EUTRA carrier frequency is configured for reduced measurement performance, otherwise it is configured for normal measurement performance, see TS 36.133 [16].</td>
</tr>
<tr>
<td>rmtc-Config</td>
<td>Parameters applicable to RSSI and channel occupancy measurement on the carrier frequency indicated by carrierFreq.</td>
</tr>
<tr>
<td>rmtc-Period</td>
<td>Indicates the RSSI measurement timing configuration (RMTC) periodicity for this frequency. Value ms40 corresponds to 40 ms periodicity, ms80 corresponds to 80 ms periodicity and so on, see TS 36.214 [48].</td>
</tr>
<tr>
<td>rmtc-SubframeOffset</td>
<td>Indicates the RSSI measurement timing configuration (RMTC) subframe offset for this frequency. The value of rmtc-SubframeOffset should be smaller than the value of rmtc-Period, see TS 36.214 [48]. For inter-frequency measurements, this field is optional present and if it is not configured, the UE chooses a random value as rmtc-SubframeOffset for measDuration which shall be selected to be between 0 and the configured rmtc-Period with equal probability.</td>
</tr>
<tr>
<td>Conditional presence</td>
<td>Explanation</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>always</td>
<td>The field is mandatory present.</td>
</tr>
<tr>
<td>WB-RSRQ</td>
<td>The field is optionally present, need ON, if the measurement bandwidth indicated by allowedMeasBandwidth is 50 resource blocks or larger; otherwise it is not present and the UE shall delete any existing value for this field, if configured.</td>
</tr>
</tbody>
</table>

## MeasObjectGERAN

The IE `MeasObjectGERAN` specifies information applicable for inter-RAT GERAN neighbouring frequencies.

### MeasObjectGERAN information element

```asn1
MeasObjectGERAN ::= SEQUENCE {
    carrierFreqs      CarrierFreqsGERAN,
    offsetFreq       Q-OffsetRangeInterRAT  DEFAULT 0,
    ncc-Permitted      BIT STRING(SIZE (8))  DEFAULT '11111111'B,
    cellForWhichToReportCGI    PhysCellIdGERAN    OPTIONAL, -- Need ON
    ... }
```

### MeasObjectGERAN field descriptions

**ncc-Permitted**

Field encoded as a bit map, where bit N is set to "0" if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to "1" if a BCCH carrier with NCC = N-1 is permitted for monitoring; N = 1 to 8; bit 1 of the bitmap is the leading bit of the bit string.

**carrierFreqs**

If E-UTRAN includes `cellForWhichToReportCGI`, it includes only one GERAN ARFCN value in `carrierFreqs`.

## MeasObjectId

The IE `MeasObjectId` used to identify a measurement object configuration.

### MeasObjectId information element

```asn1
MeasObjectId ::= INTEGER (1..maxObjectId)
MeasObjectId-v1310 ::= INTEGER (maxObjectId-Plus1-r13..maxObjectId-r13)
MeasObjectId-r13 ::= INTEGER (1..maxObjectId-r13)
```

---

**t312**

The value of timer T312. Value ms0 represents 0 ms, ms50 represents 50 ms and so on.

**tx-ResourcePoolToAddList**

List of transmission pools identities to be added to the list of pools configured for CBR measurements and for which poolReportId is included in SL-V2X-ConfigDedicated, SystemInformationBlockType21 or SystemInformationBlockType26.

**tx-ResourcePoolToRemoveList**

List of transmission resource pools identities to be removed from the list of pools configured for CBR measurements and for which poolReportId is included in SL-V2X-ConfigDedicated, SystemInformationBlockType21 or SystemInformationBlockType26.

**widebandRSRQ-Meas**

If this field is set to TRUE, the UE shall, when performing RSRQ measurements, use a wider bandwidth in accordance with TS 36.133 [16].

**whiteCellsToAddModList**

List of cells to add/modify in the white list of cells.

**whiteCellsToRemoveList**

List of cells to remove from the white list of cells.
MeasObjectNR

The IE MeasObjectNR specifies information applicable for inter-RAT NR neighbouring cells.

MeasObjectNR information element

```
MeasObjectNR-r15 ::= SEQUENCE {
  carrierFreq-r15    ARFCN-ValueNR-r15,  
  rs-ConfigSSB-r15   RS-ConfigSSB-NR-r15,  
  threshRS-Index-r15 ThresholdListNR-r15 OPTIONAL,  -- Need OR 
  maxRS-IndexCellQual-r15 MaxRS-IndexCellQualNR-r15 OPTIONAL,  -- Need OR 
  offsetFreq-r15     Q-OffsetRangeInterRAT DEFAULT 0, 
  blackCellsToRemoveList-r15 CellIndexList OPTIONAL,  -- Need ON 
  blackCellsToAddModList-r15 CellsToAddModListNR-r15 OPTIONAL,  -- Need ON 
  quantityConfigSet-r15 INTEGER (1..maxQuantSetsNR-r15), 
  cellsForWhichToReportSFTD-r15 SEQUENCE (SIZE (1..maxCellSFTD)) OF PhysCellIdNR-r15 OPTIONAL,  -- Need OR 
  ... 
} 

RS-ConfigSSB-NR-r15 ::= SEQUENCE {
  measTimingConfig-r15   MTC-SSB-NR-r15, 
  subcarrierSpacingSSB-r15 ENUMERATED {kHz15, kHz30, kHz120, kHz240}, 
  ... 
} 

CellsToAddModList-r15 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddMod-r15 
```

MeasObjectNR field descriptions

- **carrierFreq**
  
  Identifies NR carrier frequency for which this configuration is valid. E-UTRAN does not configure more than one measurement object for the same physical frequency regardless of the ARFCN used to indicate this.

- **deriveSSB-IndexFromCell**
  
  The field indicates whether the UE may use, to derive the SSB index of a cell on the indicated SSB frequency and subcarrier spacing, the timing of the NR serving cell with the same SSB frequency and subcarrier spacing if configured. Otherwise, the field indicates whether the UE may use the timing of any detected cell with the same SSB frequency and subcarrier spacing.

---

MeasObjectToAddModList

The IE MeasObjectToAddModList concerns a list of measurement objects to add or modify.

MeasObjectToAddModList information element

```
MeasObjectToAddModList ::= SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectToAddMod 
```

---
MeasObjectToAddMod ::= SEQUENCE {
  measObjectId       MeasObjectId,
  measObject         CHOICE {
    measObjectEUTRA    MeasObjectEUTRA,
    measObjectUTRA     MeasObjectUTRA,
    measObjectGERAN    MeasObjectGERAN,
    measObjectCDMA2000  MeasObjectCDMA2000,
    ...,
    measObjectWLAN-r13  MeasObjectWLAN-r13,
    measObjectNR-r15    MeasObjectNR-r15
  }
}

MeasObjectToAddModExt-r13 ::= SEQUENCE {
  measObjectId-r13  MeasObjectId-v1310,
  measObject-r13    CHOICE {
    measObjectEUTRA-r13  MeasObjectEUTRA,
    measObjectUTRA-r13   MeasObjectUTRA,
    measObjectGERAN-r13  MeasObjectGERAN,
    measObjectCDMA2000-r13 MeasObjectCDMA2000,
    ...,
    measObjectWLAN-v1320 MeasObjectWLAN-r13,
    measObjectNR-r15    MeasObjectNR-r15
  }
}

MeasObjectToAddMod-v9e0 ::= SEQUENCE {
  measObjectEUTRA-v9e0    MeasObjectEUTRA-v9e0  OPTIONAL -- Cond eutra
}

-- ASN1STOP

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>eutra</td>
<td>The field is optional present, need OR, if for the corresponding entry in MeasObjectToAddModList or MeasObjectToAddModListExt-r13 field measObject is set to measObjectEUTRA and its sub-field carrierFreq is set to maxEARFCN. Otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

---

**MeasObjectUTRA**

The IE **MeasObjectUTRA** specifies information applicable for inter-RAT UTRA neighbouring cells.

**MeasObjectUTRA** information element

-- ASN1START

MeasObjectUTRA ::= SEQUENCE {
  carrierFreq       ARFCN-ValueUTRA,
  offsetFreq        Q-OffsetRangeInterRAT DEFAULT 0,
  cellsToRemoveList  CellIndexList OPTIONAL, -- Need ON
  cellsToAddModList  CHOICE {
    cellsToAddModListUTRA-FDD CellsToAddModListUTRA-FDD,
    cellsToAddModListUTRA-TDD CellsToAddModListUTRA-TDD
  } OPTIONAL, -- Need ON
  cellForWhichToReportCGI CHOICE {
    utra-FDDPhysCellIdUTRA-FDD,
    utra-TDDPhysCellIdUTRA-TDD
  } OPTIONAL, -- Need ON
  ...,
  [[ csg-allowedReportingCells-v930 CSG-AllowedReportingCells-r9 OPTIONAL -- Need ON ]],
  [[ reducedMeasPerformance-r12 BOOLEAN OPTIONAL -- Need ON ]]
}

CellsToAddModListUTRA-FDD ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModUTRA-FDD

CellsToAddModUTRA-FDD ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId      PhysCellIdUTRA-FDD
}

CellsToAddModListUTRA-TDD ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModUTRA-TDD

-- ASN1STOP
MeasObjectUTRA field descriptions

carrierFreq
Identifies UTRA carrier frequency for which this configuration is valid. E-UTRAN does not configure more than one measurement object for the same physical frequency regardless of the ARFCN used to indicate this.

cellIndex
Entry index in the neighbouring cell list.

cellsToAddModListUTRA-FDD
List of UTRA FDD cells to add/modify in the neighbouring cell list.

cellsToAddModListUTRA-TDD
List of UTRA TDD cells to add/modify in the neighbouring cell list.

cellsToRemoveList
List of cells to remove from the neighbouring cell list.

csg-allowedReportingCells
One or more ranges of physical cell identities for which UTRA-FDD reporting is allowed.

reducedMeasPerformance
If set to TRUE the UTRA carrier frequency is configured for reduced measurement performance, otherwise it is configured for normal measurement performance, see TS 36.133 [16].

MeasObjectWLAN

The IE MeasObjectWLAN specifies information applicable for inter-RAT WLAN measurements. E-UTRAN configures at least one WLAN identifier in the MeasObjectWLAN.

MeasObjectWLAN field descriptions

bandIndicatorListWLAN
Includes the list of WLAN bands. Value band2dot4 indicates the 2.4GHz band, value band5 indicates the 5GHz band and value band60 indicates the 60GHz band.

carrierInfoListWLAN
Includes the list of WLAN carrier information for the measurement object.

wlan-ToAddModList
Includes the list of WLAN identifiers to be added to the measurement configuration.

wlan-ToRemoveList
Includes the list of WLAN identifiers to be removed from the measurement configuration.

MeasResults

The IE MeasResults covers measured results for intra-frequency, inter-frequency and inter-RAT mobility.
MeasResults information element

-- ASN1START

MeasResults ::= SEQUENCE {
  measId MeasId,
  measResultPCell SEQUENCE {
    rsrpResult RSRP-Range,
    rsrqResult RSRQ-Range
  },
  measResultNeighCells CHOICE {
    measResultListEUTRA MeasResultListEUTRA,
    measResultListUTRA MeasResultListUTRA,
    measResultListGERAN MeasResultListGERAN,
    measResultListCDMA2000 MeasResultsCDMA2000,
    ...
  },
  ...
}

MeasResultListEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA

MeasResultEUTRA ::= SEQUENCE {
  physCellId PhysCellId,
  cgi-Info SEQUENCE {
    cellGlobalId CellGlobalIdEUTRA,
    trackingAreaCode TrackingAreaCode,
    plmn-IdentityList PLMN-IdentityList2 OPTIONAL
  } OPTIONAL,
  measResult SEQUENCE {
    rsrpResult RSRP-Range OPTIONAL,
    rsrqResult RSRQ-Range OPTIONAL,
    ...
  } OPTIONAL,
  ...
}

-- ASN1END
MeasResultListIdle-r15 ::= SEQUENCE (SIZE (1..maxIdleMeasCarriers-r15)) OF MeasResultIdle-r15

MeasResultIdle-r15 ::= SEQUENCE {
  measResultServingCell-r15     SEQUENCE {
    rsrpResult-r15     RSRP-Range,
    rsrqResult-r15     RSRQ-Range-r13
  },
  measResultNeighCells-r15  CHOICE {
    measResultIdleListEUTRA-r15  MeasResultIdleListEUTRA-r15,
  } OPTIONAL,
  ...}

MeasResultIdleListEUTRA-r15 ::= SEQUENCE (SIZE (1..maxCellMeasIdle-r15)) OF MeasResultIdleEUTRA-r15

MeasResultIdleEUTRA-r15 ::= SEQUENCE {
  carrierFreq-r15      ARFCN-ValueEUTRA-r9,
  physCellId-r15      PhysCellId,
  measResult-r15      SEQUENCE {
    rsrpResult-r15     RSRP-Range,
    rsrqResult-r15     RSRQ-Range-r13
  },
  ...}

MeasResultServFreqListNR-r15 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasResultServFreqNR-r15

MeasResultServFreqNR-r15 ::= SEQUENCE {
  carrierFreq-r15      ARFCN-ValueNR-r15,
  measResultCell-r15     MeasResultCellNR-r15    OPTIONAL,
  measResultBestNeighCell-r15   MeasResultCellNR-r15    OPTIONAL,
  ...}

MeasResultCellListNR-r15::=  SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCellNR-r15

MeasResultCellNR-r15 ::=   SEQUENCE {
  pci-r15        PhysCellIdNR-r15,
  measResultCell-r15     MeasResultNR-r15,
  measResultRS-IndexList-r15   MeasResultSSB-IndexList-r15    OPTIONAL,
  ...,
  [ [  cgi-Info-r15      CGI-InfoNR-r15    OPTIONAL ] ]
}

MeasResultNR-r15 ::=    SEQUENCE {
  rsrpResult-r15     RSRP-RangeNR-r15      OPTIONAL,
  rsrqResult-r15     RSRQ-RangeNR-r15      OPTIONAL,
  rs-sinr-Result-r15     RS-SINR-RangeNR-r15      OPTIONAL,
  ...}

MeasResultSSB-IndexList-r15::=  SEQUENCE (SIZE (1..maxRS-IndexReport-r15)) OF MeasResultSSB-Index-r15

MeasResultSSB-Index-r15 ::=  SEQUENCE {
  ssb-Index-r15      RS-IndexNR-r15,
  measResultSSB-Index-r15    MeasResultNR-r15     OPTIONAL,
  ...}

MeasResultServFreqList-r10 ::= SEQUENCE (SIZE (1..maxServCell-r10)) OF MeasResultServFreq-r10

MeasResultServFreqListExt-r13 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasResultServFreq-r13

MeasResultServFreq-r10 ::= SEQUENCE {
  servFreqId-r10     ServCellIndex-r10,
  measResultSCell-r10     SEQUENCE {
  ...}
MeasResultServFreq-r13 ::= SEQUENCE {
  servFreqId-r13            ServCellIndex-r13,
  measResultSCell-r13       SEQUENCE {
    rsrpResultSCell-r13      RSRP-Range,
    rsrqResultSCell-r13      RSRQ-Range-r13,
    rs-sinr-Result-r13       RS-SINR-Range-r13 OPTIONAL
  } OPTIONAL,
  measResultBestNeighCell-r13   SEQUENCE {
    physCellId-r13           PhysCellId,
    rsrpResultNCell-r13      RSRP-Range,
    rsrqResultNCell-r13      RSRQ-Range-r13,
    rs-sinr-Result-r13       RS-SINR-Range-r13 OPTIONAL
  } OPTIONAL,
  ...,
  [[ measResultSCell-v1250    RSRQ-Range-v1250 OPTIONAL,
    measResultBestNeighCell-v1250  RSRQ-Range-v1250 OPTIONAL
  ]],
  [[ measResultSCell-v1310    SEQUENCE {
    rs-sinr-Result-r13       RS-SINR-Range-r13
  } OPTIONAL,
    measResultBestNeighCell-v1310  SEQUENCE {
    physCellId-r13           PhysCellId,
    rsrpResultNCell-r13      RSRP-Range,
    rsrqResultNCell-r13      RSRQ-Range-r13,
    rs-sinr-Result-r13       RS-SINR-Range-r13 OPTIONAL
  } OPTIONAL
  ]]
}

MeasResultCSI-RS-List-r12 ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCSI-RS-r12

MeasResultCSI-RS-r12 ::= SEQUENCE {
  measCSI-RS-Id-r12    MeasCSI-RS-Id-r12,
  csi-RSRP-Result-r12  CSI-RSRP-Range-r12,
  ...,
  [[ additionalSI-Info-r9    AdditionalSI-Info-r9    OPTIONAL
  ]],
  [[ primaryPLMN-Suitable-r12   ENUMERATED {true}   OPTIONAL
  ]]}

MeasResultListUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultUTRA

MeasResultUTRA ::= SEQUENCE {
  physCellId       CHOICE {
    fdd         PhysCellIdUTRA-FDD,
    tdd         PhysCellIdUTRA-TDD
  },
  cgi-Info        SEQUENCE {
    cellGlobalId    CellGlobalIdUTRA,
    locationAreaCode     BIT STRING (SIZE (16))   OPTIONAL,
    routingAreaCode      BIT STRING (SIZE (8))   OPTIONAL,
    plmn-IdentityList     PLMN-IdentityList2    OPTIONAL
  } OPTIONAL,
  measResult       SEQUENCE {
    utra-RSCP       INTEGER (-5..91)    OPTIONAL,
    utra-EcN0       INTEGER (0..49)     OPTIONAL,
    ...,
    [[ additionalSI-Info-r9    AdditionalSI-Info-r9    OPTIONAL
    ]],
    [[ primaryPLMN-Suitable-r12   ENUMERATED {true}   OPTIONAL
    ]]
  }
}

MeasResultListGERAN ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultGERAN

MeasResultGERAN ::= SEQUENCE {
  carrierFreq     CarrierFreqGERAN,
  physCellId      PhysCellIdGERAN,
  ...}
MeasResultsCDMA2000 ::= SEQUENCE {
  preRegistrationStatusHRPD BOOLEAN,
 _measResultListCDMA2000 MeasResultListCDMA2000
}

MeasResultListCDMA2000 ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCDMA2000

MeasResultCDMA2000 ::= SEQUENCE {
  physCellId PhysCellIdCDMA2000,
  cgi-Info CellGlobalIdCDMA2000 OPTIONAL,
  _measResult MeasResult {
    pilotPnPhase INTEGER (0..32767) OPTIONAL,
    pilotStrength INTEGER (0..63),
    ...}
}

MeasResultListWLAN-r13 ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultWLAN-r13

MeasResultListWLAN-r14 ::= SEQUENCE (SIZE (1..maxWLAN-Id-Report-r14)) OF MeasResultWLAN-r13

MeasResultWLAN-r13 ::= SEQUENCE {
  wlan-Identifiers-r13 WLAN-Identifiers-r12,
  carrierInfoWLAN-r13 WLAN-CarrierInfo-r13 OPTIONAL,
  bandWLAN-r13 WLAN-BandIndicator-r13 OPTIONAL,
  rssiWLAN-r13 WLAN-RSSI-Range-r13 OPTIONAL,
  availableAdmissionCapacityWLAN-r13 INTEGER (0..31250) OPTIONAL,
  backhaulDL-BandwidthWLAN-r13 WLAN-backhaulRate-r12 OPTIONAL,
  backhaulUL-BandwidthWLAN-r13 WLAN-backhaulRate-r12 OPTIONAL,
  channelUtilizationWLAN-r13 INTEGER (0..255) OPTIONAL,
  stationCountWLAN-r13 INTEGER (0..65535) OPTIONAL,
  connectedWLAN-r13 ENUMERATED {true} OPTIONAL,
  ...}

MeasResultListCBR-r14 ::= SEQUENCE (SIZE (1..maxCBR-Report-r14)) OF MeasResultCBR-r14

MeasResultCBR-r14 ::= SEQUENCE {
  poolIdentity-r14 SL-V2X-TxPoolReportIdentity-r14,
  cbr-PSSCH-r14 SL-CBR-r14,
  cbr-PSCCH-r14 SL-CBR-r14 OPTIONAL}

MeasResultSensing-r15 ::= SEQUENCE {
  sl-SubframeRef-r15 INTEGER (0..10239),
  sensingResult-r15 SEQUENCE (SIZE (0..400)) OF SensingResult-r15
}

SensingResult-r15 ::= SEQUENCE {
  resourceIndex-r15 INTEGER (1..2000)
}

MeasResultForECID-r9 ::= SEQUENCE {
  ue-RxTxTimeDiffResult-r9 INTEGER (0..4095),
  currentSFN-r9 BIT STRING (SIZE (10))
}

PLMN-IdentityList2 ::= SEQUENCE (SIZE (1..5)) OF PLMN-Identity

AdditionalSI-Info-r9 ::= SEQUENCE {
  csg-MemberStatus-r9 ENUMERATED {member} OPTIONAL,
  csg-Identity-r9 CSG-Identity OPTIONAL
}

MeasResultForRSSI-r13 ::= SEQUENCE {
  rssi-Result-r13 RSSI-Range-r13,
  channelOccupancy-r13 INTEGER (0..100),
  ...}
UL-PDCP-DelayResultList-r13 ::= SEQUENCE (SIZE (1..maxQCI-r13)) OF UL-PDCP-DelayResult-r13

UL-PDCP-DelayResult-r13 ::= SEQUENCE {
  qci-Id-r13 ENUMERATED {qci1, qci2, qci3, qci4, spare4, spare3, spare2, spare1},
  excessDelay-r13 INTEGER (0..31),
  ... }

CGI-InfoNR-r15 ::= SEQUENCE {
  plmn-IdentityInfoList-r15 PLMN-IdentityInfoListNR-r15 OPTIONAL,
  frequencyBandList-15 MultiFrequencyBandListNR-r15 OPTIONAL,
  noSIB1-r15 SEQUENCE {
    ssb-SubcarrierOffset-r15 INTEGER (0..15),
    pdcch-ConfigSIB1-r15 INTEGER (0..255) OPTIONAL,
    ... }
}

CellIdentityNR-r15 ::= BIT STRING (SIZE (36))

PLMN-IdentityListNR-r15 ::= SEQUENCE (SIZE (1..maxPLMN-NR-r15)) OF PLMN-Identity

PLMN-IdentityInfoListNR-r15 ::= SEQUENCE (SIZE (1..maxPLMN-NR-r15)) OF PLMN-IdentityInfoNR-r15

PLMN-IdentityInfoNR-r15 ::= SEQUENCE {
  plmn-IdentityList-r15 PLMN-IdentityListNR-r15,
  trackingAreaCode-r15 TrackingAreaCodeNR-r15 OPTIONAL,
  ran-AreaCode-r15 RAN-AreaCode-r15 OPTIONAL,
  cellIdentity-r15 CellIdentityNR-r15
}

TrackingAreaCodeNR-r15 ::= BIT STRING (SIZE (24))

-- ASN1STOP
# MeasResults field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>availableAdmissionCapacityWLAN</td>
<td>Indicates the available admission capacity of WLAN as defined in IEEE 802.11-2012 [67].</td>
</tr>
<tr>
<td>backhaulDL-BandwidthWLAN</td>
<td>Indicates the backhaul available downlink bandwidth of WLAN, equal to Downlink Speed times Downlink Load defined in Wi-Fi Alliance Hotspot 2.0 [76].</td>
</tr>
<tr>
<td>backhaulUL-BandwidthWLAN</td>
<td>Indicates the backhaul available uplink bandwidth of WLAN, equal to Uplink Speed times Uplink Load defined in Wi-Fi Alliance Hotspot 2.0 [76].</td>
</tr>
<tr>
<td>bandWLAN</td>
<td>Indicates the WLAN band.</td>
</tr>
<tr>
<td>carrierInfoWLAN</td>
<td>Indicates the WLAN channel information.</td>
</tr>
<tr>
<td>cbr-PSSCH</td>
<td>Indicates the CBR measurement results on the PSSCH of the pool indicated by poolIdentity. If adjacencyPSCCH-PSSCH is set to TRUE for the pool indicated by poolIdentity, this field indicates the CBR measurement of both the PSSCH and PSCCH resources which are measured together.</td>
</tr>
<tr>
<td>cbr-PSCCH</td>
<td>Indicates the CBR measurement results on the PSCH of the pool indicated by poolIdentity. This field is only included if adjacencyPSCCH-PSSCH is set to FALSE for the pool indicated by poolIdentity.</td>
</tr>
<tr>
<td>channelOccupancy</td>
<td>Indicates the percentage of samples when the RSSI was above the configured channelOccupancyThreshold for the associated reportConfig.</td>
</tr>
<tr>
<td>channelUtilizationWLAN</td>
<td>Indicates WLAN channel utilization as defined in IEEE 802.11-2012 [67].</td>
</tr>
<tr>
<td>connectedWLAN</td>
<td>Indicates whether the UE is connected to the WLAN for which the measurement results are applicable.</td>
</tr>
<tr>
<td>csg-MemberStatus</td>
<td>Indicates whether or not the UE is a member of the CSG of the neighbour cell.</td>
</tr>
<tr>
<td>currentSFN</td>
<td>Indicates the current system frame number when receiving the UE Rx-Tx time difference measurement results from lower layer.</td>
</tr>
<tr>
<td>excessDelay</td>
<td>Indicates excess queueing delay ratio in UL, according to excess delay ratio measurement report mapping table, as defined in TS 36.314 [71, Table 4.2.1.1.1-1]</td>
</tr>
<tr>
<td>heightUE</td>
<td>Indicates height of the UE in meters relative to the sea level. Value 0 corresponds to sea level (i.e., negative value indicates depth of the UE below sea level). Value -400 corresponds to -400 m, value -399 corresponds to -399 m and so on.</td>
</tr>
<tr>
<td>locationAreaCode</td>
<td>A fixed length code identifying the location area within a PLMN, as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td>measId</td>
<td>Identifies the measurement identity for which the reporting is being performed. If the measId-v1250 is included, the measId (i.e. without a suffix) is ignored by eNB.</td>
</tr>
<tr>
<td>measResult</td>
<td>Measured result of an E-UTRA cell; Measured result of a UTRA cell; Measured result of a GERAN cell or frequency; Measured result of a CDMA2000 cell; Measured result of a WLAN; Measured result of UE Rx-Tx time difference; Measured result of UE SFN, radio frame and subframe timing difference; or Measured result of RSSI and channel occupancy.</td>
</tr>
<tr>
<td>measResultCSI-RS-List</td>
<td>Measured results of the CSI-RS resources in discovery signals measurement.</td>
</tr>
<tr>
<td>measResultListCDMA2000</td>
<td>List of measured results for the maximum number of reported best cells for a CDMA2000 measurement identity.</td>
</tr>
<tr>
<td>measResultListEUTRA</td>
<td>List of measured results for the maximum number of reported best cells for an E-UTRA measurement identity. For UE supporting CE Mode B, when CE mode B is not restricted by upper layers, measResult-v1360 is reported if the measured RSRP is less than -140 dBm.</td>
</tr>
<tr>
<td>measResultListGERAN</td>
<td>List of measured results for the maximum number of reported best cells or frequencies for a GERAN measurement identity.</td>
</tr>
<tr>
<td>measResultListSFTD</td>
<td>List of measured SFTD results for the reported cells for a NR measurement identity.</td>
</tr>
</tbody>
</table>
### MeasResults field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>measResultListUTRA</td>
<td>List of measured results for the maximum number of reported best cells for a UTRA measurement identity.</td>
</tr>
<tr>
<td>measResultListWLAN</td>
<td>List of measured results for the maximum number of reported best WLAN outside the WLAN mobility set and connected WLAN, if any, for a WLAN measurement identity.</td>
</tr>
<tr>
<td>measResultPCell</td>
<td>Measured result of the PCell. For BL UEs or UEs in CE, when operating in CE Mode B, <code>measResultPCell-v1360</code> is reported if the measured RSRP is less than -140 dBm.</td>
</tr>
<tr>
<td>measResultsCDMA2000</td>
<td>Contains the CDMA2000 HRPD pre-registration status and the list of CDMA2000 measurements.</td>
</tr>
<tr>
<td>MeasResultServFreqList</td>
<td>Measured results of the serving frequencies: the measurement result of each SCell, if any, and of the best neighbouring cell on each serving frequency. For UE supporting CE Mode B, when CE mode B is not restricted by upper layers, <code>measResultBestNeighCell-v1360</code> is reported if the measured RSRP is less than -140 dBm.</td>
</tr>
<tr>
<td>measResultServingCell</td>
<td>Measured results of the serving cell from IDLE mode measurements.</td>
</tr>
<tr>
<td>noSIB1</td>
<td>Contains <code>ssb-SubcarrierOffset</code> and <code>pdcch-ConfigSIB1</code> fields acquired by the UE from MIB of the cell for which report CGI procedure was requested by the network in case SIB1 was not broadcast by the cell.</td>
</tr>
<tr>
<td>pilotPnPhase</td>
<td>Indicates the arrival time of a CDMA2000 pilot, measured relative to the UE's time reference in units of PN chips, see C.S0005 [25]. This information is used in either SRVCC handover or enhanced 1xRTT CS fallback procedure to CDMA2000 1xRTT.</td>
</tr>
<tr>
<td>poolIdentity</td>
<td>The identity of the transmission resource pool which is corresponding to the <code>poolReportId</code> configured in a resource pool for V2X sidelink communication.</td>
</tr>
<tr>
<td>plmn-IdentityList</td>
<td>The list of PLMN Identity read from broadcast information when the multiple PLMN Identities are broadcast.</td>
</tr>
<tr>
<td>preRegistrationStatusHRPD</td>
<td>Set to TRUE if the UE is currently pre-registered with CDMA2000 HRPD. Otherwise set to FALSE. This can be ignored by the eNB for CDMA2000 1xRTT.</td>
</tr>
</tbody>
</table>
### MeasResults field descriptions

**qci-Id**
Indicates QCI value for which `excessDelay` is provided, according to TS 36.314 [71].

**resourceIndex**
Indicates the available resource candidates within the [T1, T2] window as specified in TS 36.213 [23] section 14.1.1.6. Value 1 indicates the resource candidate on the subframe indicated by `sl-SubframeRef`, from subchannel 0 to `sensingSubchannelNumber`-1. Value 2 indicates the resource candidate on the first subframe following the subframe indicated by `sl-SubframeRef`, from subchannel 0 to `sensingSubchannelNumber`-1 (Value 101 indicates the resource candidate on the subframe indicated by `sl-SubframeRef`, from subchannel 1 to `sensingSubchannelNumber`, if the numSubchannel of the resource pool is larger than `sensingSubchannelNumber`) and so on.

**routingAreaCode**
The RAC identity read from broadcast information, as defined in TS 23.003 [27].

**rsrpResult**
Measured RSRP result of an E-UTRA cell. The rsrpResult is only reported if configured by the eNB.

**rsrqResult**
Measured RSRQ result of an E-UTRA cell. The rsrqResult is only reported if configured by the eNB.

**rssi**
GERAN Carrier RSSI. RXLEV is mapped to a value between 0 and 63, TS 45.008 [28]. When mapping the RXLEV value to the RSSI bit string, the first/leftmost bit of the bit string contains the most significant bit.

**rssi-Result**
Measured RSSI result in dBm.

**rs-sinr-Result**
Measured RS-SINR result of an E-UTRA or NR cell. The rs-sinr-Result is only reported if configured by the eNB.

**rssiWLAN**
Measured WLAN RSSI result in dBm.

**sl-SubframeRef**
Indicates the subframe corresponding to n+T1 used to obtain the sensing measurement results (see TS 36.213 [23]). Specifically, the value indicates the timing offset with respect to subframe#0 of DFN#0 in milliseconds.

**stationCountWLAN**
Indicates the total number stations currently associated with this WLAN as defined in IEEE 802.11-2012 [67].

**ue-RxTxTimeDiffResult**
UE Rx-Tx time difference measurement result of the PCell, provided by lower layers. If `ue-RxTxTimeDiffPeriodicalTDD-r13` is set to `TRUE`, the measurement mapping is according to EUTRAN TDD UE Rx-Tx time difference report mapping in TS 36.133 [16] and measurement result includes `NTAoffset`, else the measurement mapping is according to EUTRAN FDD UE Rx-Tx time difference report mapping in TS 36.133 [16].

**utra-EcN0**
According to CPICH_Ec/No in TS 25.133 [29] for FDD. Fourteen spare values. The field is not present for TDD.

**utra-RSCP**

**wlan-Identifiers**
Indicates the WLAN parameters used for identification of the WLAN for which the measurement results are applicable.

---

### MeasResultCellSFTD

The IE `MeasResultCellSFTD` consists of SFN and radio frame boundary difference between the PCell and an NR cell as specified in TS 38.215 [89] and TS 38.133 [84].

#### MeasResultCellSFTD information element

```asn1
-- ASN1START
MeasResultCellListSFTD-r15 ::=   SEQUENCE (SIZE (1..maxCellSFTD)) OF MeasResultCellSFTD-r15
MeasResultCellSFTD-r15 ::=    SEQUENCE {
  physCellId-r15       PhysCellIdNR-r15,
  sfn-OffsetResult-r15     INTEGER (0..1023),
  frameBoundaryOffsetResult-r15   INTEGER (-30720..30719),
  rsrpResult-r15       RSRP-RangeNR-r15      OPTIONAL
}
-- ASN1STOP
```
**MeasResultCellSTD field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>physCellId</td>
<td>Indicates the physical layer identity (PCI) of an NR cell.</td>
</tr>
<tr>
<td>sfn-OffsetResult</td>
<td>Indicates the SFN difference between the PCell and the NR cell as an integer value according to TS 38.215 [89].</td>
</tr>
<tr>
<td>frameBoundaryOffsetResult</td>
<td>Indicates the frame boundary difference between the PCell and the NR cell as an integer value according to TS 38.215 [89].</td>
</tr>
<tr>
<td>rsrpResult</td>
<td>Measured RSRP result of an NR cell.</td>
</tr>
</tbody>
</table>

**MeasResultSSTD**

The IE *MeasResultSSTD* consists of SFN, radio frame and subframe boundary difference between the PCell and the PSCell as specified in TS 36.214 [48] and TS 36.133 [16].

**MeasResultSSTD information element**

```asn1
MeasResultSSTD-r13 ::=      SEQUENCE {
    sfn-OffsetResult-r13      INTEGER (0..1023),
    frameBoundaryOffsetResult-r13    INTEGER (-5..4),
    subframeBoundaryOffsetResult-r13   INTEGER (0..127)
}
```

**MeasResultSSTD field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>sfn-OffsetResult</td>
<td>Indicates the SFN difference between the PCell and the PSCell as an integer value according to TS 36.214 [48].</td>
</tr>
<tr>
<td>frameBoundaryOffsetResult</td>
<td>Indicates the frame boundary difference between the PCell and the PSCell as an integer value according to TS 36.214 [48].</td>
</tr>
<tr>
<td>subframeBoundaryOffsetResult</td>
<td>Indicates the subframe boundary difference between the PCell and the PSCell as an integer value according to the mapping table in TS 36.133 [16].</td>
</tr>
</tbody>
</table>

**MeasScaleFactor**

The IE *MeasScaleFactor* specifies the factor for scaling the measurement performance requirements in TS 36.133 [16].

**MeasScaleFactor information element**

```asn1
MeasScaleFactor-r12 ::=   ENUMERATED {sf-EUTRA-cf1, sf-EUTRA-cf2}
```

**MeasSensing-Config**

The IE *MeasSensing-Config* specifies the input factors for sensing measurement as specified in TS 36.213 [23].

**MeasSensing-Config information element**

```asn1
MeasSensing-Config-r15 ::=   SEQUENCE {
    sensingSubchannelNumber-r15   INTEGER (1..20),
}
sensingPeriodicity-r15 ENUMERATED {ms20, ms50, ms100, ms200, ms300, ms400, ms500, ms600, ms700, ms800, ms900, ms1000},
sensingReselectionCounter-r15 INTEGER (5..75),
sensingPriority-r15 INTEGER (1..8)
}

--- ASN1STOP

**MeasSensing-Config field descriptions**

**sensingReselectionCounter**
Indicate the value of SLRESOURCE_RESELECTION_COUNTER, which is used to derive $C_{resel}$, as specified in TS 36.213 [23] section 14.1.1.4B.

**sensingSubchannelNumber**
Indicate the number of sub-channels, i.e., parameter $L_{subCH}$, as specified in TS 36.213 [23] section 14.1.1.6.

**sensingPeriodicity**
Indicate the resource reservation interval, i.e., parameter $r_{sVP,TX}$, as specified in TS 36.213 [23] section 14.1.1.6.

**sensingPriority**
Indicate the priority to be transmitted in the associated SCI format 1 by the UE, i.e., parameter $prio_{TX}$ as specified in TS 36.213 [23] section 14.1.1.6.

--- MTC-SSB-NR

The IE MTC-SSB-NR specifies the measurement timing configuration (MTC) applicable for SSB based NR measurements i.e. the time occasions for performing these measurements.

**MTC-SSB-NR information elements**

--- ASN1START

MTC-SSB-NR-r15 ::= SEQUENCE {
  periodicityAndOffset-r15  CHOICE {
    sf5-r15      INTEGER (0..4),
    sf10-r15     INTEGER (0..9),
    sf20-r15     INTEGER (0..19),
    sf40-r15     INTEGER (0..39),
    sf80-r15     INTEGER (0..79),
    sf160-r15    INTEGER (0..159)
  },
  ssb-Duration-r15     ENUMERATED {sf1, sf2, sf3, sf4, sf5 }
}

--- ASN1STOP

--- QuantityConfig

The IE QuantityConfig specifies the measurement quantities and layer 3 filtering coefficients for E-UTRA and inter-RAT measurements.

**QuantityConfig information element**

--- ASN1START

QuantityConfig ::= SEQUENCE {
  quantityConfigEUTRA     QuantityConfigEUTRA     OPTIONAL, -- Need ON,
  quantityConfigUTRA     QuantityConfigUTRA     OPTIONAL, -- Need ON,
  quantityConfigGERAN     QuantityConfigGERAN     OPTIONAL, -- Need ON,
  quantityConfigCDMA2000    QuantityConfigCDMA2000    OPTIONAL, -- Need ON,
  ...,
  [ [ quantityConfigUTRA-v1020  QuantityConfigUTRA-v1020   OPTIONAL -- Need ON ] ],
  [ [ quantityConfigEUTRA-v1250  QuantityConfigEUTRA-v1250   OPTIONAL -- Need ON ] ],
  [ [ quantityConfigEUTRA-v1310  QuantityConfigEUTRA-v1310   OPTIONAL -- Need ON ] ],
  [ [ quantityConfigWLAN-r13    QuantityConfigWLAN-r13     OPTIONAL -- Need ON ] ],
  [ [ quantityConfigNRList-r15  QuantityConfigNRList-r15   OPTIONAL -- Need ON ] ]
}

--- END--
QuantityConfigEUTRA ::= SEQUENCE {
    filterCoefficientRSRP FilterCoefficient DEFAULT fc4,
    filterCoefficientRSRQ FilterCoefficient DEFAULT fc4
}

QuantityConfigEUTRA-v1250 ::= SEQUENCE {
    filterCoefficientCSI-RSRP-r12 FilterCoefficient OPTIONAL -- Need
}

QuantityConfigEUTRA-v1310 ::= SEQUENCE {
    filterCoefficientRS-SINR-r13 FilterCoefficient DEFAULT fc4
}

QuantityConfigUTRA ::= SEQUENCE {
    measQuantityUTRA-FDD ENUMERATED {cpich-RSCP, cpich-EcN0},
    measQuantityUTRA-TDD ENUMERATED {pccpch-RSCP},
    filterCoefficient FilterCoefficient DEFAULT fc4
}

QuantityConfigUTRA-v1020 ::= SEQUENCE {
    filterCoefficient2-FDD-r10 FilterCoefficient DEFAULT fc4
}

QuantityConfigGERAN ::= SEQUENCE {
    measQuantityGERAN ENUMERATED {rssi},
    filterCoefficient FilterCoefficient DEFAULT fc2
}

QuantityConfigCDMA2000 ::= SEQUENCE {
    measQuantityCDMA2000 ENUMERATED {pilotStrength, pilotPnPhaseAndPilotStrength}
}

QuantityConfigNRList-r15 ::= SEQUENCE (SIZE (1..maxQuantSetsNR-r15)) OF QuantityConfigNR-r15

QuantityConfigNR-r15 ::= SEQUENCE {
    measQuantityCellNR-r15 QuantityConfigRS-NR-r15,
    measQuantityRS-IndexNR-r15 QuantityConfigRS-NR-r15 OPTIONAL
}

QuantityConfigRS-NR-r15 ::= SEQUENCE {
    filterCoeff-RSRP-r15 FilterCoefficient DEFAULT fc4,
    filterCoeff-RSRQ-r15 FilterCoefficient DEFAULT fc4,
    filterCoefficient-SINR-r13 FilterCoefficient DEFAULT fc4
}

QuantityConfigWLAN-r13 ::= SEQUENCE {
    measQuantityWLAN-r13 ENUMERATED {rssiWLAN},
    filterCoefficient-r13 FilterCoefficient DEFAULT fc4
}

-- ASN.1 STOP
**QuantityConfig field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>filterCoefficient2-FDD</strong></td>
</tr>
<tr>
<td>Specifies the filtering coefficient used for the UTRAN FDD measurement quantity, which is not included in measQuantityUTRA-FDD, when reportQuantityUTRA-FDD is present in ReportConfigInterRAT.</td>
</tr>
<tr>
<td><strong>filterCoefficientCSI-RSRP</strong></td>
</tr>
<tr>
<td>Specifies the filtering coefficient used for CSI-RSRP.</td>
</tr>
<tr>
<td><strong>filterCoefficientRSRP</strong></td>
</tr>
<tr>
<td>Specifies the filtering coefficient used for RSRP.</td>
</tr>
<tr>
<td><strong>filterCoefficientRSRQ</strong></td>
</tr>
<tr>
<td>Specifies the filtering coefficient used for RSRQ.</td>
</tr>
<tr>
<td><strong>filterCoefficientRS-SINR</strong></td>
</tr>
<tr>
<td>Specifies the filtering coefficient used for RS-SINR.</td>
</tr>
<tr>
<td><strong>measQuantityCDMA2000</strong></td>
</tr>
<tr>
<td>Measurement quantity used for CDMA2000 measurements.</td>
</tr>
<tr>
<td><em>pilotPnPhaseAndPilotStrength</em> is only applicable for MeasObjectCDMA2000 of cdma2000-Type = type1XRTT.*</td>
</tr>
<tr>
<td><strong>measQuantityRS-IndexNR</strong></td>
</tr>
<tr>
<td>Specifies L3 filter configurations for measurement results of an NR RS index for a particular RS Type (e.g. SS/PBCH block) and the configurable measurement quantities (e.g. RSRP, RSRQ and SINR).</td>
</tr>
<tr>
<td><strong>measQuantityGERAN</strong></td>
</tr>
<tr>
<td>Measurement quantity used for GERAN measurements.</td>
</tr>
<tr>
<td><strong>measQuantityCellINR</strong></td>
</tr>
<tr>
<td>Specifies L3 filter configurations for measurement results of an NR cell for a particular RS Type (e.g. SS/PBCH block) and the configurable measurement quantities (e.g. RSRP, RSRQ and SINR).</td>
</tr>
<tr>
<td><strong>measQuantityUTRA</strong></td>
</tr>
<tr>
<td>Measurement quantity used for UTRA measurements.</td>
</tr>
<tr>
<td><strong>measQuantityWLAN</strong></td>
</tr>
<tr>
<td>Measurement quantity used for WLAN measurements.</td>
</tr>
<tr>
<td><strong>quantityConfigCDMA2000</strong></td>
</tr>
<tr>
<td>Specifies quantity configurations for CDMA2000 measurements.</td>
</tr>
<tr>
<td><strong>quantityConfigEUTRA</strong></td>
</tr>
<tr>
<td>Specifies filter configurations for E-UTRA measurements.</td>
</tr>
<tr>
<td><strong>quantityConfigGERAN</strong></td>
</tr>
<tr>
<td>Specifies quantity and filter configurations for GERAN measurements.</td>
</tr>
<tr>
<td><strong>quantityConfigUTRA</strong></td>
</tr>
<tr>
<td>Specifies quantity and filter configurations for UTRA measurements. Field quantityConfigUTRA-v1020 is applicable only when reportQuantityUTRA-FDD is configured.</td>
</tr>
<tr>
<td><strong>quantityConfigWLAN</strong></td>
</tr>
<tr>
<td>Specifies quantity and filter configurations for WLAN measurements.</td>
</tr>
</tbody>
</table>

---

**ReportConfigEUTRA**

The IE `ReportConfigEUTRA` specifies criteria for triggering of an E-UTRA measurement reporting event. The E-UTRA measurement reporting events concerning CRS are labelled AN with N equal to 1, 2 and so on.

- **Event A1:** Serving becomes better than absolute threshold;
- **Event A2:** Serving becomes worse than absolute threshold;
- **Event A3:** Neighbour becomes amount of offset better than PCell/ PSCell;
- **Event A4:** Neighbour becomes better than absolute threshold;
- **Event A5:** PCell/PSCell becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2;
- **Event A6:** Neighbour becomes amount of offset better than SCell.

The E-UTRA measurement reporting events concerning CSI-RS are labelled CN with N equal to 1 and 2.

- **Event C1:** CSI-RS resource becomes better than absolute threshold;
- **Event C2:** CSI-RS resource becomes amount of offset better than reference CSI-RS resource.

The E-UTRA measurement reporting events concerning CBR are labelled VN with N equal to 1 and 2.
Event V1: CBR becomes larger than absolute threshold;
Event V2: CBR becomes smaller than absolute threshold.

The E-UTRA reporting events concerning Aerial UE height are labelled $H_N$ with $N$ equal to 1 and 2.

Event H1: Aerial UE height becomes higher than absolute threshold;
Event H2: Aerial UE height becomes lower than absolute threshold.

---

**ReportConfigEUTRA information element**

```asn1
ReportConfigEUTRA ::= SEQUENCE {
  triggerType CHOICE {
    event SEQUENCE {
      eventId CHOICE {
        eventA1 SEQUENCE {
          a1-Threshold ThresholdEUTRA
        },
        eventA2 SEQUENCE {
          a2-Threshold ThresholdEUTRA
        },
        eventA3 SEQUENCE {
          a3-Offset INTEGER (-30..30),
          reportOnLeave BOOLEAN
        },
        eventA4 SEQUENCE {
          a4-Threshold ThresholdEUTRA
        },
        eventA5 SEQUENCE {
          a5-Threshold1 ThresholdEUTRA,
          a5-Threshold2 ThresholdEUTRA
        },
        ...
        eventA6-r10 SEQUENCE {
          a6-Offset-r10 INTEGER (-30..30),
          a6-ReportOnLeave-r10 BOOLEAN
        },
        eventC1-r12 SEQUENCE {
          c1-Threshold-r12 ThresholdEUTRA-v1250,
          c1-ReportOnLeave-r12 BOOLEAN
        },
        eventC2-r12 SEQUENCE {
          c2-RefCSI-RS-r12 MeasCSI-RS-Id-r12,
          c2-Offset-r12 INTEGER (-30..30),
          c2-ReportOnLeave-r12 BOOLEAN
        },
        eventV1-r14 SEQUENCE {
          v1-Threshold-r14 SL-CBR-r14
        },
        eventV2-r14 SEQUENCE {
          v2-Threshold-r14 SL-CBR-r14
        },
        eventH1-r15 SEQUENCE {
          h1-ThresholdOffset-r15 INTEGER (0..300),
          h1-Hysteresis-15 INTEGER (1..16)
        },
        eventH2-r15 SEQUENCE {
          h2-ThresholdOffset-r15 INTEGER (0..300),
          h2-Hysteresis-15 INTEGER (1..16)
        }
      },
      hysteresis Hysteresis,
      timeToTrigger TimeToTrigger
    },
    periodical SEQUENCE {
      purpose ENUMERATED {
        reportStrongestCells, reportCGI
      }
    }
  }
}
```

---
...,
[[ si-RequestForHO-r9 ENUMERATED {setup} OPTIONAL, -- Cond reportCGI
ue-RxTxTimeDiffPeriodical-r9 ENUMERATED {setup} OPTIONAL -- Need OR
]],
[[ includeLocationInfo-r10 ENUMERATED {true} OPTIONAL, -- Need OR
reportAddNeighMeas-r10 ENUMERATED {setup} OPTIONAL -- Need OR
]],
[[ alternativeTimeToTrigger-r12 CHOICE {
    release NULL,
    setup TimeToTrigger
} OPTIONAL, -- Need ON
useTI312-r12 BOOLEAN OPTIONAL, -- Need ON
usePSCell-r12 BOOLEAN OPTIONAL, -- Need ON
a5-Threshold1-v1250 RSRQ-RangeConfig-r12 OPTIONAL, -- Need ON
a5-Threshold2-v1250 RSRQ-RangeConfig-r12 OPTIONAL, -- Need ON
reportStrongestCSI-RSs-r12 BOOLEAN OPTIONAL, -- Need ON
reportCRS-Meas-r12 BOOLEAN OPTIONAL, -- Need ON
triggerQuantityCSI-RS-r12 BOOLEAN OPTIONAL -- Need ON
}],
[[ reportSSTD-Meas-r13 BOOLEAN OPTIONAL, -- Need ON
rs-sinr-Config-r13 CHOICE {
    release NULL,
    setup SEQUENCE {
        triggerQuantity-v1310 ENUMERATED {sinr} OPTIONAL, -- Need ON
        aN-Threshold1-r13 RS-SINR-Range-r13 OPTIONAL, -- Need ON
        a5-Threshold2-r13 RS-SINR-Range-r13 OPTIONAL, -- Need ON
        reportQuantity-v1310 ENUMERATED {rsrpANDsinr, rsrqANDsinr, all}
    }
} OPTIONAL, -- Need ON
useWhiteCellList-r13 BOOLEAN OPTIONAL, -- Need ON
measRSSI-ReportConfig-r13 MeasRSSI-ReportConfig-r13 OPTIONAL, -- Need ON
includeMultiBandInfo-r13 ENUMERATED {true} OPTIONAL, -- Cond reportCGI
ul-DelayConfig-r13 UL-DelayConfig-r13 OPTIONAL -- Need ON
}],
[[ ue-RxTxTimeDiffPeriodicalTDD-r13 BOOLEAN OPTIONAL -- Need ON
]],
[[ purpose-v1430 ENUMERATED {reportLocation, sidelink, spare2, spare1} OPTIONAL -- Need ON
]],
[[ maxReportRS-Index-r15 INTEGER (0..maxRS-IndexReport-r15) OPTIONAL -- Need ON
]],
[[ includeBT-Meas-r15 BT-NameListConfig-r15 OPTIONAL, -- Need ON
includeWLAN-Meas-r15 WLAN-NameListConfig-r15 OPTIONAL, -- Need ON
purpose-r15 ENUMERATED {sensing} OPTIONAL, -- Need ON
numberOfTriggeringCells-r15 INTEGER (2..maxCellReport) OPTIONAL, -- Cond a3a4a5
a4-a5-ReportOnLeave-r15 BOOLEAN OPTIONAL -- Cond a4a5
]]
}
### ReportConfigEUTRA field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a3-Offset/ a6-Offset/ c2-Offset</td>
<td>Offset value to be used in EUTRA measurement report triggering condition for event a3/ a6/ c2. The actual value is field value * 0.5 dB.</td>
</tr>
<tr>
<td>alternativeTimeToTrigger</td>
<td>Indicates the time to trigger applicable for cells specified in altTTT-CellsToAddModList of the associated measurement object, if configured.</td>
</tr>
<tr>
<td>aN-ThresholdM/ cN-ThresholdM</td>
<td>Threshold to be used in EUTRA measurement report triggering condition for event number aN/ cN. If multiple thresholds are defined for event number aN/ cN, the thresholds are differentiated by M. E-UTRAN configures aN-Threshold1 only for events A1, A2, A4, A5 and a5-Threshold2 only for event A5.</td>
</tr>
<tr>
<td>c1-ReportOnLeave/ c2-ReportOnLeave</td>
<td>Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a CSI-RS resource in csi-RS-TriggeredList, as specified in 5.5.4.1.</td>
</tr>
<tr>
<td>c2-RefCSI-RS</td>
<td>Identity of the CSI-RS resource from the measCSI-RS-ToAddModList of the associated measObject, to be used as the reference CSI-RS resource in EUTRA measurement report triggering condition for event c2.</td>
</tr>
<tr>
<td>channelOccupancyThreshold</td>
<td>RSSI threshold which is used for channel occupancy evaluation. If set to TRUE, the UE shall measure SSTD between the PCell and the PSCell as specified in TS 36.214 [48].</td>
</tr>
<tr>
<td>eventId</td>
<td>Choice of E-UTRA event triggered reporting criteria. EUTRAN may set this field to eventC1 or eventC2 only if measDS-Config is configured in the associated measObject with one or more CSI-RS resources. The eventC1 and eventC2 are not applicable for the eventD if RS-SINR is configured as triggerQuantity or reportQuantity.</td>
</tr>
<tr>
<td>h1-Hysteresis, h2-Hysteresis</td>
<td>This parameter is used within the entry and leave condition of an event triggered reporting condition for event H1 and event H2. The actual value is field value. If this field is configured UE shall ignore parameter hysteresis.</td>
</tr>
<tr>
<td>h1-ThresholdOffset, h2-ThresholdOffset</td>
<td>An offset value to heightThreshRef to obtain the threshold to be used in EUTRA height report triggering condition for event H1 and event H2. The value for h1-ThresholdOffset and h2-ThresholdOffset is expressed in meters such that granularity is 2 meters. Value 0 corresponds to offset value 0m, value 1 corresponds to offset value 2m, value 3 correspond to offset value 4m, and so on.</td>
</tr>
<tr>
<td>includeMultiBandInfo</td>
<td>If this field is present, the UE shall acquire and include multi band information in the measurement report.</td>
</tr>
<tr>
<td>maxReportCells</td>
<td>Max number of cells, excluding the serving cell, to include in the measurement report concerning CRS, and max number of CSI-RS resources to include in the measurement report concerning CSI-RS.</td>
</tr>
<tr>
<td>measRSSI-ReportConfig</td>
<td>If this field is present, the UE shall perform measurement reporting for RSSI and channel occupancy and ignore the triggerQuantity, reportQuantity and maxReportCells fields. E-UTRAN only sets this field to true when setting triggerType to periodical and purpose to reportStrongestCells.</td>
</tr>
<tr>
<td>numberOfTriggeringCells</td>
<td>Indicates the number of cells detected that are required to fulfill an event for a measurement report to be triggered. This field is set only for the events concerning neighbor cells, i.e. eventA3, eventA4, eventA5.</td>
</tr>
<tr>
<td>reportAmount</td>
<td>Number of measurement reports applicable for triggerType event as well as for triggerType periodical. In case purpose is set to reportCGI or reportSSTD-Meas is set to true, only value 1 applies.</td>
</tr>
<tr>
<td>reportCRS-Meas</td>
<td>Indicates that UE shall include rsrc, rsrc together with csi-rsrc in the measurement report, if possible.</td>
</tr>
<tr>
<td>reportOnLeave/ a6-ReportOnLeave/ a4-a5-ReportOnLeave</td>
<td>Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a cell in cellsTriggeredList, as specified in 5.5.4.1.</td>
</tr>
<tr>
<td>reportQuantity</td>
<td>The quantities to be included in the measurement report. The value both means that both the rsrc and rsrc quantities are to be included in the measurement report. The value rsPANDSInr and rsPANDSInr mean that both rsrc and rs-sinr quantities, and both rsrc and rs-sinr quantities are to be included respectively in the measurement report. The value all means that rsrc, rsrc and rs-sinr are to be included in the measurement report. In case triggerQuantityCSI-RS is included, only value sameAsTriggerQuantity applies. If reportQuantity-v1310 is configured, the UE only considers this extension (and ignores reportQuantity i.e. without suffix).</td>
</tr>
<tr>
<td>reportSSTD-Meas</td>
<td>If this field is set to true, the UE shall measure SSTD between the PCell and the PSCell as specified in TS 36.214 [48] and ignore the triggerQuantity, reportQuantity and maxReportCells fields. E-UTRAN only sets this field to true when setting triggerType to periodical and purpose to reportStrongestCells.</td>
</tr>
<tr>
<td>reportStrongestCSI-RSs</td>
<td>Indicates that periodical CSI-RS measurement report is performed. EUTRAN configures value TRUE only if measDS-Config is configured in the associated measObject with one or more CSI-RS resources.</td>
</tr>
</tbody>
</table>
si-RequestForHO
The field applies to the reportCGI functionality, and when the field is included, the UE is allowed to use autonomous gaps in acquiring system information from the neighbour cell, applies a different value for T321, and includes different fields in the measurement report.

ThresholdEUTRA
For RSRP: RSRP based threshold for event evaluation. The actual value is field value – 140 dBm.
For RSRQ: RSRQ based threshold for event evaluation. The actual value is (field value – 40)/2 dB.
For RS-SINR: RS-SINR based threshold for event evaluation. The actual value is (field value – 46)/2 dB.
For CSI-RSRP: CSI-RSRP based threshold for event evaluation. The actual value is field value – 140 dBm.
EUTRAN configures the same threshold quantity for all the thresholds of an event.

timeToTrigger
Time during which specific criteria for the event needs to be met in order to trigger a measurement report.

triggerQuantity
The quantity used to evaluate the triggering condition for the event concerning CRS. EUTRAN sets the value according to the quantity of the ThresholdEUTRA for this event. The values rsrp, rsrq and sinr correspond to Reference Signal Received Power (RSRP), Reference Signal Received Quality (RSRQ) and Reference Signal to Noise and Interference Ratio (RS-SINR), see TS 36.214 [48]. If triggerQuantity-v1310 is configured, the UE only considers this extension (and ignores triggerQuantity i.e. without suffix).

triggerQuantityCSI-RS
The quantity used to evaluate the triggering condition for the event concerning CSI-RS. The value TRUE corresponds to CSI Reference Signal Received Power (CSI-RSRP), see TS 36.214 [48]. E-UTRAN configures value TRUE if and only if the measurement reporting event concerns CSI-RS.

ue-RxTxTimeDiffPeriodical
If this field is present, the UE shall perform UE Rx-Tx time difference measurement reporting and ignore the fields triggerQuantity, reportQuantity and maxReportCells. If the field is present, the only applicable values for the corresponding triggerType and purpose are periodical and reportStrongestCells respectively.

ue-RxTxTimeDiffPeriodicalTDD
If this field is set to TRUE, the UE shall perform UE Rx-Tx time difference measurement reporting according to EUTRAN TDD UE Rx-Tx time difference report mapping in TS 36.133 [16]. If the field is configured, the ue-RxTxTimeDiffPeriodical shall be configured. The field is applicable for TDD only.

usePSCell
If this field is set to TRUE the UE shall use the PSCell instead of the PCell. E-UTRAN configures value TRUE only for events A3 and A5, see 5.5.4.4 and 5.5.4.6.

useT312
If value TRUE is configured, the UE shall use the timer T312 with the value t312 as specified in the corresponding measObject. If the corresponding measObject does not include the timer T312 then the timer T312 is considered as not configured. E-UTRAN configures value TRUE only if triggerType is set to event.

useWhiteCellList
Indicates whether only the cells included in the white-list of the associated measObject are applicable as specified in 5.5.4.1. E-UTRAN does not configure the field for events A1, A2, C1 and C2.

ul-DelayConfig
If the field is present, E-UTRAN configures UL PDCP Packet Delay per QCI measurement and the UE shall ignore the fields triggerQuantity and maxReportCells. The applicable values for the corresponding triggerType and reportInterval are periodical and (one of the) ms1024, ms2048, ms5120 or ms10240 respectively. The reportInterval indicates the periodicity for performing and reporting of UL PDCP Delay per QCI measurement as specified in TS 36.314 [71].

Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>reportCGI</td>
<td>The field is optional, need OR, in case purpose is included and set to reportCGI; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>a3a4a5</td>
<td>This field is optional, need OR, in case eventId is set to eventA3 or eventA4 or eventA5; otherwise, this field is not present and the UE shall delete any existing value of this field.</td>
</tr>
<tr>
<td>a4a5</td>
<td>This field is optional, need OR, in case eventId is set to eventA4 or eventA5; otherwise, this field is not present and the UE shall delete any existing value of this field.</td>
</tr>
</tbody>
</table>

--- ReportConfigId
The IE ReportConfigId is used to identify a measurement reporting configuration.

--- ReportConfigId information element

```
-- ASN1START
ReportConfigId ::= INTEGER (1..maxReportConfigId)
-- ASN1STOP
```
The IE `ReportConfigInterRAT` specifies criteria for triggering of an inter-RAT measurement reporting event. The inter-RAT measurement reporting events for NR, UTRAN, GERAN and CDMA2000 are labelled B\textsubscript{N} with N equal to 1, 2 and so on. The inter-RAT measurement reporting events for WLAN are labelled W\textsubscript{N} with N equal to 1, 2 and so on.

Event B\textsubscript{1}: Neighbour becomes better than absolute threshold;

Event B\textsubscript{2}: PCell becomes worse than absolute threshold\textsubscript{1} AND Neighbour becomes better than another absolute threshold\textsubscript{2}.

Event W\textsubscript{1}: WLAN becomes better than a threshold;

Event W\textsubscript{2}: All WLAN inside WLAN mobility set become worse than a threshold\textsubscript{1} and a WLAN outside WLAN mobility set becomes better than a threshold\textsubscript{2};

Event W\textsubscript{3}: All WLAN inside WLAN mobility set become worse than a threshold.

The b\textsubscript{1} and b\textsubscript{2} event thresholds for CDMA2000 are the CDMA2000 pilot detection thresholds are expressed as an unsigned binary number equal to [-2 x 10 log 10 Ec/Io] in units of 0.5dB, see C.S0005 [25] for details.

---

**ReportConfigInterRAT information element**

---

```
ReportConfigInterRAT ::= SEQUENCE {
  triggerType event {
    eventB1 SEQUENCE {
      eventId CHOICE {
        eventB1 SEQUENCE {
          b1-Threshold CHOICE {
            b1-ThresholdUTRA ThresholdUTRA,
            b1-ThresholdGERAN ThresholdGERAN,
            b1-ThresholdCDMA2000 ThresholdCDMA2000
          }
        },
        eventB2 SEQUENCE {
          b2-Threshold1 ThresholdEUTRA,
          b2-Threshold2 CHOICE {
            b2-Threshold2UTRA ThresholdUTRA,
            b2-Threshold2GERAN ThresholdGERAN,
            b2-Threshold2CDMA2000 ThresholdCDMA2000
          }
        },
        ...
        eventW1-r13 SEQUENCE {
          w1-Threshold-r13 WLAN-RSSI-Range-r13
        },
        eventW2-r13 SEQUENCE {
          w2-Threshold1-r13 WLAN-RSSI-Range-r13,
          w2-Threshold2-r13 WLAN-RSSI-Range-r13
        },
        eventW3-r13 SEQUENCE {
          w3-Threshold-r13 WLAN-RSSI-Range-r13
        },
        eventB1-NR-r15 SEQUENCE {
          b1-ThresholdNR-r15 ThresholdNR-r15,
          reportOnLeave-r15 BOOLEAN
        },
        eventB2-NR-r15 SEQUENCE {
          b2-Threshold1-r15 ThresholdEUTRA,
          b2-Threshold2-r15 ThresholdNR-r15,
          reportOnLeave-r15 BOOLEAN
        }
      },
      hysteresis Hysteresis,
      timeToTrigger TimeToTrigger
    },
    periodical SEQUENCE {
      purpose ENUMERATED {
        reportStrongestCells,"reportStrongestCellsForSON,"..."reportStrongestCellsForSON,"
      }
    }
  }
}
```
ThresholdUTRA ::=   CHOICE{
  utra-RSCP     INTEGER (-5..91),
  utra-EcN0     INTEGER (0..49)
}

ThresholdGERAN ::=    INTEGER (0..63)

ThresholdCDMA2000 ::=   INTEGER (0..63)

ReportQuantityNR-r15::=      SEQUENCE {
  ss-rsrp          BOOLEAN,
  ss-rsrq          BOOLEAN,
  ss-sinr          BOOLEAN
}

ReportQuantityWLAN-r13 ::=  SEQUENCE {
  bandRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  carrierInfoRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  availableAdmissionCapacityRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  backhaulDL-BandwidthRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  backhaulUL-BandwidthRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  channelUtilizationRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  stationCountRequestWLAN-r13 ENUMERATED {true} OPTIONAL, -- Need OR
  ...  
  -- ASN1STOP
### ReportConfigInterRAT field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>availableAdmissionCapacityRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Available Admission Capacity in measurement reports.</td>
</tr>
<tr>
<td>backhaulDL-BandwidthRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Backhaul Downlink Bandwidth in measurement reports.</td>
</tr>
<tr>
<td>backhaulUL-BandwidthRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Backhaul Uplink Bandwidth in measurement reports.</td>
</tr>
<tr>
<td>bandRequestWLAN</td>
<td>The value true indicates that the UE shall include WLAN band in measurement reports.</td>
</tr>
<tr>
<td>bN-ThresholdM</td>
<td>Threshold to be used in inter RAT measurement report triggering condition for event number bN. If multiple thresholds are defined for event number bN, the thresholds are differentiated by M.</td>
</tr>
<tr>
<td>carrierInfoRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Carrier Information in measurement reports.</td>
</tr>
<tr>
<td>channelUtilizationRequest-WLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Channel Utilization in measurement reports.</td>
</tr>
<tr>
<td>eventId</td>
<td>Choice of inter-RAT event triggered reporting criteria.</td>
</tr>
<tr>
<td>maxReportCells</td>
<td>Max number of cells, excluding the serving cell, to include in the measurement report. In case purpose is set to reportStrongestCellsForSON only value 1 applies. For inter-RAT WLAN, it is the maximum number of WLANs to include in the measurement report.</td>
</tr>
<tr>
<td>maxReportRS-Index</td>
<td>Max number of RS indices to include in the measurement report. E-UTRAN configures value 0 only if it sets reportRS-IndexResultsNR to FALSE.</td>
</tr>
<tr>
<td>reportAmount</td>
<td>Number of measurement reports applicable for triggerType event as well as for triggerType periodical. In case purpose is set to reportCGI or reportStrongestCellsForSON only value 1 applies. In case reportSFTD-Meas is configured, only value 1 applies.</td>
</tr>
<tr>
<td>reportAnyWLAN</td>
<td>Indicates UE to report any WLAN AP meeting the triggering requirements, even if it is not included in the corresponding MeasObjectWLAN.</td>
</tr>
<tr>
<td>reportOnLeave</td>
<td>Indicates whether or not the UE shall initiate the measurement reporting procedure when the leaving condition is met for a cell in cellsTriggeredList, as specified in 5.5.4.1.</td>
</tr>
<tr>
<td>reportQuantityUTRA-FDD</td>
<td>The quantities to be included in the UTRA measurement report. The value both means that both the cpich RSCP and cpich EcN0 quantities are to be included in the measurement report.</td>
</tr>
<tr>
<td>reportSFTD-Meas</td>
<td>If this field is set to pSCell, the UE shall measure SFTD between the PCell and the PSCell as specified in TS 38.215 [89]. If the field is set to neighborCells, the UE shall measure SFTD between the PCell and the NR cells included in cellsForWhichToReportSFTD (if configured in the corresponding measObjectNR) or between the PCell and up to 3 strongest detected NR cells (if cellsForWhichToReportSFTD is not configured in the corresponding measObjectNR), as specified in TS 38.215 [89]. E-UTRAN only includes this field when setting triggerType to periodical and purpose to reportStrongestCells. If included, the UE shall ignore the triggerType and maxReportCells fields.</td>
</tr>
<tr>
<td>si-RequestForHO</td>
<td>The field applies to the reportCGI functionality, and when the field is included, the UE is allowed to use autonomous gaps in acquiring system information from the neighbour cell, applies a different value for T321, and includes different fields in the measurement report. EUTRAN does not configure the field if reportConfig is linked to a measObject set to measObjectNR.</td>
</tr>
<tr>
<td>stationCountRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Station Count in measurement reports.</td>
</tr>
<tr>
<td>b1-ThresholdGERAN, b2-Threshold2GERAN</td>
<td>The actual value is field value – 110 dBm.</td>
</tr>
<tr>
<td>b1-ThresholdUTRA, b2-Threshold2UTRA</td>
<td>The actual value is field value – 115 dBm. For utra-EcN0: The actual value is (field value – 49)/2 dB.</td>
</tr>
<tr>
<td>ultra-EcN0</td>
<td>Corresponds to CPICH_Ec/No in TS 25.133 [29] for FDD, and is not applicable for TDD.</td>
</tr>
<tr>
<td>timeToTrigger</td>
<td>Time during which specific criteria for the event needs to be met in order to trigger a measurement report.</td>
</tr>
</tbody>
</table>
ReportConfigInterRAT field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>availableAdmissionCapacityRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Available Admission Capacity in measurement reports.</td>
</tr>
<tr>
<td>backhaulDL-BandwidthRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Backhaul Downlink Bandwidth in measurement reports.</td>
</tr>
<tr>
<td>backhaulUL-BandwidthRequestWLAN</td>
<td>The value true indicates that the UE shall include, if available, WLAN Backhaul Uplink Bandwidth in measurement reports.</td>
</tr>
<tr>
<td>bandRequestWLAN</td>
<td>The value true indicates that the UE shall include WLAN band in measurement reports.</td>
</tr>
</tbody>
</table>

triggerType

E-UTRAN does not configure the value periodic in case reportConfig is linked to a measObject set to measObjectWLAN.

Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reportCGI</td>
<td>The field is optional, need OR, in case purpose is included and set to reportCGI, otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

ReportConfigToAddModList

The IE ReportConfigToAddModList concerns a list of reporting configurations to add or modify.

ReportConfigToAddModList information element

-- ASN1START
ReportConfigToAddModList ::= SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigToAddMod
ReportConfigToAddMod ::= SEQUENCE {
  reportConfigId      ReportConfigId,
  reportConfig        CHOICE {
                        reportConfigEUTRA     ReportConfigEUTRA,
                        reportConfigInterRAT    ReportConfigInterRAT
  }
}
-- ASN1STOP

ReportInterval

The ReportInterval indicates the interval between periodical reports. The ReportInterval is applicable if the UE performs periodical reporting (i.e. when reportAmount exceeds 1), for triggerType event as well as for triggerType periodic. Value ms120 corresponds with 120 ms, ms240 corresponds with 240 ms and so on, while value min1 corresponds with 1 min, min6 corresponds with 6 min and so on.

ReportInterval information element

-- ASN1START
ReportInterval ::= ENUMERATED {
  ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240, min1, min6, min12, min30, min60, spare3, spare2, spare1
}
-- ASN1STOP

RS-IndexNR

The IE RS-IndexNR is used to identify an NR Reference Signal.

RS-IndexNR information element

-- ASN1START
---

**RS-IndexNR field descriptions**

*MaxRS-IndexCellQualNR*  
Indicates the maximum number of RS indices to be considered/averaged to derive the cell quality for RRM.

---

**RSRP-Range**

The IE *RSRP-Range* specifies the value range used in RSRP measurements and thresholds. Integer value for RSRP measurements according to mapping table in TS 36.133 [16]. A given field using *RSRP-Range-v1360* shall only be signalled if the corresponding original field (using *RSRP-Range* i.e. without suffix) is set to value 0.

---

**RSRP-Range information element**

---

**RSRP-Range field descriptions**

*RSRP-Range*

For UE supporting CE Mode B, when CE mode B is not restricted by upper layers, *RSRP-Range-v1360* (i.e., with suffix) is reported if the measured RSRP is less than -140 dBm.

*RSRP-RangeSL*

Value 0 corresponds to -infinity, value 1 to -115dBm, value 2 to -110dBm, and so on (i.e. in steps of 5dBm) until value 12, which corresponds to -60dBm, while value 13 corresponds to +infinity.

*RSRP-RangeSL2*

Value 0 corresponds to -infinity, value 1 to -110dBm, value 2 to -100dBm, and so on (i.e. in steps of 10dBm) until value 6, which corresponds to -60dBm, while value 7 corresponds to +infinity.

*RSRP-RangeSL3*

Value 0 corresponds to -110dBm, value 1 to -105dBm, value 2 to -100dBm, and so on (i.e. in steps of 5dBm) until value 10, which corresponds to -60dBm, while value 11 corresponds to +infinity.

*RSRP-RangeSL4*

Indicates the range for SD-RSRP. Value 0 corresponds to -130dBm, value 1 to -128dBm, value 2 to -126dBm, and so on (i.e. in steps of 2dBm) until value 48, which corresponds to -34dBm, while value 49 corresponds to +infinity.

---

**RSRP-RangeNR**

The IE *RSRP-RangeNR* specifies the value range used in RSRP measurements and thresholds. Integer value for RSRP measurements according to mapping table in TS 38.133 [84].

---

**RSRP-RangeNR information element**
---

**RSRQ-Range**

The IE `RSRQ-Range` specifies the value range used in RSRQ measurements and thresholds. Integer value for RSRQ measurements is according to mapping table in TS 36.133 [16]. A given field using `RSRQ-Range-v1250` shall only be signalled if the corresponding original field (using `RSRQ-Range` i.e. without suffix) is set to value 0 or 34. Only a UE indicating support of `extendedRSRQ-LowerRange-r12` or `rsrq-OnAllSymbols-r12` may report `RSRQ-Range-v1250`, and this may be done without explicit configuration from the E-UTRAN. If received, the UE shall use the value indicated by the `RSRQ-Range-v1250` and ignore the value signalled by `RSRQ-Range` (without the suffix). `RSRQ-Range-r13` covers the original range and extended `RSRQ-Range-v1250`. `RSRQ-Range-r13` may be signalled without the corresponding original field and without any requirements for indicated support of `extendedRSRQ-LowerRange-r12` or `rsrq-OnAllSymbols-r12`.

**RSRQ-Range information element**

```ASN1
RSRQ-Range ::= INTEGER(0..34)
RSRQ-Range-v1250 ::= INTEGER(-30..46)
RSRQ-Range-r13 ::= INTEGER(-30..46)
```

---

**RSRQ-RangeNR**

The IE `RSRQ-RangeNR` specifies the value range used in RSRQ measurements and thresholds. Integer value for RSRQ measurements according to mapping table in TS 38.133 [84].

**RSRQ-RangeNR information element**

```ASN1
RSRQ-RangeNR-r15 ::= INTEGER (0..127)
```

---

**RSRQ-Type**

The IE `RSRQ-Type` specifies the RSRQ value type used in RSRQ measurements, see TS 36.214 [48].

**RSRQ-Type information element**

```ASN1
RSRQ-Type-r12 ::= SEQUENCE {
    allSymbols-r12       BOOLEAN,
    wideBand-r12       BOOLEAN
}
```

**RSRQ-Type field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>allSymbols</td>
<td>Value TRUE indicates use of all OFDM symbols when performing RSRQ measurements.</td>
</tr>
<tr>
<td>wideBand</td>
<td>Value TRUE indicates use of a wider bandwidth when performing RSRQ measurements.</td>
</tr>
</tbody>
</table>

---

**RS-SINR-Range**

The IE `RS-SINR-Range` specifies the value range used in RS-SINR measurements and thresholds. Integer value for RS-SINR measurements is according to mapping table in TS 36.133 [16].

**RS-SINR-Range information element**

```ASN1
```
The IE `RS-SINR-RangeNR` specifies the value range used in RS-SINR measurements and thresholds. Integer value for RS-SINR measurements is according to mapping table in TS 38.133 [84]. Value 0 corresponds to -23 dBm, value 1 corresponds to -22.5 dB and so on (i.e. 0.5dB resolution upto +40 dB for value 127).

### RS-SINR-RangeNR information element

```asn1
RS-SINR-RangeNR-r15 ::=      INTEGER (0..127)
```

The IE `RSSI-Range` specifies the value range used in RSSI measurements and thresholds. Integer value for RSSI measurements is according to mapping table in TS 36.133 [16].

### RSSI-Range information element

```asn1
RSSI-Range-r13 ::=      INTEGER(0..76)
```

The IE `SS-RSSI-Measurement` specifies the configuration of NR SSB based RSSI measurements.

### SS-RSSI-Measurement information element

```asn1
SS-RSSI-Measurement-r15 ::=   SEQUENCE {
    measurementSlots-r15     BIT STRING (SIZE(1..80)),
    endSymbol-r15       INTEGER(0..3)
}
```

**SS-RSSI-Measurement field descriptions**

**endSymbol**
Within a slot that is configured for RSSI measurements (see measurementSlots) the UE measures the RSSI from symbol 0 to symbol endSymbol. This field identifies the entry in Table 5.1.33-1 in TS 36.214 which determines the actual end symbol.

**measurementSlots**
Indicates the slots in which the UE can perform NR RSSI measurements. The length of the BIT STRING is equal to the number of slots in the configured SMTC window (determined by the ssb-duration and by the subcarrierSpacingSSB). The first (left-most / most significant) bit in the bitmap corresponds to the first slot in the SMTC window, the second bit in the bitmap corresponds to the second slot in the SMTC window, and so on. The UE measures in slots for which the corresponding bit in the bitmap is set to 1.
-- **TimeToTrigger**

The IE *TimeToTrigger* specifies the value range used for time to trigger parameter, which concerns the time during which specific criteria for the event needs to be met in order to trigger a measurement report. Value ms0 corresponds to 0 ms and behaviour as specified in 7.3.2 applies, ms40 corresponds to 40 ms, and so on.

**TimeToTrigger** information element

```asn1
TimeToTrigger ::=     ENUMERATED {
  ms0, ms40, ms64, ms80, ms100, ms128, ms160, ms256,  
  ms320, ms480, ms512, ms640, ms1024, ms1280, ms2560,  
  ms5120 }
```

-- ASN1STOP

-- **UL-DelayConfig**

The IE *UL-DelayConfig* IE specifies the configuration of the UL PDCP Packet Delay per QCI measurement specified in TS36.314 [71].

**UL-DelayConfig** information element

```asn1
UL-DelayConfig-r13 ::=     CHOICE {
  release        NULL,  
  setup        SEQUENCE {  
    delayThreshold-r13       ENUMERATED {
                            ms30, ms40, ms50, ms60, ms70, ms80,  
                            ms90,ms100, ms150, ms300, ms500, ms750, spare4,  
                            spare3, spare2, spare1}  
  }  
}
```

-- ASN1STOP

**UL-DelayConfig** field descriptions

*delayThreshold*
Indicates the delay threshold value used by UE to provide results of UL PDCP Packet Delay per QCI measurement as specified in TS 36.314 [71]. Value in milliseconds. Value ms30 means 30 ms and so on.

-- **WLAN-CarrierInfo**

The IE *WLAN-CarrierInfo* is used to identify the WLAN frequency band information, as specified in Annex E in [67].

**WLAN-CarrierInfo** information element

```asn1
WLAN-CarrierInfo-r13 ::=  SEQUENCE {  
  operatingClass-r13  INTEGER (0..255)   OPTIONAL,  
  countryCode-r13   ENUMERATED {unitedStates, europe, japan, global, ...} OPTIONAL,  
  channelNumbers-r13  WLAN-ChannelList-r13  OPTIONAL,  
    WLAN-ChannelList-r13 ::= SEQUENCE (SIZE (1..maxWLAN-Channels-r13)) OF WLAN-Channel-r13  
    WLAN-Channel-r13 ::= INTEGER(0..255)  
}
```

-- ASN1STOP

**WLAN-CarrierInfo** field descriptions

*channelNumbers*
Indicates the WLAN channels as defined in IEEE 802.11-2012 [67]. Value 0 is not used.
### WLAN-CarrierInfo field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>countryCode</td>
<td>Indicates the country code of WLAN as defined in IEEE 802.11-2012 [67].</td>
</tr>
<tr>
<td>operatingClass</td>
<td>Indicates the Operating Class of WLAN as defined in IEEE 802.11-2012 [67].</td>
</tr>
</tbody>
</table>

---

### WLAN-NameList

The IE WLAN-NameList is used to indicate the names of the WLAN AP for which the UE is configured to measure.

#### WLAN-NameList information element

```
-- ASN1START
WLAN-NameListConfig-r15 ::= CHOICE{
  release      NULL,
  setup      WLAN-NameList-r15
}
WLAN-NameList-r15 ::= SEQUENCE (SIZE (1..maxWLAN-Name-r15)) OF WLAN-Name-r15
WLAN-Name-r15 ::= OCTET STRING (SIZE (1..32))
-- ASN1STOP
```

### WLAN-NameList field descriptions

**WLAN-Name**

If configured, the UE only performs WLAN measurements according to the names identified. For each name, it refers to Service Set Identifier (SSID) defined in IEEE 802.11-2012 [67].

---

### WLAN-RSSI-Range

The IE WLAN-RSSI-Range specifies the value range used in WLAN RSSI measurements and thresholds. Integer value for WLAN RSSI measurements is according to mapping table in TS 36.133 [16]. Value 0 corresponds to -infinity, value 1 to -100dBm, value 2 to -99dBm, and so on (i.e. in steps of 1dBm) until value 140, which corresponds to 39dBm, while value 141 corresponds to +infinity.

#### WLAN-RSSI-Range information element

```
-- ASN1START
WLAN-RSSI-Range-r13 ::= INTEGER(0..141)
-- ASN1STOP
```

---

### WLAN-RTT

The IE WLAN-RTT covers the measured round trip time between the target device and WLAN AP and optionally the accuracy expressed as the standard deviation of the delay.

#### WLAN-RTT information element

```
-- ASN1START
WLAN-RTT-r15 ::= SEQUENCE {
  rttValue-r15     INTEGER (0..16777215),
  rttUnits-r15     ENUMERATED {  microseconds, hundredsofnanoseconds, tensofnanoseconds, nanoseconds, tenthsofnanoseconds, },
  rttAccuracy-r15   INTEGER (0..255) OPTIONAL,
... }
-- ASN1STOP
```
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**WLAN-RTT field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>rttValue</strong></td>
<td>This field specifies the Round Trip Time (RTT) measurement between the target device and WLAN AP in units given by the field <strong>rttUnits</strong> as defined in TS 36.355 [54].</td>
</tr>
<tr>
<td><strong>rttUnits</strong></td>
<td>This field specifies the Units for the fields <strong>rttValue</strong> and <strong>rttAccuracy</strong>. The available Units are 1000ns, 100ns, 10ns, 1ns, and 0.1ns as defined in TS 36.355 [54].</td>
</tr>
<tr>
<td><strong>rttAccuracy</strong></td>
<td>This field provides the estimated accuracy of the provided <strong>rttValue</strong> expressed as the standard deviation in units given by the field <strong>rttUnits</strong> as defined in TS 36.355 [54].</td>
</tr>
</tbody>
</table>

**WLAN-Status**

The IE **WLAN-Status** indicates the current status of WLAN connection. The values are set as described in Sections 5.6.15.2 and 5.6.15.4.

**WLAN-Status information element**

```
-- ASN1START

WLAN-Status-r13 ::= ENUMERATED {successfulAssociation, failureWlanRadioLink, failureWlanUnavailable, failureTimeout}
WLAN-Status-v1430 ::= ENUMERATED {suspended, resumed}

-- ASN1STOP
```

**WLAN-SuspendConfig**

The IE **WLAN-SuspendConfig** is used for configuration of WLAN suspend/resume functionality.

```
-- ASN1START

WLAN-SuspendConfig-r14 ::= SEQUENCE {
  wlan-SuspendResumeAllowed-r14   BOOLEAN  OPTIONAL, -- Need ON
  wlan-SuspendTriggersStatusReport-r14  BOOLEAN  OPTIONAL  -- Need ON
}

-- ASN1STOP
```

**WLAN-SuspendConfig field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>wlan-SuspendResumeAllowed</strong></td>
<td>Indicates whether the UE is allowed to use suspend-resume mechanism, i.e., to indicate WLAN being temporarily unavailable and WLAN being available again after temporary unavailability.</td>
</tr>
<tr>
<td><strong>wlan-SuspendTriggersStatusReport</strong></td>
<td>Indicates whether the UE shall trigger PDCP status report as defined in [8] when WLAN is temporarily unavailable and UE reports this status.</td>
</tr>
</tbody>
</table>

### 6.3.6 Other information elements

**AbsoluteTimeInfo**

The IE **AbsoluteTimeInfo** indicates an absolute time in a format YY-MM-DD HH:MM:SS and using BCD encoding. The first/ leftmost bit of the bit string contains the most significant bit of the most significant digit of the year and so on.

**AbsoluteTimeInfo information element**

```
-- ASN1START

AbsoluteTimeInfo-r10 ::= BIT STRING (SIZE (48))

-- ASN1STOP
```
--- AMF-Identifier

The IE AMF-Identifier (AMFI) comprises of an AMF Region ID, an AMF Set ID and an AMF Pointer as specified in 23.003 [27], section 2.10.1.

**AMF-Identifier information element**

---

```
-- ASN1START
AMF-Identifier-r15 ::= BIT STRING (SIZE (24))
-- ASN1STOP
```

--- AreaConfiguration

The *AreaConfiguration* indicates area for which UE is requested to perform measurement logging. If not configured, measurement logging is not restricted to specific cells or tracking areas but applies as long as the RPLMN is contained in *plmn-IdentityList* stored in *VarLogMeasReport*.

**AreaConfiguration information element**

---

```
-- ASN1START
AreaConfiguration-r10 ::= CHOICE {
  cellGlobalIdList-r10 CellGlobalIdList-r10,
  trackingAreaCodeList-r10 TrackingAreaCodeList-r10
}
AreaConfiguration-v1130 ::= SEQUENCE {
  trackingAreaCodeList-v1130 TrackingAreaCodeList-v1130
}
CellGlobalIdList-r10 ::= SEQUENCE (SIZE (1..32)) OF CellGlobalIdEUTRA
TrackingAreaCodeList-r10 ::= SEQUENCE (SIZE (1..8)) OF TrackingAreaCode
TrackingAreaCodeList-v1130 ::= SEQUENCE {
  plmn-Identity-perTAC-List-r11 SEQUENCE (SIZE (1..8)) OF PLMN-Identity
}
-- ASN1STOP
```

### AreaConfiguration field descriptions

**plmn-Identity-perTAC-List**

Includes the PLMN identity for each of the TA codes included in *trackingAreaCodeList*. The PLMN identity listed first in *plmn-Identity-perTAC-List* corresponds with the TA code listed first in *trackingAreaCodeList* and so on.

--- BandCombinationList

The IE **BandCombinationList** contains a list of CA band combinations.

**BandCombinationList information element**

---

```
-- ASN1START
BandCombinationList-r14 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombination-r14
BandCombination-r14 ::= SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandIndication-r14
BandIndication-r14 ::= SEQUENCE {
  bandEUTRA-r14 FreqBandIndicator-r11,
  ca-BandwidthClassDL-r14 CA-BandwidthClass-r10,
  ca-BandwidthClassUL-r14 CA-BandwidthClass-r10 OPTIONAL
}
-- ASN1STOP
```
The IE **C-RNTI** identifies a UE having a RRC connection within a cell.

**C-RNTI information element**

```
C-RNTI ::= BIT STRING (SIZE (16))
```

The **DedicatedInfoCDMA2000** is used to transfer UE specific CDMA2000 information between the network and the UE. The RRC layer is transparent for this information.

**DedicatedInfoCDMA2000 information element**

```
DedicatedInfoCDMA2000 ::= OCTET STRING
```

The **DedicatedInfoNAS** is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for this information.

**DedicatedInfoNAS information element**

```
DedicatedInfoNAS ::= OCTET STRING
```

The IE **FilterCoefficient** specifies the measurement filtering coefficient. Value fc0 corresponds to k = 0, fc1 corresponds to k = 1, and so on.

**FilterCoefficient information element**

```
FilterCoefficient ::= ENUMERATED {
  fc0, fc1, fc2, fc3, fc4, fc5,
  fc6, fc7, fc8, fc9, fc11, fc13,
  fc15, fc17, fc19, spare1, ...}
```

The IE **FlightPathInfoReportConfig** specifies flight path information report configuration.

**FlightPathInfoReportConfig information element**

```
FlightPathInfoReportConfig-r15 ::= SEQUENCE {
  maxWayPointNumber-r15      INTEGER (1..maxWayPoint-r15),
  includeTimeStamp-r15      ENUMERATED {true}   OPTIONAL
}
```
FlightPathInfoReportConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>maxWayPointNumber</td>
<td>Indicates the maximum number of way points UE can include in the flight path information report if this information is available at the UE.</td>
</tr>
<tr>
<td>includeTimeStamp</td>
<td>Indicates whether time stamp of each way point can be reported in the flight path information report if time stamp information is available at the UE.</td>
</tr>
</tbody>
</table>

GNSS-ID

The IE GNSS-ID is used to indicate a specific GNSS (see also TS 36.355 [54]).

I-RNTI

The I-RNTI IE is used to identify the suspended UE context of a UE in RRC_INACTIVE.

LoggingDuration

The LoggingDuration indicates the duration for which UE is requested to perform measurement logging. Value min10 corresponds to 10 minutes, value min20 corresponds to 20 minutes and so on.

LoggingInterval

The LoggingInterval indicates the periodicity for logging measurement results. Value ms1280 corresponds to 1.28s, value ms2560 corresponds to 2.56s and so on.
– **MeasSubframePattern**

The IE *MeasSubframePattern* is used to specify a subframe pattern. The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod \(x = 0\), where SFN is that of PCell and \(x\) is the size of the bit string divided by 10. "1" denotes that the corresponding subframe is used.

**MeasSubframePattern information element**

```
MeasSubframePattern-r10 ::= CHOICE {
  subframePatternFDD-r10    BIT STRING (SIZE (40)),
  subframePatternTDD-r10    CHOICE {
    subframeConfig1-5-r10    BIT STRING (SIZE (20)),
    subframeConfig0-r10      BIT STRING (SIZE (70)),
    subframeConfig6-r10      BIT STRING (SIZE (60)),
    ...
  },
  ...
}
```

– **MMEC**

The IE *MMEC* identifies an MME within the scope of an MME Group within a PLMN, see TS 23.003 [27].

**MMEC information element**

```
MMEC ::=       BIT STRING (SIZE (8))
```

– **NeighCellConfig**

The IE *NeighCellConfig* is used to provide the information related to MBSFN and TDD UL/DL configuration of neighbour cells.

**NeighCellConfig information element**

```
NeighCellConfig ::=   BIT STRING (SIZE (2))
```

**NeighCellConfig field descriptions**

- `neighCellConfig`
  - Provides information related to MBSFN and TDD UL/DL configuration of neighbour cells of this frequency
  - 00: Not all neighbour cells have the same MBSFN subframe allocation as the serving cell on this frequency, if configured, and as the PCell otherwise
  - 10: The MBSFN subframe allocations of all neighbour cells are identical to or subsets of that in the serving cell on this frequency, if configured, and of that in the PCell otherwise
  - 01: No MBSFN subframes are present in all neighbour cells
  - 11: Different UL/DL allocation in neighbouring cells for TDD compared to the serving cell on this frequency, if configured, and compared to the PCell otherwise
  - For TDD, 00, 10 and 01 are only used for same UL/DL allocation in neighbouring cells compared to the serving cell on this frequency, if configured, and compared to the PCell otherwise.
NG-5G-S-TMSI

The IE NG-5G-S-TMSI contains a 5G S-Temporary Mobile Subscriber Identity, a temporary UE identity provided by the AMF which uniquely identifies the UE within the tracking area, see TS 23.003 [27].

NG-5G-S-TMSI information element

-- ASN1START
NG-5G-S-TMSI-r15 ::= BIT STRING (SIZE (48))
-- ASN1STOP

OtherConfig

The IE OtherConfig contains configuration related to other configuration

OtherConfig information element

-- ASN1START
OtherConfig-r9 ::= SEQUENCE {
  reportProximityConfig-r9   ReportProximityConfig-r9 OPTIONAL, -- Need ON
  ...,
  ...,
  bw-PreferenceIndicationTimer-r14 ENUMERATED {s0, s0dot5, s1, s2, s5, s10, s20, s30, s60, s90, s120, s300, s600, spare3, spare2, spare1} OPTIONAL, -- Need OR
  sps-AssistanceInfoReport-r14 BOOLEAN OPTIONAL, -- Need ON
  delayBudgetReportingConfig-r14 CHOICE{
    release NULL,
    setup SEQUENCE{
      delayBudgetReportingProhibitTimer-r14 ENUMERATED {s0, s0dot4, s0dot8, 
s1dot6, s3, s6, s12, s30}
    }
  } OPTIONAL, -- Need ON
  rlm-ReportConfig-r14 CHOICE {
    release NULL,
    setup SEQUENCE{
      rlmReportTimer-r14 ENUMERATED {s0, s0dot5, s1, s2, s5, s10, s20, s30, s60, s90, s120, s300, s600, spare3, spare2, spare1},
      rlmReportRep-MPDCCH-r14 ENUMERATED {setups} OPTIONAL -- Need OR
    }
  } OPTIONAL -- Need ON
  }
}
[[ overheatingAssistanceConfig-r14 CHOICE{
  release NULL,
  setup SEQUENCE{
    overheatingIndicationProhibitTimer-r14 ENUMERATED {s0, s0dot5, s1, s2, s5, s10, s20, s30, s60, s90, s120, s300, s600, spare3, spare2, spare1}
  }
  } OPTIONAL -- Need ON
  }
[[ measConfigAppLayer-r15 CHOICE{
  release NULL,
  setup SEQUENCE{
    measConfigAppLayerContainer-r15 OCTET STRING (SIZE(1..1000)),
    serviceType ENUMERATED {qoe, qoemtsi, spare6, spare5, spare4, spare3, spare2, spare1}
  }
  } OPTIONAL, -- Need ON
  alic-BitConfig-r15 BOOLEAN OPTIONAL, -- Need ON
  bt-NameListConfig-r15 BT-NameListConfig-r15 OPTIONAL, --Need ON
  wlan-NameListConfig-r15 WLAN-NameListConfig-r15 OPTIONAL --Need ON
}
}]
IDC-Config-r11 ::= SEQUENCE {
  idc-Indication-r11 ENUMERATED {setup} OPTIONAL, -- Need OR
autonomousDenialParameters-r11 ::= SEQUENCE {
  autonomousDenialSubframes-r11 ENUMERATED {n2, n5, n10, n15, n20, n30, spare2, spare1},
  autonomousDenialValidity-r11 ENUMERATED {sf200, sf500, sf1000, sf2000, spare4, spare3, spare2, spare1}
}  OPTIONAL,  -- Need OR
...
[[ idc-Indication-UL-CA-r11 ENUMERATED {setup} OPTIONAL -- Cond idc-Ind ]],
[[ idc-HardwareSharingIndication-r13 ENUMERATED {setup} OPTIONAL -- Need OR ]],
[[ idc-Indication-MRDC-r15 CHOICE{
    release NULL,
    setup CandidateServingFreqListNR-r15
}  OPTIONAL -- Cond idc-Ind ]]
}

ObtainLocationConfig-r11 ::= SEQUENCE {
  obtainLocation-r11 ENUMERATED {setup} OPTIONAL -- Need OR
}

PowerPrefIndicationConfig-r11 ::= CHOICE{
  release NULL,
  setup SEQUENCE{
    powerPrefIndicationTimer-r11 ENUMERATED {s0, s0dot5, s1, s2, s5, s10, s20, s30, s60, s90, s120, s300, s600, spare3, spare2, spare1}
  }
}

ReportProximityConfig-r9 ::= SEQUENCE {
  proximityIndicationEUTRA-r9 ENUMERATED {enabled} OPTIONAL, -- Need OR
  proximityIndicationUTRA-r9 ENUMERATED {enabled} OPTIONAL -- Need OR
}

CandidateServingFreqListNR-r15 ::= SEQUENCE (SIZE (1..maxFreqIDC-r11)) OF ARFCN-ValueNR-r15
-- ASN1STOP
<table>
<thead>
<tr>
<th>OtherConfig field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ailc-BitConfig</strong></td>
</tr>
<tr>
<td>Indicates whether the UE is allowed to provide assistance information bit for local cache. If configured, the UE shall only apply to a DRB configured with 12-bit PDCP SN format as specified in TS 36.323 [8].</td>
</tr>
<tr>
<td><strong>autonomousDenialSubframes</strong></td>
</tr>
<tr>
<td>Indicates the maximum number of the UL subframes for which the UE is allowed to deny any UL transmission. Value n2 corresponds to 2 subframes, n5 to 5 subframes and so on. E-UTRAN does not configure autonomous denial for frequencies on which SCG cells are configured.</td>
</tr>
<tr>
<td><strong>autonomousDenialValidity</strong></td>
</tr>
<tr>
<td>Indicates the validity period over which the UL autonomous denial subframes shall be counted. Value sf200 corresponds to 200 subframes, sf500 corresponds to 500 subframes and so on.</td>
</tr>
<tr>
<td><strong>bw-PreferencelIndicationTimer</strong></td>
</tr>
<tr>
<td>Prohibit timer for bandwidth preference indication reporting. Value in seconds. Value s0 means prohibit timer is set to 0 second, value s0dot5 means prohibit timer is set to 0.5 second, value s1 means prohibit timer is set to 1 second and so on.</td>
</tr>
<tr>
<td><strong>CandidateServingFreqListNR</strong></td>
</tr>
<tr>
<td>Indicates the candidate NR serving frequencies that are subject to IDC indication for MR-DC.</td>
</tr>
<tr>
<td><strong>delayBudgetReportingProhibitTimer</strong></td>
</tr>
<tr>
<td>Prohibit timer for delay budget reporting. Value in seconds. Value s0 means prohibit timer is set to 0 second, value s0dot4 means prohibit timer is set to 0.4 second, and so on.</td>
</tr>
<tr>
<td><strong>idc-HardwareSharingIndication</strong></td>
</tr>
<tr>
<td>The field is used to indicate whether the UE is allowed indicate in InDeviceCoexIndication that the cause of the problems are due to hardware sharing, and whether the UE is allowed to omit the TDM assistance information.</td>
</tr>
<tr>
<td><strong>idc-Indication</strong></td>
</tr>
<tr>
<td>The field is used to indicate whether the UE is configured to initiate transmission of the InDeviceCoexIndication message to the network.</td>
</tr>
<tr>
<td><strong>idc-Indication-MRDC</strong></td>
</tr>
<tr>
<td>The field is used to indicate whether the UE is configured to provide IDC indications for MR-DC using the InDeviceCoexIndication message.</td>
</tr>
<tr>
<td><strong>idc-Indication-UL-CA</strong></td>
</tr>
<tr>
<td>The field is used to indicate whether the UE is configured to provide IDC indications for UL CA using the InDeviceCoexIndication message.</td>
</tr>
<tr>
<td><strong>measConfigAppLayerContainer</strong></td>
</tr>
<tr>
<td>The field contains configuration of application layer measurements, see Annex L (normative) in TS 26.247 [90].</td>
</tr>
<tr>
<td><strong>serviceType</strong></td>
</tr>
<tr>
<td>Indicates the type of application layer measurement. Value qoe indicates Quality of Experience Measurement Collection for streaming services, value qoemtsi indicates Enhanced Quality of Experience Measurement Collection for MTSI.</td>
</tr>
<tr>
<td><strong>obtainLocation</strong></td>
</tr>
<tr>
<td>Requests the UE to attempt to have detailed location information available using GNSS. E-UTRAN configures the field only if includeLocationInfo is configured for one or more measurements.</td>
</tr>
<tr>
<td><strong>overheatingAssistanceConfig</strong></td>
</tr>
<tr>
<td>Configuration for the UE to report assistance information to inform the eNB about UE detected internal overheating.</td>
</tr>
<tr>
<td><strong>overheatingIndicationProhibitTimer</strong></td>
</tr>
<tr>
<td>Prohibit timer for overheating assistance information reporting. Value in seconds. Value s0 means prohibit timer is set to 0 seconds, value s0dot5 means prohibit timer is set to 0.5 second, value s1 means prohibit timer is set to 1 second and so on.</td>
</tr>
<tr>
<td><strong>powerPrefIndicationTimer</strong></td>
</tr>
<tr>
<td>Prohibit timer for Power Preference Indication reporting. Value in seconds. Value s0 means prohibit timer is set to 0 second, value s0dot5 means prohibit timer is set to 0.5 second, value s1 means prohibit timer is set to 1 second and so on.</td>
</tr>
<tr>
<td><strong>reportProximityConfig</strong></td>
</tr>
<tr>
<td>Indicates, for each of the applicable RATs (EUTRA, UTRA), whether or not proximity indication is enabled for CSG member cell(s) of the concerned RAT. Note.</td>
</tr>
<tr>
<td><strong>rimReportTimer</strong></td>
</tr>
<tr>
<td>Prohibit timer for RLM event reporting, i.e. “early-out-of-sync” and “early-in-sync” event reporting, as specified in section 5.6.10. Value in seconds. Value s0 means prohibit timer is set to 0 second, value s0dot5 means prohibit timer is set to 0.5 second, value s1 means prohibit timer is set to 1 second and so on.</td>
</tr>
<tr>
<td><strong>rimReportRep-MPDCCH</strong></td>
</tr>
<tr>
<td>The field is used to indicate whether the UE is configured to report excess repetitions on MPDCCH.</td>
</tr>
<tr>
<td><strong>sps-AssistanceInfoReport</strong></td>
</tr>
<tr>
<td>Value TRUE indicates that the UE is allowed to report SPS-AssistanceInformation.</td>
</tr>
</tbody>
</table>

NOTE: Enabling/ disabling of proximity indication includes enabling/ disabling of the related functionality e.g. autonomous search in connected mode.
<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>idc-Ind</td>
<td>The field is optionally present if idc-Indication is present, need OR. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

- **RAN-AreaCode**

The **RAN-AreaCode** IE indicates RAN area code of the cell.

**RAN-AreaCode information element**

```plaintext
RAN-AreaCode-r15 ::= INTEGER (0..255)
```

- **RAND-CDMA2000 (1xRTT)**

The **RAND-CDMA2000** concerns a random value, generated by the eNB, to be passed to the CDMA2000 upper layers.

**RAND-CDMA2000 information element**

```plaintext
RAND-CDMA2000 ::= BIT STRING (SIZE (32))
```

- **RAT-Type**

The IE **RAT-Type** is used to indicate the radio access technology (RAT), including E-UTRA, of the requested/transferred UE capabilities. A separate value applies for some EUTRA-NR capabilities that are transferred by a separate UE capability container, used in case of EN-DC.

**RAT-Type information element**

```plaintext
RAT-Type ::= ENUMERATED {
  eutra, utra, geran-cs, geran-ps, cdma2000-1XRTT, nr, eutra-nr, spare1, ...}
```

- **ResumeIdentity**

The IE **ResumeIdentity** is used to identify the suspended UE context

**ResumeIdentity information element**

```plaintext
ResumeIdentity-r13 ::= BIT STRING (SIZE(40))
```

- **RRC-TransactionIdentifier**

The IE **RRC-TransactionIdentifier** is used, together with the message type, for the identification of an RRC procedure (transaction).

**RRC-TransactionIdentifier information element**
RRC-TransactionIdentifier ::= INTEGER (0..3)
-- ASN1STOP

– **SBAS-ID**

The IE SBAS-ID is used to indicate a specific SBAS (see also TS 36.355 [54]).

-- ASN1START

```asn1
SBAS-ID-r15 ::= SEQUENCE {
  sbas-id-r15    ENUMERATED { waas, egnos, msas, gagan, ...},
  ...
}
-- ASN1STOP
```

– **ShortI-RNTI**

The ShortI-RNTI IE is used to identify the suspended UE context of a UE in RRC_INACTIVE using fewer bits compared to I-RNTI.

```
ShortI-RNTI information element
```

-- ASN1START

```asn1
ShortI-RNTI-r15 ::= BIT STRING (SIZE(24))
-- ASN1STOP
```

– **S-NSSAI**

The IE S-NSSAI identifies a Network Slice end to end and comprises a slice/service type and a slice differentiator, see TS 23.003 [27].

```
S-NSSAI information element
```

-- ASN1START

```asn1
S-NSSAI-r15 ::= CHOICE{
  sst       BIT STRING (SIZE (8)),
  sst-SD    BIT STRING (SIZE (32))
}
-- ASN1STOP
```

<table>
<thead>
<tr>
<th>S-NSSAI field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>sst</code></td>
</tr>
<tr>
<td>Indicates the S-NSSAI consists of Slice/Service Type, see TS 23.003 [27].</td>
</tr>
<tr>
<td><code>sst-SD</code></td>
</tr>
<tr>
<td>Indicates the S-NSSAI consists of Slice/Service Type and Slice Differentiator, see TS 23.003 [27].</td>
</tr>
</tbody>
</table>

– **S-TMSI**

The IE S-TMSI contains an S-Temporary Mobile Subscriber Identity, a temporary UE identity provided by the EPC which uniquely identifies the UE within the tracking area, see TS 23.003 [27].

```
S-TMSI information element
```

-- ASN1START

```asn1
S-TMSI ::= SEQUENCE {
  mmec        MMEC,
  m-TMSI        BIT STRING (SIZE (32))
}
-- ASN1STOP
```
S-TMSI field descriptions

**m-TMSI**
The first/leftmost bit of the bit string contains the most significant bit of the M-TMSI.

---

**TraceReference**

The *TraceReference* contains parameter Trace Reference as defined in TS 32.422 [58].

**TraceReference information element**

```asn1
-- ASN1START
TraceReference-r10 ::= SEQUENCE {
    plmn-Identity-r10   PLMN-Identity,
    traceId-r10       OCTET STRING (SIZE (3))
}
-- ASN1STOP
```

---

**UE-CapabilityRAT-ContainerList**

The IE *UE-CapabilityRAT-ContainerList* contains list of containers, one for each RAT for which UE capabilities are transferred, if any.

**UE-CapabilityRAT-ContainerList information element**

```asn1
-- ASN1START
UE-CapabilityRAT-ContainerList ::= SEQUENCE (SIZE (0..maxRAT-Capabilities)) OF UE-CapabilityRAT-Container

UE-CapabilityRAT-Container ::= SEQUENCE {
    rat-Type       RAT-Type,
    ueCapabilityRAT-Container   OCTET STRING
}
-- ASN1STOP
```

**UE-CapabilityRAT-ContainerList field descriptions**

**ueCapabilityRAT-Container**

Container for the UE capabilities of the indicated RAT. The encoding is defined in the specification of each RAT:
- For E-UTRA: the encoding of UE capabilities is defined in IE *UE-EUTRA-Capability*.
- For UTRA: the octet string contains the INTER RAT HANDOVER INFO message defined in TS 25.331 [19].
- For GERAN CS: the octet string contains the concatenated string of the Mobile Station Classmark 2 and Mobile Station Classmark 3. The first 5 octets correspond to Mobile Station Classmark 2 and the following octets correspond to Mobile Station Classmark 3. The Mobile Station Classmark 2 is formatted as 'TLV' and is coded in the same way as the *Mobile Station Classmark 2* information element in TS 24.008 [49]. The first octet is the **Mobile station classmark 2 IEI** and its value shall be set to 33H. The second octet is the **Length of mobile station classmark 2** and its value shall be set to 3. The octet 3 contains the first octet of the value part of the *Mobile Station Classmark 2* information element, the octet 4 contains the second octet of the value part of the *Mobile Station Classmark 2* information element and so on. For each of these octets, the first/ leftmost/ most significant bit of the octet contains b8 of the corresponding octet of the Mobile Station Classmark 2. The Mobile Station Classmark 3 is formatted as 'V' and is coded in the same way as the value part in the *Mobile station classmark 3* information element in TS 24.008 [49]. The sixth octet of this octet string contains octet 1 of the value part of *Mobile station classmark 3*, the seventh of octet of this octet string contains octet 2 of the value part of *Mobile station classmark 3* and so on. Note.
- For GERAN PS: the encoding of UE capabilities is formatted as 'V' and is coded in the same way as the value part in the *MS Radio Access Capability* information element in TS 24.008 [49].
- For CDMA2000-1XRTT: the octet string contains the A21 Mobile Subscription Information and the encoding of this is defined in A.S0008 [33]. The A21 Mobile Subscription Information contains the supported CDMA2000 1xRTT band class and band sub-class information.
- For NR: The octet string contains the IE *UE-NR-Capability* as defined in TS 38.331 [82].
- For EUTRA-NR: The octet string contains the IE *UE-MRDC-Capability* as defined in TS 38.331 [82].
NOTE: The value part is specified by means of CSN.1, which encoding results in a bit string, to which final padding may be appended up to the next octet boundary TS 24.008 [49]. The first/ leftmost bit of the CSN.1 bit string is placed in the first/ leftmost/ most significant bit of the first octet. This continues until the last bit of the CSN.1 bit string, which is placed in the last/ rightmost/ least significant bit of the last octet.

-- UE-EUTRA-Capability

The IE **UE-EUTRA-Capability** is used to convey the E-UTRA UE Radio Access Capability Parameters, see TS 36.306 [5], and the Feature Group Indicators for mandatory features (defined in Annexes B.1 and C.1) to the network. The IE **UE-EUTRA-Capability** is transferred in E-UTRA or in another RAT.

NOTE 0: For (UE capability specific) guidelines on the use of keyword OPTIONAL, see Annex A.3.5.

**UE-EUTRA-Capability** information element

```asn
-- ASN.1START

UE-EUTRA-Capability ::= SEQUENCE {
  accessStratumRelease    AccessStratumRelease,
  ue-Category       INTEGER (1..5),
  pdcp-Parameters      PDCP-Parameters,
  phyLayerParameters    PhyLayerParameters,
  rf-Parameters        RF-Parameters,
  measParameters       MeasParameters,
  featureGroupIndicators    BIT STRING (SIZE (32)) OPTIONAL,
  interRAT-Parameters     SEQUENCE {
   utraFDD     IRAT-ParametersUTRA-FDD OPTIONAL,
    utraTDD128      IRAT-ParametersUTRA-TDD128 OPTIONAL,
    utraTDD384      IRAT-ParametersUTRA-TDD384 OPTIONAL,
    utraTDD768      IRAT-ParametersUTRA-TDD768 OPTIONAL,
    geran      IRAT-ParametersGERAN OPTIONAL,
    cdma2000-HRPD      IRAT-ParametersCDMA2000-HRPD OPTIONAL,
    cdma2000-1xRTT      IRAT-ParametersCDMA2000-1xRTT OPTIONAL,
  },
  nonCriticalExtension    UE-EUTRA-Capability-v920-IEs OPTIONAL
}

-- Late non critical extensions

UE-EUTRA-Capability-v9a0-IEs ::= SEQUENCE {
  featureGroupIndRel9Add-r9   BIT STRING (SIZE (32)) OPTIONAL,
  fdd-Add-UE-EUTRA-Capabilities-r9 UE-EUTRA-CapabilityAddXDD-Mode-r9 OPTIONAL,
  tdd-Add-UE-EUTRA-Capabilities-r9 UE-EUTRA-CapabilityAddXDD-Mode-r9 OPTIONAL,
  nonCriticalExtension    UE-EUTRA-Capability-v9c0-IEs OPTIONAL
}

UE-EUTRA-Capability-v9c0-IEs ::= SEQUENCE {
  interRAT-ParametersUTRA-v9c0  IRAT-ParametersUTRA-v9c0 OPTIONAL,
  nonCriticalExtension    UE-EUTRA-Capability-v9d0-IEs OPTIONAL
}

UE-EUTRA-Capability-v9d0-IEs ::= SEQUENCE {
  phyLayerParameters-v9d0    PhyLayerParameters-v9d0 OPTIONAL,
  nonCriticalExtension    UE-EUTRA-Capability-v9e0-IEs OPTIONAL
}

UE-EUTRA-Capability-v9e0-IEs ::= SEQUENCE {
  rf-Parameters-v9e0     RF-Parameters-v9e0 OPTIONAL,
  nonCriticalExtension    UE-EUTRA-Capability-v9h0-IEs OPTIONAL
}

UE-EUTRA-Capability-v9h0-IEs ::= SEQUENCE {
  interRAT-ParametersUTRA-v9h0  IRAT-ParametersUTRA-v9h0 OPTIONAL,
  -- Following field is only to be used for late REL-9 extensions
  lateNonCriticalExtension   OCTET STRING OPTIONAL,
  nonCriticalExtension    UE-EUTRA-Capability-v10c0-IEs OPTIONAL
}

UE-EUTRA-Capability-v10c0-IEs ::= SEQUENCE {
  otwoa-PositioningCapabilities-r10 OTDOA-PositioningCapabilities-r10 OPTIONAL,
  nonCriticalExtension    UE-EUTRA-Capability-v10f0-IEs OPTIONAL
}

UE-EUTRA-Capability-v10f0-IEs ::= SEQUENCE {
  rf-Parameters-v10f0     RF-Parameters-v10f0 OPTIONAL,
}

-- ASN.1END
```
nonCriticalExtension  UE-EUTRA-Capability-v10i0-IEs  OPTIONAL

UE-EUTRA-Capability-v10i0-IEs ::= SEQUENCE {
    rf-Parameters-v10i0  RF-Parameters-v10i0  OPTIONAL,
    -- Following field is only to be used for late REL-10 extensions
    lateNonCriticalExtension OCTET STRING (CONTAINING UE-EUTRA-Capability-v10j0-IEs) OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v11d0-IEs  OPTIONAL
}

UE-EUTRA-Capability-v10j0-IEs ::= SEQUENCE {
    rf-Parameters-v10j0  RF-Parameters-v10j0  OPTIONAL,
    nonCriticalExtension  SEQUENCE {}  OPTIONAL
}

UE-EUTRA-Capability-v11d0-IEs ::= SEQUENCE {
    rf-Parameters-v11d0  RF-Parameters-v11d0  OPTIONAL,
    otherParameters-v11d0  Other-Parameters-v11d0  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v11x0-IEs  OPTIONAL
}

UE-EUTRA-Capability-v11x0-IEs ::= SEQUENCE {
    -- Following field is only to be used for late REL-11 extensions
    lateNonCriticalExtension OCTET STRING  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v12b0-IEs  OPTIONAL
}

UE-EUTRA-Capability-v12b0-IEs ::= SEQUENCE {
    rf-Parameters-v12b0  RF-Parameters-v12b0  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v12x0-IEs  OPTIONAL
}

UE-EUTRA-Capability-v12x0-IEs ::= SEQUENCE {
    -- Following field is only to be used for late REL-12 extensions
    lateNonCriticalExtension OCTET STRING  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v1370-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1370-IEs ::= SEQUENCE {
    ce-Parameters-v1370  CE-Parameters-v1370  OPTIONAL,
    fdd-Add-UE-EUTRA-Capabilities-v1370  UE-EUTRA-CapabilityAddXDD-Mode-v1370  OPTIONAL,
    tdd-Add-UE-EUTRA-Capabilities-v1370  UE-EUTRA-CapabilityAddXDD-Mode-v1370  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v1380-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1380-IEs ::= SEQUENCE {
    rf-Parameters-v1380  RF-Parameters-v1380  OPTIONAL,
    ce-Parameters-v1380  CE-Parameters-v1380  OPTIONAL,
    fdd-Add-UE-EUTRA-Capabilities-v1380  UE-EUTRA-CapabilityAddXDD-Mode-v1380,  OPTIONAL,
    tdd-Add-UE-EUTRA-Capabilities-v1380  UE-EUTRA-CapabilityAddXDD-Mode-v1380,  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v1390-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1390-IEs ::= SEQUENCE {
    rf-Parameters-v1390  RF-Parameters-v1390  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v13x0-IEs  OPTIONAL
}

UE-EUTRA-Capability-v13x0-IEs ::= SEQUENCE {
    -- Following field is only to be used for late REL-13 extensions
    lateNonCriticalExtension OCTET STRING  OPTIONAL,
    nonCriticalExtension  UE-EUTRA-Capability-v1470-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1470-IEs ::= SEQUENCE {
    mmbg-Parameters-v1470  MBMS-Parameters-v1470  OPTIONAL,
    phyLayerParameters-v1470  PhyLayerParameters-v1470  OPTIONAL,
    rf-Parameters-v1470  RF-Parameters-v1470  OPTIONAL,
    -- Following field is only to be used for late REL-14 extensions
    nonCriticalExtension  SEQUENCE {}  OPTIONAL
}

-- Regular non critical extensions
UE-EUTRA-Capability-v920-IEs ::= SEQUENCE {
    phyLayerParameters-v920  PhyLayerParameters-v920,  OPTIONAL,
    interRAT-ParametersGERAN-v920  IRAT-ParametersGERAN-v920,  OPTIONAL
}
interRAT-ParametersUTRA-v920 ::= IRAT-ParametersUTRA-v920 OPTIONAL,
interRAT-ParametersCDMA2000-v920 ::= IRAT-ParametersCDMA2000-1XRTT-v920 OPTIONAL,
deviceType-r9 ::= ENUMERATED {noBenFromBatConsumeOpt} OPTIONAL,
csg-ProximityIndicationParameters-r9 ::= CSG-ProximityIndicationParameters-r9,
neighCellSI-AcquisitionParameters-r9 ::= NeighCellSI-AcquisitionParameters-r9,
son-Parameters-r9 ::= SON-Parameters-r9,
nonCriticalExtension ::= UE-EUTRA-Capability-v940-IEs OPTIONAL
}

UE-EUTRA-Capability-v940-IEs ::= SEQUENCE {
lateNonCriticalExtension ::= OCTET STRING (CONTAINING UE-EUTRA-Capability-v940-IEs) OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1020-IEs OPTIONAL
}

UE-EUTRA-Capability-v1020-IEs ::= SEQUENCE {
ue-Category-v1020 ::= INTEGER (6..8) OPTIONAL,
phyLayerParameters-v1020 ::= PhyLayerParameters-v1020 OPTIONAL,
measParameters-v1020 ::= MeasParameters-v1020 OPTIONAL,
featureGroupIndRe110-r10 ::= BIT STRING (SIZE (32)) OPTIONAL,
interRAT-ParametersCDMA2000-v1020 ::= IRAT-ParametersCDMA2000-1XRTT-v1020 OPTIONAL,
ue-BasedNetwPerfMeasParameters-r10 ::= UE-BasedNetwPerfMeasParameters-r10 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1060-IEs OPTIONAL
}

UE-EUTRA-Capability-v1060-IEs ::= SEQUENCE {
ue-Category-v1060 ::= INTEGER (6..8) OPTIONAL,
fdd-Add-UE-EUTRA-Capabilities-v1060 ::= UE-EUTRA-CapabilityAddFDD-Mode-v1060 OPTIONAL,
tdd-Add-UE-EUTRA-Capabilities-v1060 ::= UE-EUTRA-CapabilityAddTDD-Mode-v1060 OPTIONAL,
rf-Parameters-v1060 ::= RF-Parameters-v1060 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1090-IEs OPTIONAL
}

UE-EUTRA-Capability-v1090-IEs ::= SEQUENCE {
ue-Category-v1090 ::= INTEGER (9..10) OPTIONAL,
phyLayerParameters-v1090 ::= PhyLayerParameters-v1090 OPTIONAL,
rfr-Parameters-v1090 ::= RF-Parameters-v1090 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1130-IEs OPTIONAL
}

UE-EUTRA-Capability-v1130-IEs ::= SEQUENCE {
pdcp-Parameters-v1130 ::= PDCP-Parameters-v1130 OPTIONAL,
phyLayerParameters-v1130 ::= PhyLayerParameters-v1130 OPTIONAL,
rfr-Parameters-v1130 ::= RF-Parameters-v1130 OPTIONAL,
imterRAT-ParametersCDMA2000-v1130 ::= IRAT-ParametersCDMA2000-v1130 OPTIONAL,
otherParameters-r11 ::= Other-Parameters-r11 OPTIONAL,
fdd-Add-UE-EUTRA-Capabilities-v1130 ::= UE-EUTRA-CapabilityAddFDD-Mode-v1130 OPTIONAL,
tdd-Add-UE-EUTRA-Capabilities-v1130 ::= UE-EUTRA-CapabilityAddTDD-Mode-v1130 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1170-IEs OPTIONAL
}

UE-EUTRA-Capability-v1170-IEs ::= SEQUENCE {
ue-Category-v1170 ::= INTEGER (9..10) OPTIONAL,
phyLayerParameters-v1170 ::= PhyLayerParameters-v1170 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1180-IEs OPTIONAL
}

UE-EUTRA-Capability-v1180-IEs ::= SEQUENCE {
rfr-Parameters-v1180 ::= RF-Parameters-v1180 OPTIONAL,
mmms-Parameters-r11 ::= MMMS-Parameters-r11 OPTIONAL,
fdd-Add-UE-EUTRA-Capabilities-v1180 ::= UE-EUTRA-CapabilityAddFDD-Mode-v1180 OPTIONAL,
tdd-Add-UE-EUTRA-Capabilities-v1180 ::= UE-EUTRA-CapabilityAddTDD-Mode-v1180 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v11a0-IEs OPTIONAL
}

UE-EUTRA-Capability-v11a0-IEs ::= SEQUENCE {
ue-Category-v11a0 ::= INTEGER (11..12) OPTIONAL,
measParameters-v11a0 ::= MeasParameters-v11a0 OPTIONAL,
nonCriticalExtension ::= UE-EUTRA-Capability-v1250-IEs OPTIONAL
}

UE-EUTRA-Capability-v1250-IEs ::= SEQUENCE {
phyLayerParameters-v1250 ::= PhyLayerParameters-v1250 OPTIONAL,
rfr-Parameters-v1250 ::= RF-Parameters-v1250 OPTIONAL,
r1c-Parameters-r12 ::= RLC-Parameters-r12 OPTIONAL,
ue-BasedNetwPerfMeasParameters-v1250 ::= UE-BasedNetwPerfMeasParameters-v1250 OPTIONAL,
ue-CategoryDL-r12 ::= INTEGER (0..14) OPTIONAL,
ue-CategoryUL-r12 ::= INTEGER (0..13) OPTIONAL,
wlan-IW-Parameters-r12  WLAN-IW-Parameters-r12  OPTIONAL,
measParameters-v1250  MeasParameters-v1250  OPTIONAL,
dc-Parameters-r12  DC-Parameters-r12  OPTIONAL,
mmb-Parameters-v1250  MMB-Parameters-v1250  OPTIONAL,
macc-Parameters-r12  MACC-Parameters-r12  OPTIONAL,
fd-Add-UE-EUTRA-Capabilities-v1250  UE-EUTRA-CapabilityAddXDD-Mode-v1250  OPTIONAL,
tdd-Add-UE-EUTRA-Capabilities-v1250  UE-EUTRA-CapabilityAddXDD-Mode-v1250  OPTIONAL,
sl-Parameters-r12  SL-Parameters-r12  OPTIONAL,
nonCriticalExtension  UE-EUTRA-Capability-v1260-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1260-IEs ::= SEQUENCE {
  ue-CategoryDL-v1260  INTEGER (15..16)  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1270-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1270-IEs ::= SEQUENCE {
  rf-Parameters-v1270  RF-Parameters-v1270  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1280-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1280-IEs ::= SEQUENCE {
  phylayerParameters-v1280  PhylayerParameters-v1280  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1310-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1310-IEs ::= SEQUENCE {
  ue-CategoryDL-v1310  ENUMERATED {n17, m1}  OPTIONAL,
  ue-CategoryUL-v1310  ENUMERATED {n14, m1}  OPTIONAL,
  pdcp-Parameters-v1310  PDCP-Parameters-v1310  OPTIONAL,
  rlc-Parameters-v1310  RLC-Parameters-v1310  OPTIONAL,
  mac-Parameters-v1310  MAC-Parameters-v1310  OPTIONAL,
  phylayerParameters-v1310  PhylayerParameters-v1310  OPTIONAL,
  rf-Parameters-v1310  RF-Parameters-v1310  OPTIONAL,
  measParameters-v1310  MeasParameters-v1310  OPTIONAL,
  dc-Parameters-v1310  DC-Parameters-v1310  OPTIONAL,
  sl-Parameters-v1310  SL-Parameters-v1310  OPTIONAL,
  scpdm-Parameters-v1310  SCPDM-Parameters-v1310  OPTIONAL,
  ce-Parameters-v1310  CE-Parameters-v1310  OPTIONAL,
  interRAT-ParametersWLAN-v1310  IRAT-ParametersWLAN-v1310  OPTIONAL,
  las-Parameters-v1310  LAA-Parameters-v1310  OPTIONAL,
  lwa-Parameters-v1310  LWA-Parameters-v1310  OPTIONAL,
  wlan-IW-Parameters-v1310  WLAN-IW-Parameters-v1310  OPTIONAL,
  fdd-Add-UE-EUTRA-Capabilities-v1310  UE-EUTRA-CapabilityAddXDD-Mode-v1310  OPTIONAL,
  tdd-Add-UE-EUTRA-Capabilities-v1310  UE-EUTRA-CapabilityAddXDD-Mode-v1310  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1320-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1320-IEs ::= SEQUENCE {
  ce-Parameters-v1320  CE-Parameters-v1320  OPTIONAL,
  phylayerParameters-v1320  PhylayerParameters-v1320  OPTIONAL,
  rf-Parameters-v1320  RF-Parameters-v1320  OPTIONAL,
  fdd-Add-UE-EUTRA-Capabilities-v1320  UE-EUTRA-CapabilityAddXDD-Mode-v1320  OPTIONAL,
  tdd-Add-UE-EUTRA-Capabilities-v1320  UE-EUTRA-CapabilityAddXDD-Mode-v1320  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1330-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1330-IEs ::= SEQUENCE {
  ue-CategoryDL-v1330  INTEGER (18..19)  OPTIONAL,
  phylayerParameters-v1330  PhylayerParameters-v1330  OPTIONAL,
  ue-CE-NeedULGaps-v1330  ENUMERATED {true}  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1340-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1340-IEs ::= SEQUENCE {
  ue-CategoryUL-v1340  INTEGER (15)   OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1350-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1350-IEs ::= SEQUENCE {
  ue-CategoryDL-v1350  ENUMERATED {oneBis}  OPTIONAL,
  ue-CategoryUL-v1350  ENUMERATED {oneBis}  OPTIONAL,
  ce-Parameters-v1350  CE-Parameters-v1350  OPTIONAL,
  nonCriticalExtension  UE-EUTRA-Capability-v1360-IEs  OPTIONAL
}

UE-EUTRA-Capability-v1360-IEs ::= SEQUENCE {

other-Parameters-v1360 Other-Parameters-v1360 OPTIONAL,
nonCriticalExtension UE-EUTRA-Capability-v1430-IEs OPTIONAL
}

UE-EUTRA-Capability-v1430-IEs ::= SEQUENCE {
  phyLayerParameters-v1430 PhyLayerParameters-v1430,
  ue-CategoryDL-v1430 ENUMERATED [m2] OPTIONAL,
  ue-CategoryUL-v1430 ENUMERATED {n16, n17, n18, n19, n20, m2} OPTIONAL,
  mac-Parameters-v1430 MAC-Parameters-v1430 OPTIONAL,
  measParameters-v1430 MeasParameters-v1430 OPTIONAL,
  pdcp-Parameters-v1430 PDCP-Parameters-v1430 OPTIONAL,
  rlc-Parameters-v1430 RLC-Parameters-v1430 OPTIONAL,
  laa-Parameters-v1430 LAA-Parameters-v1430 OPTIONAL,
  lwa-Parameters-v1430 LWA-Parameters-v1430 OPTIONAL,
  lwip-Parameters-v1430 LWIP-Parameters-v1430 OPTIONAL,
  otherParameters-v1430 Other-Parameters-v1430,
  mmtel-Parameters-r14 MMTEL-Parameters-r14 OPTIONAL,
  mobilityParameters-r14 MobilityParameters-r14 OPTIONAL,
  ce-Parameters-v1430 CE-Parameters-v1430,
  fdd-Add-UE-EUTRA-Capabilities-v1430 UE-EUTRA-CapabilityAddXDD-Mode-v1430 OPTIONAL,
  tdd-Add-UE-EUTRA-Capabilities-v1430 UE-EUTRA-CapabilityAddXDD-Mode-v1430 OPTIONAL,
  mbms-Parameters-v1430 MBMS-Parameters-v1430 OPTIONAL,
  sl-Parameters-v1430 SL-Parameters-v1430 OPTIONAL,
  ue-BasedNetwPerfMeasParameters-v1430 UE-BasedNetwPerfMeasParameters-v1430 OPTIONAL,
  highSpeedEnhParameters-r14 HighSpeedEnhParameters-r14 OPTIONAL,
  nonCriticalExtension UE-EUTRA-Capability-v1440-IEs OPTIONAL
}

UE-EUTRA-Capability-v1440-IEs ::= SEQUENCE {
  lwa-Parameters-v1440 LWA-Parameters-v1440,
  mac-Parameters-v1440 MAC-Parameters-v1440,
  nonCriticalExtension UE-EUTRA-Capability-v1450-IEs OPTIONAL
}

UE-EUTRA-Capability-v1450-IEs ::= SEQUENCE {
  phyLayerParameters-v1450 PhyLayerParameters-v1450 OPTIONAL,
  rf-Parameters-v1450 RF-Parameters-v1450 OPTIONAL,
  otherParameters-v1450 Other-Parameters-v1450,
  ue-CategoryDL-v1450 INTEGER (20) OPTIONAL,
  nonCriticalExtension UE-EUTRA-Capability-v1460-IEs OPTIONAL
}

UE-EUTRA-Capability-v1460-IEs ::= SEQUENCE {
  ue-CategoryDL-v1460 INTEGER (21) OPTIONAL,
  nonCriticalExtension UE-EUTRA-Capability-v1510-IEs OPTIONAL
}

UE-EUTRA-Capability-v1510-IEs ::= SEQUENCE {
  irat-ParametersNR-r15 IRAT-ParametersNR-r15 OPTIONAL,
  featureSetsEUTRA-r15 FeatureSetsEUTRA-r15 OPTIONAL,
  pdcp-ParametersNR-r15 PDCP-ParametersNR-r15 OPTIONAL,
  fdd-Add-UE-EUTRA-Capabilities-v1510 UE-EUTRA-CapabilityAddXDD-Mode-v1510 OPTIONAL,
  tdd-Add-UE-EUTRA-Capabilities-v1510 UE-EUTRA-CapabilityAddXDD-Mode-v1510 OPTIONAL,
  nonCriticalExtension UE-EUTRA-Capability-v1520-IEs OPTIONAL
}

UE-EUTRA-Capability-v1520-IEs ::= SEQUENCE {
  measParameters-v1520 MeasParameters-v1520 OPTIONAL,
  nonCriticalExtension UE-EUTRA-Capability-v1530-IEs OPTIONAL
}

UE-EUTRA-Capability-v1530-IEs ::= SEQUENCE {
  measParameters-v1530 MeasParameters-v1530 OPTIONAL,
  otherParameters-v1530 Other-Parameters-v1530 OPTIONAL,
  neighCellSI-AcquisitionParameters-v1530 NeighCellSI-AcquisitionParameters-v1530 OPTIONAL,
  mac-Parameters-v1530 MAC-Parameters-v1530 OPTIONAL,
  phyLayerParameters-v1530 PhyLayerParameters-v1530 OPTIONAL,
  rf-Parameters-v1530 RF-Parameters-v1530 OPTIONAL,
  pdcp-Parameters-v1530 PDCP-Parameters-v1530 OPTIONAL,
  rlc-Parameters-v1530 RLC-Parameters-v1530 OPTIONAL,
  sl-Parameters-v1530 SL-Parameters-v1530 OPTIONAL,
  extendedNumberOfDRBs-r15 ENUMERATED {supported} OPTIONAL,
  reducedCP-Latency-r15 ENUMERATED {supported} OPTIONAL

lna-Parameters-v1530  LAAs-Parameters-v1530  OPTIONAL,
ue-CategoryUL-v1530  INTEGER (22..26)  OPTIONAL,
fdd-Add-UE-EUTRA-Capabilities-v1530  UE-EUTRA-CapabilityAddXDD-Mode-v1530  OPTIONAL,
tdd-Add-UE-EUTRA-Capabilities-v1530  UE-EUTRA-CapabilityAddXDD-Mode-v1530  OPTIONAL,
nonCriticalExtension  SEQUENCE {}  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-r9 ::= SEQUENCE {
  phyLayerParameters-r9  PhyLayerParameters  OPTIONAL,
  featureGroupIndicators-r9  BIT STRING (SIZE (32))  OPTIONAL,
  featureGroupIndRel9Add-r9  BIT STRING (SIZE (32))  OPTIONAL,
  interRAT-ParametersGERAN-r9  IRAT-ParametersGERAN  OPTIONAL,
  interRAT-ParametersUTRA-r9  IRAT-ParametersUTRA-v920  OPTIONAL,
  interRAT-ParametersCDMA2000-r9  IRAT-ParametersCDMA2000-1XRTT-v920  OPTIONAL,
  neighCellSI-AcquisitionParameters-r9  NeighCellSI-AcquisitionParameters-r9  OPTIONAL,
  ...
}

UE-EUTRA-CapabilityAddXDD-Mode-v1060 ::= SEQUENCE {
  phyLayerParameters-v1060  PhyLayerParameters-v1020  OPTIONAL,
  featureGroupIndRel10-v1060  BIT STRING (SIZE (32))  OPTIONAL,
  interRAT-ParametersCDMA2000-v1060  IRAT-ParametersCDMA2000-1XRTT-v1020  OPTIONAL,
  interRAT-ParametersUTRA-TDD-v1060  IRAT-ParametersUTRA-v1020  OPTIONAL,
  ...
  [ otdoa-PositioningCapabilities-r10  OTOA-PositioningCapabilities-r10  OPTIONAL ]
}

UE-EUTRA-CapabilityAddXDD-Mode-v1130 ::= SEQUENCE {
  phyLayerParameters-v1130  PhyLayerParameters-v1130  OPTIONAL,
  measParameters-v1130  MeasParameters-v1130  OPTIONAL,
  otherParameters-r11  Other-Parameters-r11  OPTIONAL,
  ...
}

UE-EUTRA-CapabilityAddXDD-Mode-v1180 ::= SEQUENCE {
  mbms-Parameters-r11  MBMS-Parameters-r11
}

UE-EUTRA-CapabilityAddXDD-Mode-v1250 ::= SEQUENCE {
  phyLayerParameters-v1250  PhyLayerParameters-v1250  OPTIONAL,
  measParameters-v1250  MeasParameters-v1250  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-v1310 ::= SEQUENCE {
  phyLayerParameters-v1310  PhyLayerParameters-v1310  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-v1320 ::= SEQUENCE {
  phyLayerParameters-v1320  PhyLayerParameters-v1320  OPTIONAL,
  scptm-Parameters-r13  SCPTM-Parameters-r13  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-v1370 ::= SEQUENCE {
  ce-Parameters-v1370  CE-Parameters-v1370  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-v1380 ::= SEQUENCE {
  ce-Parameters-v1380  CE-Parameters-v1380
}

UE-EUTRA-CapabilityAddXDD-Mode-v1430 ::= SEQUENCE {
  phyLayerParameters-v1430  PhyLayerParameters-v1430  OPTIONAL,
  mmtel-Parameters-r14  MMTEL-Parameters-r14  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-v1510 ::= SEQUENCE {
  pdcp-ParametersNR-r15  PDCP-ParametersNR-r15  OPTIONAL
}

UE-EUTRA-CapabilityAddXDD-Mode-v1530 ::= SEQUENCE {
  neighCellSI-AcquisitionParameters-v1530  NeighCellSI-AcquisitionParameters-v1530  OPTIONAL,
  reducedCP-Latency-r15  ENUMERATED {supported}
}

AccessStratumRelease ::= ENUMERATED {
  rel8, rel9, rel10, rel11, rel12, rel13, rel14, rel15, ...}
FeatureSetsEUTRA-r15 ::= SEQUENCE {
  featureSetsDL-r15  SEQUENCE (SIZE (1..maxFeatureSets-r15)) OF FeatureSetDL-r15 OPTIONAL,
  featureSetsDL-PerCC-r15  SEQUENCE (SIZE (1..maxPerCC-FeatureSets-r15)) OF FeatureSetDL-PerCC-r15 OPTIONAL,
  featureSetsUL-r15  SEQUENCE (SIZE (1..maxFeatureSets-r15)) OF FeatureSetUL-r15 OPTIONAL,
  featureSetsUL-PerCC-r15  SEQUENCE (SIZE (1..maxPerCC-FeatureSets-r15)) OF FeatureSetUL-PerCC-r15 OPTIONAL,
  ...
}

MobilityParameters-r14 ::= SEQUENCE {
  makeBeforeBreak-r14 ENUMERATED {supported} OPTIONAL,
  rach-Less-r14 ENUMERATED {supported} OPTIONAL,
}

DC-Parameters-r12 ::= SEQUENCE {
  drb-TypeSplit-r12 ENUMERATED {supported} OPTIONAL,
  drb-TypeSCG-r12 ENUMERATED {supported} OPTIONAL,
}

DC-Parameters-v1310 ::= SEQUENCE {
  pdcp-TransferSplitUL-r13 ENUMERATED {supported} OPTIONAL,
  ue-SSTD-Meas-r13 ENUMERATED {supported} OPTIONAL,
}

MAC-Parameters-r12 ::= SEQUENCE {
  logicalChannelSR-ProhibitTimer-r12 ENUMERATED {supported} OPTIONAL,
  longDRX-Command-r12 ENUMERATED {supported} OPTIONAL,
}

MAC-Parameters-v1310 ::= SEQUENCE {
  extendedMAC-LengthField-r13 ENUMERATED {supported} OPTIONAL,
  extendedLongDRX-r13 ENUMERATED {supported} OPTIONAL,
}

MAC-Parameters-v1430 ::= SEQUENCE {
  shortSPS-IntervalFDD-r14 ENUMERATED {supported} OPTIONAL,
  shortSPS-IntervalTDD-r14 ENUMERATED {supported} OPTIONAL,
  skipUplinkDynamic-r14 ENUMERATED {supported} OPTIONAL,
  skipUplinkSPS-r14 ENUMERATED {supported} OPTIONAL,
  multipleUplinkSPS-r14 ENUMERATED {supported} OPTIONAL,
  dataInactMon-r14 ENUMERATED {supported} OPTIONAL,
}

MAC-Parameters-v1440 ::= SEQUENCE {
  rai-Support-r14 ENUMERATED {supported} OPTIONAL,
}

MAC-Parameters-v1530 ::= SEQUENCE {
  min-Proc-TimelineSubslot-r15 SEQUENCE (SIZE(1..3)) OF ProcessingTimelineSubslot-r15 OPTIONAL,
  skipSubframeProcessing-r15 ENUMERATED {supported} OPTIONAL,
  earlyData-UP-r15 ENUMERATED {supported} OPTIONAL,
  dormantSCellState-r15 ENUMERATED {supported} OPTIONAL,
  directSCellActivation-r15 ENUMERATED {supported} OPTIONAL,
  directSCellHibernation-r15 ENUMERATED {supported} OPTIONAL,
  extendedLCID-Duplication-r15 ENUMERATED {supported} OPTIONAL,
  sps-ServingCell-r15 ENUMERATED {supported} OPTIONAL,
}

ProcessingTimelineSet-r15 ::= ENUMERATED {set1, set2}

RLC-Parameters-r12 ::= SEQUENCE {
  extendedRLC-LI-Field-r12 ENUMERATED {supported} OPTIONAL,
}

RLC-Parameters-v1310 ::= SEQUENCE {
  extendedRLC-LI-Field-r12 ENUMERATED {supported} OPTIONAL,
}

RLC-Parameters-v1430 ::= SEQUENCE {
  extendedPollByte-r14 ENUMERATED {supported} OPTIONAL,
}

RLC-Parameters-v1530 ::= SEQUENCE {
  flexibleUM-AM-Combinations-r15 ENUMERATED {supported} OPTIONAL,
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rlc-AM-Ooo-Delivery-r15 ENUMERATED {supported} OPTIONAL,
rlc-UN-Ooo-Delivery-r15 ENUMERATED {supported} OPTIONAL

PDCP-Parameters ::= SEQUENCE {
supportedROHC-Profiles ROHC-ProfileSupportList-r15,
maxNumberROHC-ContextSessions ENUMERATED {
cs2, cs4, cs8, cs12, cs16, cs24, cs32,
cs48, cs64, cs128, cs256, cs512, cs1024,
cs16384, spare2, spare1} DEFAULT cs16,

...}

PDCP-Parameters-v1130 ::= SEQUENCE {
pdcp-SN-Extension-r11 ENUMERATED {supported} OPTIONAL,
supportRohcContextContinue-r11 ENUMERATED {supported} OPTIONAL
}

PDCP-Parameters-v1310 ::= SEQUENCE {
pdcp-SN-Extension-18bits-r13 ENUMERATED {supported} OPTIONAL
}

PDCP-Parameters-v1430 ::= SEQUENCE {
supportedUplinkOnlyROHC-Profiles-r14 SupportedUplinkOnlyROHC-Profiles-r14,
maxNumberROHC-ContextSessions-r14 ENUMERATED {
cs2, cs4, cs8, cs12, cs16, cs24, cs32,
cs48, cs64, cs128, cs256, cs512, cs1024,
cs16384, spare2, spare1} DEFAULT cs16
}

PDCP-Parameters-v1530 ::= SEQUENCE {
pdcp-Duplication-r15 SupportedUDC-r15 ENUMERATED {supported} OPTIONAL,

SupportedUDC-r15 ::= SEQUENCE {
supportedStandardDic-r15 ENUMERATED {supported} OPTIONAL,
supportedOperatorDic-r15 SupportedOperatorDic-r15 OPTIONAL
}

SupportedOperatorDic-r15 ::= SEQUENCE {
versionOfDictionary-r15 INTEGER (0..15),
associatedPLMN-ID-r15 PLMN-Identity
}

PhyLayerParameters ::= SEQUENCE {
ue-TxAntennaSelectionSupported BOOLEAN,
ue-SpecificRefSigsSupported BOOLEAN
}

PhyLayerParameters-v920 ::= SEQUENCE {
enhancedDualLayerFDD-r9 ENUMERATED {supported} OPTIONAL,
enhancedDualLayerTDD-r9 ENUMERATED {supported} OPTIONAL
}

PhyLayerParameters-v9d0 ::= SEQUENCE {
tm5-FDD-r9 ENUMERATED {supported} OPTIONAL,
tm5-TDD-r9 ENUMERATED {supported} OPTIONAL
}

PhyLayerParameters-v1020 ::= SEQUENCE {
twoAntennaPortsForPUCCH-r10 ENUMERATED {supported} OPTIONAL,
tm9-With-8Tx-FDD-r10 ENUMERATED {supported} OPTIONAL,
pmi-Disabling-r10 ENUMERATED {supported} OPTIONAL,
crossCarrierScheduling-r10 ENUMERATED {supported} OPTIONAL,
simultaneousPUCCH-PUSCH-r10 ENUMERATED {supported} OPTIONAL,
multiClusterPUSCH-WithinCC-r10 ENUMERATED {supported} OPTIONAL,
nonContiguousUL-RA-WithinCC-List-r10 NonContiguousUL-RA-WithinCC-List-r10 OPTIONAL
}

PhyLayerParameters-v1130 ::= SEQUENCE {
crs-InterfHandl-r11 ENUMERATED {supported} OPTIONAL,
ePDCCH-r11 ENUMERATED {supported} OPTIONAL,
multiACK-CSI-Reporting-r11 ENUMERATED {supported} OPTIONAL,
ss-CCH-InterfHandl-r11 ENUMERATED {supported} OPTIONAL,
tdd-SpecialSubframe-r11 ENUMERATED {supported} OPTIONAL,
txDiv-PUCCH1b-ChSelect-r11 ENUMERATED (supported) OPTIONAL,
u1-CoMP-r11 ENUMERATED (supported) OPTIONAL
}

PhyLayerParameters-v1170 ::= SEQUENCE {
  interBandTDD-CA-WithoutDifferentConfig-r11 BIT STRING (SIZE (2)) OPTIONAL
}

PhyLayerParameters-v1250 ::= SEQUENCE {
  e-HARQ-Pattern-FDD-r12 ENUMERATED (supported) OPTIONAL,
  enhanced-4TxCodebook-r12 ENUMERATED (supported) OPTIONAL,
  tdd-FDD-CA-PCell1Duplex-r12 BIT STRING (SIZE (2)) OPTIONAL,
  phy-TDD-ReConfig-TDD-PCell1-r12 ENUMERATED (supported) OPTIONAL,
  phy-TDD-ReConfig-TDD-PCell2-r12 ENUMERATED (supported) OPTIONAL,
  pusch-FeedbackMode-r12 ENUMERATED (supported) OPTIONAL,
  pusch-SRS-PowerControl-SubframeSet-r12 ENUMERATED (supported) OPTIONAL,
  csi-SubframeSet-r12 ENUMERATED (supported) OPTIONAL,
  noResourceRestrictionForTTIBundling-r12 ENUMERATED (supported) OPTIONAL,
  discoverySignalsInDeactSCell-r12 ENUMERATED (supported) OPTIONAL,
  naics-Capability-List-r12 NAICS-Capability-List-r12 OPTIONAL
}

PhyLayerParameters-v1280 ::= SEQUENCE {
  alternativeTBS-Indices-r12 ENUMERATED (supported) OPTIONAL
}

PhyLayerParameters-v1310 ::= SEQUENCE {
  aperiodicCSI-Reporting-r13 BIT STRING (SIZE (2)) OPTIONAL,
  codebook-HARQ-ACK-r13 BIT STRING (SIZE (2)) OPTIONAL,
  crossCarrierScheduling-B5-r13 ENUMERATED (supported) OPTIONAL,
  fdd-HARQ-TimingTDD-r13 ENUMERATED (supported) OPTIONAL,
  maxNumberUpdatedCSI-Proc-r13 INTEGER (5..32) OPTIONAL,
  pucch-Format4-r13 ENUMERATED (supported) OPTIONAL,
  pucch-Format5-r13 ENUMERATED (supported) OPTIONAL,
  pucch-SCell-r13 ENUMERATED (supported) OPTIONAL,
  spatialBundling-HARQ-ACK-r13 ENUMERATED (supported) OPTIONAL,
  supportedBlindDecoding-r13 ENUMERATED (supported) OPTIONAL,
  maxNumberDecoding-r13 INTEGER (1..32) OPTIONAL,
  pdch-CandidateReductions-r13 ENUMERATED (supported) OPTIONAL,
  skipMonitoringDCI-Format0-1A-r13 ENUMERATED (supported) OPTIONAL
}

PhyLayerParameters-v1320 ::= SEQUENCE {
  mimo-UE-Parameters-r13 MIMO-UE-Parameters-r13 OPTIONAL
}

PhyLayerParameters-v1330 ::= SEQUENCE {
  cch-InterMitigation-RefRecTypeA-r13 ENUMERATED (supported) OPTIONAL,
  cch-InterMitigation-RefRecTypeB-r13 ENUMERATED (supported) OPTIONAL,
  cch-InterMitigation-MaxNumCCs-r13 INTEGER (1.. maxServCell-r13) OPTIONAL,
  crs-InterfMitigationTM10-r13 ENUMERATED (supported) OPTIONAL
}

PhyLayerParameters-v1430 ::= SEQUENCE {
  ce-PUSCH-NB-MaxTBS-r14 ENUMERATED (supported) OPTIONAL,
  ce-PDSCH-PUSCH-MaxBandwidth-r14 ENUMERATED (bw5, bw20) OPTIONAL,
  ce-HARQ-AckBundling-r14 ENUMERATED (supported) OPTIONAL,
  ce-RetuningSymbols-r14 ENUMERATED (n0, n1) OPTIONAL,
  ce-PDSCH-PUSCH-Enhancement-r14 ENUMERATED (supported) OPTIONAL,
  ce-SchedulingEnhancement-r14 ENUMERATED (supported) OPTIONAL,
  ce-SRS-Enhancement-r14 ENUMERATED (supported) OPTIONAL,
  ce-PUCCH-Enhancement-r14 ENUMERATED (supported) OPTIONAL,
  ce-ClosedLoopTxAntennaSelection-r14 ENUMERATED (supported) OPTIONAL,
  tdd-SpecialSubframe-r14 ENUMERATED (supported) OPTIONAL,
  tdd-TTI-Bundling-r14 ENUMERATED (supported) OPTIONAL,
  dms-LessUpPTS-r14 ENUMERATED (supported) OPTIONAL,
  mimo-UE-Parameters-v1430 MIMO-UE-Parameters-r13 OPTIONAL,
  alternativeTBS-Index-r14 ENUMERATED (supported) OPTIONAL,
  feMBMS-Unicast-Parameters-r14 FeMBMS-Unicast-Parameters-r14 OPTIONAL
}

PhyLayerParameters-v1450 ::= SEQUENCE {
  ce-SRS-EnhancementWithoutComb4-r14 ENUMERATED (supported) OPTIONAL,
PhyLayerParameters-v1470 ::= SEQUENCE {
    mimo-UE-Parameters-v1470  MIMO-UE-Parameters-v1470  OPTIONAL,
    srs-UE-Parameters-v1470   ENUMERATED {supported}  OPTIONAL
}

PhyLayerParameters-v1530 ::= SEQUENCE {
    stti-SPT-Capabilities-r15  SEQUENCE {
        aperiodicCsi-ReportingSTTI-r15 ENUMERATED {supported}  OPTIONAL,
        dmrs-BasedSDDCCH-MBSFN-r15  ENUMERATED {supported}  OPTIONAL,
        dmrs-BasedSDDCCH-nonMBSFN-r15 ENUMERATED {supported}  OPTIONAL,
        dmrs-PositionPattern-r15    ENUMERATED {supported}  OPTIONAL,
        dmrs-SharingSubslotPDSCH-r15 ENUMERATED {supported}  OPTIONAL,
        dmrs-RepetitionSubslotPDSCH-r15 ENUMERATED {supported}  OPTIONAL,
        epdchc-SPT-differentCells-r15 ENUMERATED {supported}  OPTIONAL,
        epdchc-STTI-differentCells-r15 ENUMERATED {supported}  OPTIONAL,
        maxLayersSlotOrSubslotPUSCH-r15 ENUMERATED {oneLayer,twoLayers,threeLayers}  OPTIONAL
    }  OPTIONAL,
    maxNumberUpdatedCSI-Proc-SPT-r15 INTEGER(5..32)  OPTIONAL,
    maxNumberUpdatedCSI-Proc-STTI-Comb77-r15 INTEGER(1..32)  OPTIONAL,
    maxNumberUpdatedCSI-Proc-STTI-Comb27-r15 INTEGER(1..32)  OPTIONAL,
    mimo-UE-ParametersSTTI-r15  MIMO-UE-Parameters-v1310  OPTIONAL,
    mimo-UE-ParametersSTTI-v1530 MIMO-UE-Parameters-v1430  OPTIONAL,
    numberOfBlindDecodesUES-r15 INTEGER(4..32)  OPTIONAL,
    pdsch-SlotSubslotPDSCH-Decoding-r15 ENUMERATED {supported}  OPTIONAL,
    powerUCI-SubslotPUSCH       ENUMERATED {supported}  OPTIONAL,
    slotPDSCH-TxDiv-TM9and10    ENUMERATED {supported}  OPTIONAL,
    subslotPDSCH-TxDiv-TM9and10 ENUMERATED {supported}  OPTIONAL,
    spdcch-differentRS-types-r15 ENUMERATED {supported}  OPTIONAL,
    srs-SC77-TrigerringPS2-r15  ENUMERATED {supported}  OPTIONAL,
    sps-cyclicShift-r15        ENUMERATED {supported}  OPTIONAL,
    spdcch-Reuse-r15           ENUMERATED {supported}  OPTIONAL,
    stti-STTI-r15              ENUMERATED {slot,subslot,slotAndSubslot}  OPTIONAL,
    tm9-slotPDSCH-r15          ENUMERATED {supported}  OPTIONAL,
    tm9-slotSubslot-r15        ENUMERATED {supported}  OPTIONAL,
    tmi0-slotSubslot-r15       ENUMERATED {supported}  OPTIONAL,
    tm10-slotSubslot-r15       ENUMERATED {supported}  OPTIONAL,
    ul-AsynchHarqSharingDiff-TTI-Lengths-r15 ENUMERATED {supported}  OPTIONAL
}

ce-Capabilities-r15  SEQUENCE {
    ce-CRS-IntMitig-r15 ENUMERATED {supported}  OPTIONAL,
    ce-CQI-AlternativeTable-r15 ENUMERATED {supported}  OPTIONAL,
    ce-PDSCH-FlexibleStartPRB-CE-ModeA-r15 ENUMERATED {supported}  OPTIONAL,
    ce-PDSCH-FlexibleStartPRB-CE-ModeB-r15 ENUMERATED {supported}  OPTIONAL,
    ce-PDSCH-64QAM-r15  ENUMERATED {supported}  OPTIONAL,
    ce-PUSCH-FlexibleStartPRB-CE-ModeA-r15 ENUMERATED {supported}  OPTIONAL,
    ce-PUSCH-FlexibleStartPRB-CE-ModeB-r15 ENUMERATED {supported}  OPTIONAL,
    ce-PUSCH-SubPRB-Allocation-r15 ENUMERATED {supported}  OPTIONAL,
    ce-UL-HARQ-ACK-Feedback-r15 ENUMERATED {supported}  OPTIONAL
}

shortCQI-P0CellActivation-r15 ENUMERATED {supported}  OPTIONAL,
mimo-CBSR-AdvancedCSI-r15 ENUMERATED {supported}  OPTIONAL,
crs-IntMitig-r15 ENUMERATED {supported}  OPTIONAL,
u1-PowerControlEnhancements-r15 ENUMERATED {supported}  OPTIONAL

urlc-Capabilities-r15  SEQUENCE {
    pdsch-RepSubframe-r15 ENUMERATED {supported}  OPTIONAL,
    pdsch-RepSlot-r15    ENUMERATED {supported}  OPTIONAL,
    pdsch-RepSubslot-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-MultiConfigSubframe-r15 INTEGER(0..5)  OPTIONAL,
    pusch-SPS-MultiConfigSlot-r15 INTEGER(0..31)  OPTIONAL,
    pusch-SPS-MultiConfigSubslot-r15 INTEGER(0..31)  OPTIONAL,
    pusch-SPS-MaxConfigSlot-r15 INTEGER(0..31)  OPTIONAL,
    pusch-SPS-MaxConfigSubslot-r15 INTEGER(0..31)  OPTIONAL,
    pusch-SPS-MaxConfigSubframe-r15 INTEGER(0..31)  OPTIONAL,
    pusch-SPS-SlotRepPCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SlotRepPCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SlotRepSCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SlotRepSCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SubframeRepPCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SubframeRepPCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SubframeRepSCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SubframeRepSCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SubslotRepPCell-r15 ENUMERATED {supported}  OPTIONAL,
    pusch-SPS-SubslotRepPCell-r15 ENUMERATED {supported}  OPTIONAL,
MIMO-UE-Parameters-r13 ::= SEQUENCE {
  parametersTM9-r13 MIMO-UE-ParametersPerTM-r13 OPTIONAL,
  parametersTM10-r13 MIMO-UE-ParametersPerTM-r13 OPTIONAL,
  srs-EnhancementsTDD-r13 ENUMERATED {supported} OPTIONAL,
  srs-Enhancements-r13 ENUMERATED {supported} OPTIONAL,
  interferenceMeasRestriction-r13 ENUMERATED {supported} OPTIONAL,
}

MIMO-UE-Parameters-v1430 ::= SEQUENCE {
  parametersTM9-v1430 MIMO-UE-ParametersPerTM-v1430 OPTIONAL,
  parametersTM10-v1430 MIMO-UE-ParametersPerTM-v1430 OPTIONAL,
}

MIMO-UE-Parameters-v1470 ::= SEQUENCE {
  parametersTM9-v1470 MIMO-UE-ParametersPerTM-v1470,
  parametersTM10-v1470 MIMO-UE-ParametersPerTM-v1470,
}

MIMO-NonPrecodedCapabilities-r13 ::= SEQUENCE {
  nzp-CSI-RS-AperiodicInfo-r14 SEQUENCE {
    nMaxProc-r14 INTEGER(5..32),
    nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4} OPTIONAL,
  } OPTIONAL,
  nzp-CSI-RS-PeriodicInfo-r14 SEQUENCE {
    nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4} OPTIONAL,
  } OPTIONAL,
  zp-CSI-RS-AperiodicInfo-r14 ENUMERATED {supported} OPTIONAL,
  ul-dmrs-Enhancements-r14 ENUMERATED {supported} OPTIONAL,
  densityReductionNP-r14 ENUMERATED {supported} OPTIONAL,
  densityReductionBF-r14 ENUMERATED {supported} OPTIONAL,
  hybridCSI-r14 ENUMERATED {supported} OPTIONAL,
  semiOL-r14 ENUMERATED {supported} OPTIONAL,
  csi-ReportingNP-r14 ENUMERATED {supported} OPTIONAL,
  csi-ReportingAdvanced-r14 ENUMERATED {supported} OPTIONAL,
}

MIMO-NonPrecodedCapabilities-v1430 ::= SEQUENCE {
  nzp-CSI-RS-AperiodicInfo-r14 SEQUENCE {
    nMaxProc-r14 INTEGER(5..32),
    nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4} OPTIONAL,
  } OPTIONAL,
  nzp-CSI-RS-PeriodicInfo-r14 SEQUENCE {
    nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4} OPTIONAL,
  } OPTIONAL,
  zp-CSI-RS-AperiodicInfo-r14 ENUMERATED {supported} OPTIONAL,
  ul-dmrs-Enhancements-r14 ENUMERATED {supported} OPTIONAL,
  densityReductionNP-r14 ENUMERATED {supported} OPTIONAL,
  densityReductionBF-r14 ENUMERATED {supported} OPTIONAL,
  hybridCSI-r14 ENUMERATED {supported} OPTIONAL,
  semiOL-r14 ENUMERATED {supported} OPTIONAL,
  csi-ReportingNP-r14 ENUMERATED {supported} OPTIONAL,
  csi-ReportingAdvanced-r14 ENUMERATED {supported} OPTIONAL,
}

MIMO-NonPrecodedCapabilities-v1470 ::= SEQUENCE {
  nzp-CSI-RS-AperiodicInfo-r14 SEQUENCE {
    nMaxProc-r14 INTEGER(5..32),
    nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4} OPTIONAL,
  } OPTIONAL,
  nzp-CSI-RS-PeriodicInfo-r14 SEQUENCE {
    nMaxResource-r14 ENUMERATED {ffs1, ffs2, ffs3, ffs4} OPTIONAL,
  } OPTIONAL,
  zp-CSI-RS-AperiodicInfo-r14 ENUMERATED {supported} OPTIONAL,
  ul-dmrs-Enhancements-r14 ENUMERATED {supported} OPTIONAL,
  densityReductionNP-r14 ENUMERATED {supported} OPTIONAL,
  densityReductionBF-r14 ENUMERATED {supported} OPTIONAL,
  hybridCSI-r14 ENUMERATED {supported} OPTIONAL,
  semiOL-r14 ENUMERATED {supported} OPTIONAL,
  csi-ReportingNP-r14 ENUMERATED {supported} OPTIONAL,
  csi-ReportingAdvanced-r14 ENUMERATED {supported} OPTIONAL,
}

MIMO-CA-ParametersPerBoBC-r13 ::= SEQUENCE {
  parametersTM9-r13 MIMO-CA-ParametersPerBoBCPerTM-r13 OPTIONAL,
  parametersTM10-r13 MIMO-CA-ParametersPerBoBCPerTM-r13 OPTIONAL,
}

MIMO-CA-ParametersPerBoBC-r15 ::= SEQUENCE {
  parametersTM9-r15 MIMO-CA-ParametersPerBoBCPerTM-r15 OPTIONAL,
  parametersTM10-r15 MIMO-CA-ParametersPerBoBCPerTM-r15 OPTIONAL,
}

MIMO-CA-ParametersPerBoBC-v1430 ::= SEQUENCE {
  parametersTM9-v1430 MIMO-CA-ParametersPerBoBCPerTM-v1430 OPTIONAL,
  parametersTM10-v1430 MIMO-CA-ParametersPerBoBCPerTM-v1430 OPTIONAL,
}

MIMO-CA-ParametersPerBoBC-v1470 ::= SEQUENCE {
  parametersTM9-v1470 MIMO-CA-ParametersPerBoBCPerTM-v1470 OPTIONAL,
  parametersTM10-v1470 MIMO-CA-ParametersPerBoBCPerTM-v1470 OPTIONAL,
}

MIMO-CA-ParametersPerBoBCPerTM-r13 ::= SEQUENCE {
  nonPrecoded-r13 MIMO-NonPrecodedCapabilities-r13 OPTIONAL,
}

MIMO-CA-ParametersPerBoBCPerTM-v1430 ::= SEQUENCE {
  nonPrecoded-r13 MIMO-NonPrecodedCapabilities-r13 OPTIONAL,
}

MIMO-CA-ParametersPerBoBCPerTM-v1470 ::= SEQUENCE {
  nonPrecoded-r13 MIMO-NonPrecodedCapabilities-r13 OPTIONAL,
}
MIMO-CA-ParametersPerBoBCPerTM-v1430 ::= SEQUENCE {  
  csi-ReportingNP-r14     ENUMERATED (different)   OPTIONAL,  
  csi-ReportingAdvanced-r14   ENUMERATED (different)   OPTIONAL  
}  
MIMO-CA-ParametersPerBoBCPerTM-v1470 ::= SEQUENCE {  
  csi-ReportingAdvancedMaxPorts-r14 ENUMERATED (n8, n12, n16, n20, n24, n28) OPTIONAL  
}  
MIMO-CA-ParametersPerBoBCPerTM-v15 ::= SEQUENCE {  
  nonPrecoded-r13       MIMO-NonPrecodedCapabilities-r13 OPTIONAL,  
  beamformed-r13       MIMO-BeamformedCapabilityList-r13 OPTIONAL,  
  dmrs-Enhancements-r13     ENUMERATED {different}    OPTIONAL,  
  csi-ReportingNP-r14      ENUMERATED {different}    OPTIONAL,  
  csi-ReportingAdvanced-r14    ENUMERATED {different}    OPTIONAL  
}  
MIMO-NonPrecodedCapabilities-r13 ::= SEQUENCE {  
  config1-r13        ENUMERATED {supported}   OPTIONAL,  
  config2-r13        ENUMERATED {supported}   OPTIONAL,  
  config3-r13        ENUMERATED {supported}   OPTIONAL,  
  config4-r13        ENUMERATED {supported}   OPTIONAL  
}  
MIMO-UE-BeamformedCapabilities-r13 ::=  SEQUENCE {  
  altCodebook-r13       ENUMERATED {supported}   OPTIONAL,  
  mimo-BeamformedCapabilities-r13   MIMO-BeamformedCapabilityList-r13  
}  
MIMO-BeamformedCapabilityList-r13 ::=  SEQUENCE (SIZE (1..maxCSI-Proc-r11)) OF MIMO-BeamformedCapabilities-r13  
MIMO-BeamformedCapabilities-r13 ::=  SEQUENCE {  
  k-Max-r13        INTEGER (1..8),  
  n-MaxList-r13       BIT STRING (SIZE (1..7))  OPTIONAL  
}  
NonContiguousUL-RA-WithinCC-List-r10 ::= SEQUENCE (SIZE (1..maxBands)) OF NonContiguousUL-RA-WithinCC-r10  
NonContiguousUL-RA-WithinCC-r10 ::=  SEQUENCE {  
  nonContiguousUL-RA-WithinCC-Info-r10 ENUMERATED {supported}     OPTIONAL  
}  
RF-Parameters ::=     SEQUENCE {  
  supportedBandListEUTRA    SupportedBandListEUTRA  
}  
RF-Parameters-v9e0 ::=     SEQUENCE {  
  supportedBandListEUTRA-v9e0    SupportedBandListEUTRA-v9e0    OPTIONAL  
}  
RF-Parameters-v1020 ::=     SEQUENCE {  
  supportedBandCombination-r10   SupportedBandCombination-r10  
}  
RF-Parameters-v1060 ::=     SEQUENCE {  
  supportedBandCombinationExt-r10 SupportedBandCombinationExt-r10  
}  
RF-Parameters-v1090 ::=     SEQUENCE {  
  supportedBandCombination-v1090 SupportedBandCombination-v1090 OPTIONAL  
}  
RF-Parameters-v10f0 ::=     SEQUENCE {  
  modifiedMPR-Behavior-r10     BIT STRING (SIZE (32))    OPTIONAL  
}  
RF-Parameters-v10i0 ::=     SEQUENCE {  
  supportedBandCombination-v10i0   SupportedBandCombination-v10i0  
}  
RF-Parameters-v10j0 ::=     SEQUENCE {  
  multiNS-Pmax-r10      ENUMERATED {supported}     OPTIONAL  
}
RF-Parameters-v1130 ::= SEQUENCE {
  supportedBandCombination-v1130 SupportedBandCombination-v1130  OPTIONAL
}

RF-Parameters-v1180 ::= SEQUENCE {
  freqBandRetrieval-r11 ENUMERATED {supported}  OPTIONAL,
  requestedBands-r11  SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicator-r11  OPTIONAL,
  supportedBandCombinationAdd-r11 SupportedBandCombinationAdd-r11  OPTIONAL
}

RF-Parameters-v11d0 ::= SEQUENCE {
  supportedBandCombinationAdd-v11d0 SupportedBandCombinationAdd-v11d0  OPTIONAL
}

RF-Parameters-v1250 ::= SEQUENCE {
  supportedBandListEUTRA-v1250 SupportedBandListEUTRA-v1250  OPTIONAL,
  supportedBandCombination-v1250 SupportedBandCombination-v1250  OPTIONAL,
  supportedBandCombinationAdd-v1250 SupportedBandCombinationAdd-v1250  OPTIONAL,
  freqBandPriorityAdjustment-r12 ENUMERATED {supported}  OPTIONAL
}

RF-Parameters-v1270 ::= SEQUENCE {
  supportedBandCombination-v1270 SupportedBandCombination-v1270  OPTIONAL,
  supportedBandCombinationAdd-v1270 SupportedBandCombinationAdd-v1270  OPTIONAL
}

RF-Parameters-v1310 ::= SEQUENCE {
  eNB-RequestedParameters-r13 SEQUENCE {
    reducedIntNonContCombRequested-r13 ENUMERATED {true}  OPTIONAL,
    requestedCCsDL-r13 INTEGER (2..32)  OPTIONAL,
    requestedCCsUL-r13 INTEGER (2..32)  OPTIONAL,
    skipFallbackCombRequested-r13 ENUMERATED {true}  OPTIONAL
  }  OPTIONAL,
  maximumCCsRetrieval-r13 ENUMERATED {supported}  OPTIONAL,
  skipFallbackCombinations-r13 ENUMERATED {supported}  OPTIONAL,
  reducedIntNonContComb-r13 ENUMERATED {supported}  OPTIONAL,
  supportedBandListEUTRA-v1310 SupportedBandListEUTRA-v1310  OPTIONAL,
  supportedBandCombinationReduced-r13 SupportedBandCombinationReduced-r13  OPTIONAL
}

RF-Parameters-v1320 ::= SEQUENCE {
  supportedBandListEUTRA-v1320 SupportedBandListEUTRA-v1320  OPTIONAL,
  supportedBandCombination-v1320 SupportedBandCombination-v1320  OPTIONAL,
  supportedBandCombinationAdd-v1320 SupportedBandCombinationAdd-v1320  OPTIONAL,
  supportedBandCombinationReduced-v1320 SupportedBandCombinationReduced-v1320  OPTIONAL
}

RF-Parameters-v1380 ::= SEQUENCE {
  supportedBandCombination-v1380 SupportedBandCombination-v1380  OPTIONAL,
  supportedBandCombinationAdd-v1380 SupportedBandCombinationAdd-v1380  OPTIONAL,
  supportedBandCombinationReduced-v1380 SupportedBandCombinationReduced-v1380  OPTIONAL
}

RF-Parameters-v1390 ::= SEQUENCE {
  supportedBandCombination-v1390 SupportedBandCombination-v1390  OPTIONAL,
  supportedBandCombinationAdd-v1390 SupportedBandCombinationAdd-v1390  OPTIONAL,
  supportedBandCombinationReduced-v1390 SupportedBandCombinationReduced-v1390  OPTIONAL
}

RF-Parameters-v1430 ::= SEQUENCE {
  supportedBandCombination-v1430 SupportedBandCombination-v1430  OPTIONAL,
  supportedBandCombinationAdd-v1430 SupportedBandCombinationAdd-v1430  OPTIONAL,
  supportedBandCombinationReduced-v1430 SupportedBandCombinationReduced-v1430  OPTIONAL,
  eNB-RequestedParameters-v1430 SEQUENCE {
    requestedDiffFallbackCombList-r14 BandCombinationList-r14  OPTIONAL,
    diffFallbackCombReport-r14 ENUMERATED {supported}  OPTIONAL
  }  OPTIONAL
}

RF-Parameters-v1450 ::= SEQUENCE {
  supportedBandCombination-v1450 SupportedBandCombination-v1450  OPTIONAL,
RF-Parameters-v1470 ::= SEQUENCE {
  supportedBandCombinationAdd-v1470 SupportedBandCombinationAdd-v1470 OPTIONAL,
  supportedBandCombinationReduced-v1470 SupportedBandCombinationReduced-v1470 OPTIONAL
}

RF-Parameters-v1530 ::= SEQUENCE {
  stTI-SPT-Supported-r15 ENUMERATED (supported) OPTIONAL,
  supportedBandCombination-v1530 SupportedBandCombination-v1530 OPTIONAL,
  supportedBandCombinationAdd-v1530 SupportedBandCombinationAdd-v1530 OPTIONAL,
  supportedBandCombinationReduced-v1530 SupportedBandCombinationReduced-v1530 OPTIONAL,
  powerClass-14dBm-r15 ENUMERATED (supported) OPTIONAL
}

SkipSubframeProcessing-r15 ::= SEQUENCE {
  skipProcessingDL-Slot-r15 INTEGER (0..3) OPTIONAL,
  skipProcessingDL-SubSlot-r15 INTEGER (0..3) OPTIONAL,
  skipProcessingUL-Slot-r15 INTEGER (0..3) OPTIONAL,
  skipProcessingUL-SubSlot-r15 INTEGER (0..3) OPTIONAL
}

STTI-SPT-Parameters-r15 ::= SEQUENCE {
  frameStructureType-SPT-r15 BIT STRING (SIZE (3)) OPTIONAL,
  maxNumberCCs-SPT-r15 INTEGER (1..32) OPTIONAL
}

STTI-SPT-BandParameters-r15 ::= SEQUENCE {
  d1-1024QAM-Slot-r15 ENUMERATED (supported) OPTIONAL,
  d1-1024QAM-SubslotTA-1-r15 ENUMERATED (supported) OPTIONAL,
  d1-1024QAM-SubslotTA-2-r15 ENUMERATED (supported) OPTIONAL,
  simultaneousTx-differentTx-duration-r15 ENUMERATED (supported) OPTIONAL,
  stTI-CA-MIMO-ParametersDL-r15 CA-MIMO-ParametersDL-r15 OPTIONAL,
  stTI-CA-MIMO-ParametersUL-r15 CA-MIMO-ParametersUL-r15 OPTIONAL,
  stTI-CA-MIMO-Coexistence ENUMERATED (supported) OPTIONAL,
  stTI-MIMO-CA-ParametersPerBoBCs-r15 MIMO-CA-ParametersPerBoBCs-r15 OPTIONAL,
  stTI-SupportedCombinations-r15 stTI-SupportedCombinations-r15 OPTIONAL,
  stTI-SupportedCSI-Proc-r15 ENUMERATED (n1, n3, n4) OPTIONAL,
  ul-256QAM-Slot-r15 ENUMERATED (supported) OPTIONAL,
  ul-256QAM-Subslot-r15 ENUMERATED (supported) OPTIONAL
}

STTI-SupportedCombinations-r15 ::= SEQUENCE {
  combination-22-r15 DL-UL-CCs-r15 OPTIONAL,
  combination-77-r15 DL-UL-CCs-r15 OPTIONAL,
  combination-27-r15 DL-UL-CCs-r15 OPTIONAL,
  combination-22-27-r15 DL-UL-CCs-r15 OPTIONAL,
  combination-77-22-r15 DL-UL-CCs-r15 OPTIONAL,
  combination-77-27-r15 DL-UL-CCs-r15 OPTIONAL
}

DL-UL-CCs-r15 ::= SEQUENCE {
  maxNumberDL-CCs-r15 INTEGER (1..32) OPTIONAL,
  maxNumberUL-CCs-r15 INTEGER (1..32) OPTIONAL
}

SupportedBandCombination-r10 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-r10

SupportedBandCombinationExt-r10 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParametersExt-r10

SupportedBandCombination-v1090 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1090

SupportedBandCombination-v1010 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1010

SupportedBandCombination-v1130 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1130

SupportedBandCombination-v1250 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1250
SupportedBandCombination-v1270 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1270
SupportedBandCombination-v1320 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1320
SupportedBandCombination-v1380 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1380
SupportedBandCombination-v1390 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1390
SupportedBandCombination-v1430 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1430
SupportedBandCombination-v1450 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1450
SupportedBandCombination-v1470 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1470
SupportedBandCombination-v1530 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-v1530
SupportedBandCombinationAdd-r11 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-r11
SupportedBandCombinationAdd-v11d0 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v10d0
SupportedBandCombinationAdd-v1250 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1250
SupportedBandCombinationAdd-v1270 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1270
SupportedBandCombinationAdd-v1320 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1320
SupportedBandCombinationAdd-v1380 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1380
SupportedBandCombinationAdd-v1390 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1390
SupportedBandCombinationAdd-v1430 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1430
SupportedBandCombinationAdd-v1450 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1450
SupportedBandCombinationAdd-v1470 ::= SEQUENCE (SIZE (1..maxBandComb-r11)) OF BandCombinationParameters-v1470
SupportedBandCombinationReduced-r13 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-r13
SupportedBandCombinationReduced-v1320 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1320
SupportedBandCombinationReduced-v1380 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1380
SupportedBandCombinationReduced-v1390 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1390
SupportedBandCombinationReduced-v1430 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1430
SupportedBandCombinationReduced-v1450 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1450
SupportedBandCombinationReduced-v1470 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1470
SupportedBandCombinationReduced-v1530 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF BandCombinationParameters-v1530

BandCombinationParameters-r10 ::= SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-r10

BandCombinationParametersExt-r10 ::= SEQUENCE {
  supportedBandwidthCombinationSet-r10 SupportedBandwidthCombinationSet-r10 OPTIONAL
}

BandCombinationParameters-v1090 ::= SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1090

BandCombinationParameters-v10i0 ::= SEQUENCE {
  bandParameterList-v10i0   SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v10i0 OPTIONAL
}

BandCombinationParameters-v1130 ::= SEQUENCE {
  multipleTimingAdvance-r11 ENUMERATED {supported} OPTIONAL,
  simultaneousRx-Tx-r11 ENUMERATED {supported} OPTIONAL,
  bandParameterList-r11   SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1130 OPTIONAL,
  ...
}

BandCombinationParameters-r11 ::= SEQUENCE {
  bandParameterList-r11   SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-r11,
  supportedBandwidthCombinationSet-r11 SupportedBandwidthCombinationSet-r10 OPTIONAL,
  multipleTimingAdvance-r11 ENUMERATED {supported} OPTIONAL,
  simultaneousRx-Tx-r11 ENUMERATED {supported} OPTIONAL,
  bandInfoEUTRA-r11 BandInfoEUTRA,
  ...
}

BandCombinationParameters-v1250 ::= SEQUENCE {
  dc-Support-r12     SEQUENCE {
    asynchronous-r12 ENUMERATED {supported} OPTIONAL,
    supportedCellGrouping-r12 BIT STRING (SIZE(3)),
    threeEntries-r12    BIT STRING (SIZE(7)),
    fourEntries-r12     BIT STRING (SIZE(15))
  } OPTIONAL,
  supportedNAICS-2CRS-AP-r12 BIT STRING (SIZE (1..maxNAICS-Entries-r12)) OPTIONAL,
  commSupportedBandsPerBC-r12 BIT STRING (SIZE (1.. maxBands)) OPTIONAL,
  ...
}

BandCombinationParameters-v1270 ::= SEQUENCE {
  bandParameterList-v1270   SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1270 OPTIONAL
}

BandCombinationParameters-r13 ::= SEQUENCE {
  differentFallbackSupported-r13 ENUMERATED {true} OPTIONAL,
  bandParameterList-r13   SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-r13,
  supportedBandwidthCombinationSet-r13 SupportedBandwidthCombinationSet-r10 OPTIONAL,
  multipleTimingAdvance-r13 ENUMERATED {supported} OPTIONAL,
  simultaneousRx-Tx-r13 ENUMERATED {supported} OPTIONAL,
  bandInfoEUTRA-r13 BandInfoEUTRA,
  dc-Support-r13     SEQUENCE {
    asynchronous-r13 ENUMERATED {supported} OPTIONAL,
    supportedCellGrouping-r13 CHOICE {
      threeEntries-r13 BIT STRING (SIZE(3)),
      fourEntries-r13 BIT STRING (SIZE(7)),
      fiveEntries-r13 BIT STRING (SIZE(15))
    } OPTIONAL,
    supportedNAICS-2CRS-AP-r13 BIT STRING (SIZE (1..maxNAICS-Entries-r12)) OPTIONAL,
    commSupportedBandsPerBC-r13 BIT STRING (SIZE (1.. maxBands)) OPTIONAL
  }
}

BandCombinationParameters-v1320 ::= SEQUENCE {
  bandParameterList-v1320   SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF
BandCombinationParameters-v1380 ::= SEQUENCE {
  bandParameterList-v1380  SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1380  OPTIONAL
}

BandCombinationParameters-v1390 ::= SEQUENCE {
  ue-CA-PowerClass-N-r13   ENUMERATED {class2}    OPTIONAL
}

BandCombinationParameters-v1430 ::= SEQUENCE {
  bandParameterList-v1430  SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1430  OPTIONAL,
  v2x-SupportedTxBandCombListPerBC-r14   BIT STRING (SIZE (1.. maxBandComb-r13)) OPTIONAL,
  v2x-SupportedRxBandCombListPerBC-r14   BIT STRING (SIZE (1.. maxBandComb-r13)) OPTIONAL
}

BandCombinationParameters-v1450 ::= SEQUENCE {
  bandParameterList-v1450  SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1450  OPTIONAL
}

BandCombinationParameters-v1470 ::= SEQUENCE {
  bandParameterList-v1470  SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1470  OPTIONAL,
  srs-MaxSimultaneousCCs-r14 INTEGER (1..31)    OPTIONAL
}

BandCombinationParameters-v1530 ::= SEQUENCE {
  bandParameterList-v1530  SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-v1530  OPTIONAL,
  spt-Parameters-r15    SPT-Parameters-r15    OPTIONAL
}  -- If an additional band combination parameter is defined, which are supported for EN-DC, it shall be defined in the IE CA-ParametersEUTRA in TS 38.331 [82].

SupportedBandwidthCombinationSet-r10 ::= BIT STRING (SIZE (1..maxBandwidthCombSet-r10))

BandParameters-r10 ::= SEQUENCE {
  bandEUTRA-r10     FreqBandIndicator,
  bandParametersUL-r10    BandParametersUL-r10     OPTIONAL,
  bandParametersDL-r10    BandParametersDL-r10     OPTIONAL
}

BandParameters-v1090 ::= SEQUENCE {
  bandEUTRA-v1090     FreqBandIndicator-v9e0     OPTIONAL,
  ...          
}

BandParameters-v1010 ::= SEQUENCE {
  bandParametersDL-v1010  SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF CA-MIMO-ParametersDL-v1010
}

BandParameters-v1130 ::= SEQUENCE {
  supportedCSI-Proc-r11  ENUMERATED (n1, n3, n4)
}

BandParameters-r11 ::= SEQUENCE {
  bandEUTRA-r11     FreqBandIndicator-r11,
  bandParametersUL-r11    BandParametersUL-r11     OPTIONAL,
  bandParametersDL-r11    BandParametersDL-r11     OPTIONAL,
  supportedCSI-Proc-r11  ENUMERATED (n1, n3, n4)    OPTIONAL
}

BandParameters-v1270 ::= SEQUENCE {
  bandParametersDL-v1270  SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF CA-MIMO-ParametersDL-v1270
}

BandParameters-r13 ::= SEQUENCE {
  bandEUTRA-r13     FreqBandIndicator-r11,
  bandParametersUL-r13    BandParametersUL-r13     OPTIONAL,
BandParameters-v1320 ::= SEQUENCE {
  bandParametersDL-v1320 MIMO-ParametersPerBoBC-r13
}

BandParameters-v1380 ::= SEQUENCE {
  txAntennaSwitchDL-r13 INTEGER (1..32) OPTIONAL,
  txAntennaSwitchUL-r13 INTEGER (1..32) OPTIONAL
}

BandParameters-v1430 ::= SEQUENCE {
  bandParametersDL-v1430 MIMO-ParametersPerBoBC-v1430 OPTIONAL,
  ul-256QAM-r14 ENUMERATED {supported} OPTIONAL,
  ul-256QAM-perCC-InfoList-r14 SEQUENCE (SIZE (2..maxServCell-r13)) OF UL-256QAM-perCC-Info-r14 OPTIONAL,
  retuningTimeInfoBandList-r14 SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF RetuningTimeInfo-r14 OPTIONAL
}

BandParameters-v1450 ::= SEQUENCE {
  must-CapabilityPerBand-r14 MUST-Parameters-r14 OPTIONAL
}

BandParameters-v1470 ::= SEQUENCE {
  bandParametersDL-v1470 MIMO-ParametersPerBoBC-v1470 OPTIONAL
}

BandParameters-v1530 ::= SEQUENCE {
  ue-TxAntennaSelection-SRS-1T4R-r15 ENUMERATED {supported} OPTIONAL,
  ue-TxAntennaSelection-SRS-2T4R-2Pairs-r15 ENUMERATED {supported} OPTIONAL,
  ue-TxAntennaSelection-SRS-2T4R-3Pairs-r15 ENUMERATED {supported} OPTIONAL,
  dl-1024QAM-r15 ENUMERATED {supported} OPTIONAL,
  qcl-TypeC-Operation-r15 ENUMERATED {supported} OPTIONAL,
  qcl-CRI-BasedCSI-Reporting-r15 ENUMERATED {supported} OPTIONAL,
  stti-SPT-BandParameters-r15 STTI-SPT-BandParameters-r15 OPTIONAL
}

V2X-BandParameters-r14 ::= SEQUENCE {
  v2x-FreqBandEUTRA-r14 FreqBandIndicator-r11,
  bandParametersTxSL-r14 BandParametersTxSL-r14 OPTIONAL,
  bandParametersRxSL-r14 BandParametersRxSL-r14 OPTIONAL
}

V2X-BandParameters-v1530 ::= SEQUENCE {
  v2x-EnhancedHighReception-r15 ENUMERATED {supported} OPTIONAL
}

BandParametersTxSL-r14 ::= SEQUENCE {
  v2x-BandwidthClassTxSL-r14 V2X-BandwidthClassSL-r14,
  v2x-eNB-Scheduled-r14 ENUMERATED {supported} OPTIONAL,
  v2x-HighPower-r14 ENUMERATED {supported} OPTIONAL
}

BandParametersRxSL-r14 ::= SEQUENCE {
  v2x-BandwidthClassRxSL-r14 V2X-BandwidthClassSL-r14,
  v2x-HighReception-r14 ENUMERATED {supported} OPTIONAL
}

V2X-BandwidthClassSL-r14 ::= SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF V2X-BandwidthClass-r14

UL-256QAM-perCC-Info-r14 ::= SEQUENCE {
  ul-256QAM-perCC-r14 ENUMERATED {supported} OPTIONAL
}

FeatureSetDL-r15 ::= SEQUENCE {
  mimo-CA-ParametersPerBoBC-r15 MIMO-CA-ParametersPerBoBC-r15 OPTIONAL,
  featureSetPerCC-ListDL-r15 SEQUENCE (SIZE (1..maxServCell-r13)) OF FeatureSetDLPerCC-Id-r15
}

FeatureSetDLPerCC-r15 ::= SEQUENCE {
  fourLayerTM3-TM4-r15 ENUMERATED {supported} OPTIONAL,
  supportedMIMO-CapabilityDL-r15 MIMO-CapabilityDL-r10 OPTIONAL,
  supportedCSI-Proc-r15 ENUMERATED {n1, n3, n4} OPTIONAL
}
FeatureSetUL-r15 ::= SEQUENCE {
  featureSetPerCC-ListUL-r15  SEQUENCE (SIZE(1..maxServCell-r13)) OF FeatureSetUL-PerCC-Id-r15
}

FeatureSetUL-PerCC-r15 ::= SEQUENCE {
  supportedMIMO-CapabilityUL-r15  MIMO-CapabilityUL-r10  OPTIONAL,
  ul-256QAM-r15  ENUMERATED {supported}  OPTIONAL
}

FeatureSetDL-PerCC-Id-r15 ::= INTEGER (0..maxPerCC-FeatureSets-r15)
FeatureSetUL-PerCC-Id-r15 ::= INTEGER (0..maxPerCC-FeatureSets-r15)

BandParametersUL-r10 ::= SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF CA-MIMO-ParametersUL-r10

BandParametersUL-r13 ::= CA-MIMO-ParametersUL-r10

CA-MIMO-ParametersUL-r10 ::= SEQUENCE {
  ca-BandwidthClassUL-r10  CA-BandwidthClass-r10,
  supportedMIMO-CapabilityUL-r10  MIMO-CapabilityUL-r10  OPTIONAL
}

CA-MIMO-ParametersUL-r15 ::= SEQUENCE {
  supportedMIMO-CapabilityUL-r15  MIMO-CapabilityUL-r10  OPTIONAL
}

BandParametersDL-r10 ::= SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF CA-MIMO-ParametersDL-r10

BandParametersDL-r13 ::= CA-MIMO-ParametersDL-r13

CA-MIMO-ParametersDL-r10 ::= SEQUENCE {
  ca-BandwidthClassDL-r10  CA-BandwidthClass-r10,
  supportedMIMO-CapabilityDL-r10  MIMO-CapabilityDL-r10  OPTIONAL
}

CA-MIMO-ParametersVL-v10i0 ::= SEQUENCE {
  fourLayerTM3-TM4-r10  ENUMERATED {supported}  OPTIONAL
}

CA-MIMO-ParametersVL-v1270 ::= SEQUENCE {
  intraBandContiguousCC-InfoList-r12  SEQUENCE (SIZE (1..maxServCell-r10)) OF IntraBandContiguousCC-Info-r12
}

CA-MIMO-ParametersDL-v13 ::= SEQUENCE {
  ca-BandwidthClassDL-r13  CA-BandwidthClass-r10,
  supportedMIMO-CapabilityDL-r13  MIMO-CapabilityDL-r10  OPTIONAL,
  fourLayerTM3-TM4-r13  ENUMERATED {supported}  OPTIONAL
}

CA-MIMO-ParametersDL-v15 ::= SEQUENCE {
  supportedMIMO-CapabilityDL-r15  MIMO-CapabilityDL-r10  OPTIONAL,
  fourLayerTM3-TM4-r15  ENUMERATED {supported}  OPTIONAL,
}

IntraBandContiguousCC-Info-r12 ::= SEQUENCE {
  fourLayerTM3-TM4-perCC-r12  ENUMERATED {supported}  OPTIONAL,
  supportedMIMO-CapabilityDL-r12  MIMO-CapabilityDL-r10  OPTIONAL,
  supportedCSI-Proc-r12  ENUMERATED {n1, n3, n4}  OPTIONAL
}

ca-BandwidthClass-r10 ::= ENUMERATED {a, b, c, d, e, f, ...}

V2X-BandwidthClass-r14 ::= ENUMERATED {a, b, c, d, e, f, ..., cl-v1530}

MIMO-CapabilityUL-r10 ::= ENUMERATED {twoLayers, fourLayers}

MIMO-CapabilityDL-r10 ::= ENUMERATED {twoLayers, fourLayers, eightLayers}

MUST-Parameters-r14 ::= SEQUENCE {
  must-TM234-UpTo2Tx-r14  ENUMERATED {supported}  OPTIONAL,
  must-TM89-UpToOneInterferingLayer-r14  ENUMERATED {supported}  OPTIONAL,
  must-TM10-UpToOneInterferingLayer-r14  ENUMERATED {supported}  OPTIONAL,
  must-TM89-UpToThreeInterferingLayers-r14  ENUMERATED {supported}  OPTIONAL,
must-TM10-UpToThreeInterferingLayers-r14 ENUMERATED {supported} OPTIONAL

SupportedBandListEUTRA ::= SEQUENCE {SIZE (1..maxBands)} OF SupportedBandEUTRA

SupportedBandListEUTRA-v9e0 ::= SEQUENCE {SIZE (1..maxBands)} OF SupportedBandEUTRA-v9e0

SupportedBandListEUTRA-v1250 ::= SEQUENCE {SIZE (1..maxBands)} OF SupportedBandEUTRA-v1250

SupportedBandListEUTRA-v1310 ::= SEQUENCE {SIZE (1..maxBands)} OF SupportedBandEUTRA-v1310

SupportedBandListEUTRA-v1320 ::= SEQUENCE {SIZE (1..maxBands)} OF SupportedBandEUTRA-v1320

SupportedBandEUTRA ::= SEQUENCE {
    bandEUTRA FreqBandIndicator,
    halfDuplex BOOLEAN
}

SupportedBandEUTRA-v9e0 ::= SEQUENCE {
    bandEUTRA-v9e0 FreqBandIndicator-v9e0 OPTIONAL
}

SupportedBandEUTRA-v1250 ::= SEQUENCE {
    dl-256QAM-r12 ENUMERATED {supported} OPTIONAL,
    ul-64QAM-r12 ENUMERATED {supported} OPTIONAL
}

SupportedBandEUTRA-v1310 ::= SEQUENCE {
    ue-PowerClass-5-r13 ENUMERATED {supported} OPTIONAL
}

SupportedBandEUTRA-v1320 ::= SEQUENCE {
    intraFreq-CE-NeedForGaps-r13 ENUMERATED {supported} OPTIONAL,
    ue-PowerClass-N-r13 ENUMERATED {class1, class2, class4} OPTIONAL
}

MeasParameters ::= SEQUENCE {
    bandListEUTRA BandListEUTRA
}

MeasParameters-v1020 ::= SEQUENCE {
    bandCombinationListEUTRA-r10 BandCombinationListEUTRA-r10
}

MeasParameters-v1130 ::= SEQUENCE {
    rsrqMeasWideband-r11 ENUMERATED {supported} OPTIONAL
}

MeasParameters-v11a0 ::= SEQUENCE {
    benefitsFromInterruption-r11 ENUMERATED {true} OPTIONAL
}

MeasParameters-v1250 ::= SEQUENCE {
    timerT312-r12 ENUMERATED {supported} OPTIONAL,
    alternativeTimeToTrigger-r12 ENUMERATED {supported} OPTIONAL,
    incMonEUTRA-r12 ENUMERATED {supported} OPTIONAL,
    incMonUTRA-r12 ENUMERATED {supported} OPTIONAL,
    extendedMaxMeasId-r12 ENUMERATED {supported} OPTIONAL,
    extendedRSRQ-LowerRange-r12 ENUMERATED {supported} OPTIONAL,
    rsrQ-OnAllSymbols-r12 ENUMERATED {supported} OPTIONAL,
    crs-DiscoverySignalsMeas-r12 ENUMERATED {supported} OPTIONAL,
    csi-RS-DiscoverySignalsMeas-r12 ENUMERATED {supported} OPTIONAL
}

MeasParameters-v1310 ::= SEQUENCE {
    rs-SINR-Meas-r13 ENUMERATED {supported} OPTIONAL,
    whiteCellList-r13 ENUMERATED {supported} OPTIONAL,
    extendedMaxObjectId-r13 ENUMERATED {supported} OPTIONAL,
    ul-PDCP-Delay-r13 ENUMERATED {supported} OPTIONAL,
    extendedFreqPriorities-r13 ENUMERATED {supported} OPTIONAL,
    multiBandInfoReport-r13 ENUMERATED {supported} OPTIONAL,
    rssi-AndChannelOccupancyReporting-r13 ENUMERATED {supported} OPTIONAL
}

MeasParameters-v1430 ::= SEQUENCE {
    ceMeasurements-r14 ENUMERATED {supported} OPTIONAL,
    ncsg-r14 ENUMERATED {supported} OPTIONAL,
    shortMeasurementGap-r14 ENUMERATED {supported} OPTIONAL,
    perServingCellMeasurementGap-r14 ENUMERATED {supported} OPTIONAL,
nonUniformGap-r14 ENUMERATED {supported} OPTIONAL
}

MeasParameters-v1520 ::= SEQUENCE {
  measGapPatterns-v1520 BIT STRING (SIZE (8)) OPTIONAL
}

MeasParameters-v1530 ::= SEQUENCE {
  qoe-MTSI-MeasReport-r15 ENUMERATED {supported} OPTIONAL,
  ca-IdleModeMeasurements-r15 ENUMERATED {supported} OPTIONAL,
  ca-IdleModeValidityArea-r15 ENUMERATED {supported} OPTIONAL,
  qoe-MTSI-MeasReport-r15 ENUMERATED {supported} OPTIONAL,
  heightMeas-r15 ENUMERATED {supported} OPTIONAL,
  multipleCellsMeasExtension-r15 ENUMERATED {supported} OPTIONAL
}

MeasParameters-v1520 ::= SEQUENCE {
  measGapPatterns-v1520 BIT STRING (SIZE (8)) OPTIONAL
}

MeasParameters-v1530 ::= SEQUENCE {
  qoe-MTSI-MeasReport-r15 ENUMERATED {supported} OPTIONAL,
  ca-IdleModeMeasurements-r15 ENUMERATED {supported} OPTIONAL,
  ca-IdleModeValidityArea-r15 ENUMERATED {supported} OPTIONAL,
  heightMeas-r15 ENUMERATED {supported} OPTIONAL,
  multipleCellsMeasExtension-r15 ENUMERATED {supported} OPTIONAL
}

BandListEUTRA ::= SEQUENCE (SIZE (1..maxBands)) OF BandInfoEUTRA
BandCombinationListEUTRA-r10 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandInfoEUTRA
BandInfoEUTRA ::= SEQUENCE {
  interFreqBandList InterFreqBandList OPTIONAL,
  interRAT-BandList InterRAT-BandList OPTIONAL
}

InterFreqBandList ::= SEQUENCE (SIZE (1..maxBands)) OF InterFreqBandInfo
InterFreqBandInfo ::= SEQUENCE {
  interFreqNeedForGaps BOOLEAN
}

InterRAT-BandList ::= SEQUENCE (SIZE (1..maxBands)) OF InterRAT-BandInfo
InterRAT-BandInfo ::= SEQUENCE {
  interRAT-NeedForGaps BOOLEAN
}

IRAT-ParametersNR-r15 ::= SEQUENCE {
  en-DC-r15 ENUMERATED {supported} OPTIONAL,
  eventB2-r15 ENUMERATED {supported} OPTIONAL,
  supportedBandListNR-r15 SupportedBandListNR-r15 OPTIONAL
}

IRAT-ParametersUTRA-FDD ::= SEQUENCE {

PDCP-ParametersNR-r15 ::= SEQUENCE {
  rohc-Profiles-r15 ROHC-ProfileSupportList-r15,
  rohc-ContextMaxSessions-r15 ENUMERATED {
    cs2, cs4, cs8, cs12, cs16, cs24, cs32,
    cs48, cs64, cs128, cs256, cs512, cs1024,
    cs16384, spare2, spare1} DEFAULT cs16,
  rohc-ProfilesUL-Only-r15 ENUMERATED {supported} OPTIONAL,
  outOfOrderDelivery-r15 ENUMERATED {supported} OPTIONAL,
  sn-SizeLo-r15 ENUMERATED {supported} OPTIONAL,
  ims-VoiceOverNR-PDCP-MCG-Bearer-r15 ENUMERATED {supported} OPTIONAL,
  ims-VoiceOverNR-PDCP-SCG-Bearer-r15 ENUMERATED {supported} OPTIONAL
}

ROHC-ProfileSupportList-r15 ::= SEQUENCE {
  profile0x0001-r15 BOOLEAN,
  profile0x0002-r15 BOOLEAN,
  profile0x0003-r15 BOOLEAN,
  profile0x0004-r15 BOOLEAN,
  profile0x0006-r15 BOOLEAN,
  profile0x101-r15 BOOLEAN,
  profile0x102-r15 BOOLEAN,
  profile0x103-r15 BOOLEAN,
  profile0x104-r15 BOOLEAN
}

SupportedBandListNR-r15 ::= SEQUENCE (SIZE (1..maxBandsNR-r15)) OF SupportedBandNR-r15
SupportedBandNR-r15 ::= SEQUENCE {
  bandNR-r15 FreqBandIndicatorNR-r15
}

IRAT-ParametersUTRA-FDD ::= SEQUENCE {


supportedBandListUTRA-FDD ::= SupportedBandListUTRA-FDD

IRAT-ParametersUTRA-v920 ::= SEQUENCE {
    e-RedirectionUTRA-r9 ENUMERATED {supported}
}

IRAT-ParametersUTRA-v9c0 ::= SEQUENCE {
    voiceOverPS-HS-UTRA-FDD-r9 ENUMERATED {supported} OPTIONAL,
    voiceOverPS-HS-UTRA-TDD128-r9 ENUMERATED {supported} OPTIONAL,
    srvcc-FromUTRA-FDD-ToUTRA-FDD-r9 ENUMERATED {supported} OPTIONAL,
    srvcc-FromUTRA-FDD-ToGERAN-r9 ENUMERATED {supported} OPTIONAL,
    srvcc-FromUTRA-TDD128-ToUTRA-TDD128-r9 ENUMERATED {supported} OPTIONAL,
    srvcc-FromUTRA-TDD128-ToGERAN-r9 ENUMERATED {supported} OPTIONAL
}

IRAT-ParametersUTRA-v9h0 ::= SEQUENCE {
    mfb1-UTRA-r9 ENUMERATED {supported}
}

SupportedBandListUTRA-FDD ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-FDD

SupportedBandUTRA-FDD ::= ENUMERATED {
    bandI, bandII, bandIII, bandIV, bandV, bandVI, bandVII, bandVIII, bandIX, bandXI, bandX, bandXII, bandXIII, bandXIV, bandXV, bandXVI, ...
}

SupportedBandListUTRA-TDD128 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD128

SupportedBandUTRA-TDD128 ::= ENUMERATED {
    a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, ...
}

SupportedBandListUTRA-TDD384 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD384

SupportedBandUTRA-TDD384 ::= ENUMERATED {
    a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, ...
}

SupportedBandListUTRA-TDD768 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-TDD768

SupportedBandUTRA-TDD768 ::= ENUMERATED {
    a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, ...
}

IRAT-ParametersUTRA-TDD-v1020 ::= SEQUENCE {
    e-RedirectionUTRA-TDD-r10 ENUMERATED {supported}
}

IRAT-ParametersGERAN ::= SEQUENCE {
    supportedBandListGERAN SupportedBandListGERAN,
    interRAT-P5-HO-ToGERAN BOOLEAN
}

IRAT-ParametersGERAN-v920 ::= SEQUENCE {
    dtm-r9 ENUMERATED {supported} OPTIONAL,
    e-RedirectionGERAN-r9 ENUMERATED {supported} OPTIONAL
}

SupportedBandListGERAN ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandGERAN

SupportedBandGERAN ::= ENUMERATED {...
IRAT-ParametersCDMA2000-HRPD ::= SEQUENCE {
  supportedBandListHRPD   SupportedBandListHRPD,
  tx-ConfigHRPD      ENUMERATED {single, dual},
  rx-ConfigHRPD      ENUMERATED {single, dual}
}

SupportedBandListHRPD ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

IRAT-ParametersCDMA2000-1XRTT ::= SEQUENCE {
  supportedBandList1XRTT   SupportedBandList1XRTT,
  tx-Config1XRTT      ENUMERATED {single, dual},
  rx-Config1XRTT      ENUMERATED {single, dual}
}

IRAT-ParametersCDMA2000-1XRTT-v920 ::= SEQUENCE {
  e-CSFB-1XRTT-r9          ENUMERATED {supported},
  e-CSFB-ConcPS-Mobil1XRTT-r9 ENUMERATED {supported}   OPTIONAL
}

IRAT-ParametersCDMA2000-1XRTT-v1020 ::= SEQUENCE {
  e-CSFB-dual-1XRTT-r10 ENUMERATED {supported}
}

IRAT-ParametersCDMA2000-v1130 ::= SEQUENCE {
  cdma2000-NW-Sharing-r11 ENUMERATED {supported}  OPTIONAL
}

IRAT-ParametersWLAN-r13 ::= SEQUENCE {
  supportedBandListWLAN-r13 SEQUENCE (SIZE (1..maxWLAN-Bands-r13)) OF WLAN-BandIndicator-r13
}

CSG-ProximityIndicationParameters-r9 ::= SEQUENCE {
  intraFreqProximityIndication-r9 ENUMERATED {supported}   OPTIONAL,
  interFreqProximityIndication-r9 ENUMERATED {supported}   OPTIONAL,
  utran-ProximityIndication-r9  ENUMERATED {supported}   OPTIONAL
}

NeighCellSI-AcquisitionParameters-r9 ::= SEQUENCE {
  intraFreqSI-AcquisitionForHO-r9 ENUMERATED {supported}   OPTIONAL,
  interFreqSI-AcquisitionForHO-r9 ENUMERATED {supported}   OPTIONAL,
  utran-SI-AcquisitionForHO-r9  ENUMERATED {supported}   OPTIONAL
}

NeighCellSI-AcquisitionParameters-v1530 ::= SEQUENCE {
  reportCGI-NR-EN-DC-r15 ENUMERATED {supported}   OPTIONAL,
  reportCGI-NR-NoEN-DC-r15 ENUMERATED {supported}   OPTIONAL
}

SON-Parameters-r9 ::= SEQUENCE {
  rach-Report-r9      ENUMERATED {supported}   OPTIONAL
}

UE-BasedNetwPerfMeasParameters-r10 ::= SEQUENCE {
  loggedMeasurementsIdle-r10 ENUMERATED {supported}   OPTIONAL,
  standaloneGNSS-Location-r10 ENUMERATED {supported}   OPTIONAL
}

UE-BasedNetwPerfMeasParameters-v1250 ::= SEQUENCE {
  loggedMBSFNMeasurements-r12 ENUMERATED {supported}
}

UE-BasedNetwPerfMeasParameters-v1430 ::= SEQUENCE {
  locationReport-r14 ENUMERATED {supported}   OPTIONAL
}

UE-BasedNetwPerfMeasParameters-v1530 ::= SEQUENCE {
  loggedMeasBT-r15 ENUMERATED {supported}   OPTIONAL,
  loggedMeasWLAN-r15 ENUMERATED {supported}   OPTIONAL,
  immMeasBT-r15 ENUMERATED {supported}   OPTIONAL,
  immMeasWLAN-r15 ENUMERATED {supported}   OPTIONAL
}
OTDOA-PositioningCapabilities-r10 ::= SEQUENCE {
  otdoa-UE-Assisted-r10     ENUMERATED {supported},
  interFreqRSTD-Measurement-r10 ENUMERATED {supported} OPTIONAL
}

Other-Parameters-r11 ::= SEQUENCE {
  inDeviceCoexInd-r11 ENUMERATED {supported} OPTIONAL,
  powerPrefInd-r11 ENUMERATED {supported} OPTIONAL,
  ue-Rx-TxTimeDiffMeasurements-r11 ENUMERATED {supported} OPTIONAL
}

Other-Parameters-v11d0 ::= SEQUENCE {
  inDeviceCoexInd-UL-CA-r11 ENUMERATED {supported} OPTIONAL
}

Other-Parameters-v1360 ::= SEQUENCE {
  inDeviceCoexInd-HardwareSharingInd-r13 ENUMERATED {supported} OPTIONAL
}

Other-Parameters-v1430 ::= SEQUENCE {
  bwPrefInd-r14 ENUMERATED {supported} OPTIONAL,
  rlm-ReportSupport-r14 ENUMERATED {supported} OPTIONAL
}

OtherParameters-v1450 ::= SEQUENCE {
  overheatingInd-r14 ENUMERATED {supported} OPTIONAL
}

Other-Parameters-v1460 ::= SEQUENCE {
  nonCSG-SI-Reporting-r14 ENUMERATED {supported} OPTIONAL
}

Other-Parameters-v1530 ::= SEQUENCE {
  assistInfoBitForLC-r15 ENUMERATED {supported} OPTIONAL,
  timeReferenceProvision-r15 ENUMERATED {supported} OPTIONAL,
  flightPathPlan-r15 ENUMERATED {supported} OPTIONAL
}

MBMS-Parameters-r11 ::= SEQUENCE {
  mbms-SCell-r11 ENUMERATED {supported} OPTIONAL,
  mbms-NonServingCell-r11 ENUMERATED {supported} OPTIONAL
}

MBMS-Parameters-v1250 ::= SEQUENCE {
  mbms-AsyncDC-r12 ENUMERATED {supported} OPTIONAL
}

MBMS-Parameters-v1430 ::= SEQUENCE {
  fembmsDedicatedCell-r14 ENUMERATED {supported} OPTIONAL,
  fembmsMixedCell-r14 ENUMERATED {supported} OPTIONAL,
  subcarrierSpacingMBMS-khz7dot5-r14 ENUMERATED {supported} OPTIONAL,
  subcarrierSpacingMBMS-khz1dot25-r14 ENUMERATED {supported} OPTIONAL
}

MBMS-Parameters-v1470 ::= SEQUENCE {
  mbms-MaxBW-r14 CHOICE {
    implicitValue NULL,
    explicitValue INTEGER(2..20)
  },
  mbms-ScalingFactor1dot25-r14 ENUMERATED {n3, n6, n9, n12} OPTIONAL,
  mbms-ScalingFactor7dot5-r14 ENUMERATED {n1, n2, n3, n4} OPTIONAL
}

FeMBMS-Unicast-Parameters-r14 ::= SEQUENCE {
  unicast-fembmsMixedSCell-r14 ENUMERATED {supported} OPTIONAL,
  emptyUnicastRegion-r14 ENUMERATED {supported} OPTIONAL
}

SCPTM-Parameters-r13 ::= SEQUENCE {
  scptm-ParallelReception-r13 ENUMERATED {supported} OPTIONAL,
  scptm-SCell-r13 ENUMERATED {supported} OPTIONAL,
  scptm-NonServingCell-r13 ENUMERATED {supported} OPTIONAL,
  scptm-AsyncDC-r13 ENUMERATED {supported} OPTIONAL
}

CE-Parameters-r13 ::= SEQUENCE {
  ce-ModeA-r13 ENUMERATED {supported} OPTIONAL,
| CE-Parameters-v1320 ::= SEQUENCE { |
| intraFreqA3-CE-ModeA-r13 ENUMERATED [supported] OPTIONAL, |
| intraFreqA3-CE-ModeB-r13 ENUMERATED [supported] OPTIONAL, |
| intraFreqHO-CE-ModeA-r13 ENUMERATED [supported] OPTIONAL, |
| intraFreqHO-CE-ModeB-r13 ENUMERATED [supported] OPTIONAL } |
| CE-Parameters-v1350 ::= SEQUENCE { |
| unicastFrequencyHopping-r13 ENUMERATED [supported] OPTIONAL } |
| CE-Parameters-v1370 ::= SEQUENCE { |
| tm9-CE-ModeA-r13 ENUMERATED [supported] OPTIONAL, |
| tm9-CE-ModeB-r13 ENUMERATED [supported] OPTIONAL } |
| CE-Parameters-v1380 ::= SEQUENCE { |
| tm6-CE-ModeA-r13 ENUMERATED [supported] OPTIONAL } |
| CE-Parameters-v1430 ::= SEQUENCE { |
| ce-SwitchWithoutHO-r14 ENUMERATED [supported] OPTIONAL } |
| LAA-Parameters-r13 ::= SEQUENCE { |
| crossCarrierSchedulingLAA-DL-r13 ENUMERATED [supported] OPTIONAL, |
| csi-RS-DRS-RRM-MeasurementsLAA-r13 ENUMERATED [supported] OPTIONAL, |
| downlinkLAA-r13 ENUMERATED [supported] OPTIONAL, |
| endingDwPTS-r13 ENUMERATED [supported] OPTIONAL, |
| secondSlotStartingPosition-r13 ENUMERATED [supported] OPTIONAL, |
| tm9-LAA-r13 ENUMERATED [supported] OPTIONAL, |
| tm10-LAA-r13 ENUMERATED [supported] OPTIONAL } |
| LAA-Parameters-v1430 ::= SEQUENCE { |
| crossCarrierSchedulingLAA-UL-r14 ENUMERATED [supported] OPTIONAL, |
| uplinkLAA-r14 ENUMERATED [supported] OPTIONAL, |
| twoStepSchedulingTimingInfo-r14 ENUMERATED {nPlus1, nPlus2, nPlus3} OPTIONAL, |
| uss-BlindDecodingAdjustment-r14 ENUMERATED [supported] OPTIONAL, |
| uss-BlindDecodingReduction-r14 ENUMERATED [supported] OPTIONAL, |
| outOfSequenceGrantHandling-r14 ENUMERATED [supported] OPTIONAL } |
| LAA-Parameters-v1530 ::= SEQUENCE { |
| aul-r15 ENUMERATED [supported] OPTIONAL, |
| laa-PUSCH-Mode1-r15 ENUMERATED [supported] OPTIONAL, |
| laa-PUSCH-Mode2-r15 ENUMERATED [supported] OPTIONAL, |
| laa-PUSCH-Mode3-r15 ENUMERATED [supported] OPTIONAL } |
| WLAN-IW-Parameters-r12 ::= SEQUENCE { |
| wlan-IW-RAN-Rules-r12 ENUMERATED [supported] OPTIONAL, |
| wlan-IW-ANDSF-Policies-r12 ENUMERATED [supported] OPTIONAL } |
| LWA-Parameters-r13 ::= SEQUENCE { |
| lwa-r13 ENUMERATED [supported] OPTIONAL, |
| lwa-SlitBearer-r13 ENUMERATED [supported] OPTIONAL, |
| wlan-MAC-Address-r13 OCTET STRING (SIZE (6)) OPTIONAL, |
| lwa-BufferSize-r13 ENUMERATED [supported] OPTIONAL } |
| LWA-Parameters-v1430 ::= SEQUENCE { |
| lwa-HO-WithoutWT-Change-r14 ENUMERATED [supported] OPTIONAL, |
| lwa-UL-r14 ENUMERATED [supported] OPTIONAL, |
| wlan-PeriodicMeas-r14 ENUMERATED [supported] OPTIONAL, |
| wlan-ReportAnyWLAN-r14 ENUMERATED [supported] OPTIONAL, |
| wlan-SupportedDataRate-r14 INTEGER (1..2048) OPTIONAL } |
| LWA-Parameters-v1440 ::= SEQUENCE { |
| lwa-RLC-UM-r14 ENUMERATED [supported] OPTIONAL } |
| WLAN-IW-Parameters-v1310 ::= SEQUENCE { |
rclwi-r13
   ENUMERATED {supported} OPTIONAL
}

LWIP-Parameters-r13 ::= SEQUENCE {
   lwip-r13     ENUMERATED {supported}    OPTIONAL
}

LWIP-Parameters-v1430 ::= SEQUENCE {
   lwip-Aggregation-DL-r14    ENUMERATED {supported}    OPTIONAL,
   lwip-Aggregation-UL-r14    ENUMERATED {supported}    OPTIONAL
}

NAICS-Capability-List-r12 ::= SEQUENCE (SIZE (1..maxNAICS-Entries-r12)) OF NAICS-Capability-Entry-r12

NAICS-Capability-Entry-r12 ::= SEQUENCE {
   numberOfNAICS-CapableCC-r12    INTEGER(1..5),
   numberOfAggregatedPRB-r12     ENUMERATED {
      n50, n75, n100, n125, n150, n175,
      n200, n225, n250, n275, n300, n350,
      n400, n450, n500, spare),
   ...
}

SL-Parameters-r12 ::= SEQUENCE {
   commSimultaneousTx-r12     ENUMERATED {supported}  OPTIONAL,
   commSupportedBands-r12     FreqBandIndicatorListEUTRA-r12 OPTIONAL,
   discSupportedBands-r12     SupportedBandInfoList-r12 OPTIONAL,
   discScheduledResourceAlloc-r12    ENUMERATED {supported}  OPTIONAL,
   disc-UE-SelectedResourceAlloc-r12    ENUMERATED {supported}  OPTIONAL,
   discSupportedProc-r12     ENUMERATED {supported}  OPTIONAL
}

SL-Parameters-v1310 ::= SEQUENCE {
   discSysInfoReporting-r13     ENUMERATED {supported}  OPTIONAL,
   commMultipleTx-r13         ENUMERATED {supported}  OPTIONAL,
   discInterFreqTx-r13       ENUMERATED {supported}  OPTIONAL,
   discPeriodicSLSS-r13      ENUMERATED {supported}  OPTIONAL
}

SL-Parameters-v1430 ::= SEQUENCE {
   zoneBasedPoolSelection-r14    ENUMERATED {supported}  OPTIONAL,
   ue-AutonomousWithFullSensing-r14  ENUMERATED {supported}  OPTIONAL,
   s1-CongestionControl-r14     ENUMERATED {supported}  OPTIONAL,
   v2x-TxWithShortResvInterval-r14 ENUMERATED {supported}  OPTIONAL,
   v2x-numberTxRxTiming-r14    INTEGER(1..16)      OPTIONAL,
   slss-TxRx-r14               ENUMERATED {supported}  OPTIONAL,
   v2x-SupportedBandCombinationList-r14 V2X-SupportedBandCombination-r14 OPTIONAL
}

SL-Parameters-v1530 ::= SEQUENCE {
   slss-SupportedTxFreq-r15     ENUMERATED {single, multiple} OPTIONAL,
   s1-64QAM-Tx-r15              ENUMERATED {supported}  OPTIONAL,
   s1-Transdiveristy-r15       ENUMERATED {supported}  OPTIONAL,
   ue-CategorySL-r15           ENUMERATED {supported}  OPTIONAL,
   v2x-SupportedBandCombinationList-v1530 V2X-SupportedBandCombination-v1530 OPTIONAL
}

UE-CategorySL-r15 ::= SEQUENCE {
   ue-CategorySL-C-TX-r15     INTEGER(1..5),
   ue-CategorySL-C-RX-r15    INTEGER(1..4)
}

V2X-SupportedBandCombination-r14 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF V2X-BandCombinationParameters-r14

V2X-SupportedBandCombination-v1530 ::= SEQUENCE (SIZE (1..maxBandComb-r13)) OF V2X-BandCombinationParameters-v1530

V2X-BandCombinationParameters-r14 ::= SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF V2X-BandParameters-r14

V2X-BandCombinationParameters-v1530 ::= SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF V2X-BandParameters-v1530
SupportedBandInfoList-r12 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandInfo-r12

SupportedBandInfo-r12 ::= SEQUENCE {
support-r12        ENUMERATED {supported} OPTIONAL
}

FreqBandIndicatorListEUTRA-r12 ::= SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicator-r11

MMTEL-Parameters-r14 ::= SEQUENCE {
delayBudgetReporting-r14    ENUMERATED {supported} OPTIONAL,
pusch-Enhancements-r14      ENUMERATED {supported} OPTIONAL,
recommendedBitRate-r14      ENUMERATED {supported} OPTIONAL,
recommendedBitRateQuery-r14 ENUMERATED {supported} OPTIONAL
}

RetuningTimeInfo-r14 ::= SEQUENCE {
  retuningInfo    SEQUENCE {
    rf-RetuningTimeDL-r14   ENUMERATED {n0, n0dot5, n1, n1dot5, n2, n2dot5, n3, n3dot5, n4, n4dot5, n5, n5dot5, n6, n6dot5, n7, spare1} OPTIONAL,
    rf-RetuningTimeUL-r14   ENUMERATED {n0, n0dot5, n1, n1dot5, n2, n2dot5, n3, n3dot5, n4, n4dot5, n5, n5dot5, n6, n6dot5, n7, spare1} OPTIONAL
  }
}

HighSpeedEnhParameters-r14 ::= SEQUENCE {
  measurementEnhancements-r14 ENUMERATED {supported} OPTIONAL,
demodulationEnhancements-r14 ENUMERATED {supported} OPTIONAL,
prach-Enhancements-r14       ENUMERATED {supported} OPTIONAL
}

-- ASN1STOP
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>accessStratumRelease</td>
<td>Set to rel14 in this version of the specification. NOTE 7.</td>
</tr>
<tr>
<td>additionalRx-Tx-PerformanceReq</td>
<td>-</td>
</tr>
<tr>
<td>alternativeTBS-Indices</td>
<td>-</td>
</tr>
<tr>
<td>alternativeTBS-Index</td>
<td>No</td>
</tr>
<tr>
<td>alternativeTimeToTrigger</td>
<td>No</td>
</tr>
<tr>
<td>altMCS-Table</td>
<td>-</td>
</tr>
<tr>
<td>aperiodicCSI-Reporting</td>
<td>No</td>
</tr>
<tr>
<td>aperiodicCSI-ReportingSTTI</td>
<td>No</td>
</tr>
<tr>
<td>assistInfoBitForLC</td>
<td>-</td>
</tr>
<tr>
<td>aul</td>
<td>-</td>
</tr>
<tr>
<td>bandCombinationListEUTRA</td>
<td>-</td>
</tr>
<tr>
<td>BandCombinationParameters-v1090, BandCombinationParameters-v10i0, BandCombinationParameters-v1270</td>
<td>-</td>
</tr>
<tr>
<td>BandCombinationParameters-v1130</td>
<td>-</td>
</tr>
<tr>
<td>BandCombinationParameters-r10</td>
<td>-</td>
</tr>
<tr>
<td>bandEUTRA</td>
<td>-</td>
</tr>
<tr>
<td>bandListEUTRA</td>
<td>-</td>
</tr>
<tr>
<td>bandParameterList-v1380</td>
<td>-</td>
</tr>
<tr>
<td>bandParametersUL, bandParametersDL</td>
<td>-</td>
</tr>
<tr>
<td>beamformed (in MIMO-CA-ParametersPerBoBCPerTM)</td>
<td>-</td>
</tr>
<tr>
<td>beamformed (in MIMO-UE-ParametersPerTM)</td>
<td>TBD</td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>benefitsFromInterruption</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE power consumption would benefit from being allowed to cause interruptions to serving cells when performing measurements of deactivated SCell carriers for <code>measCycleSCell</code> of less than 640ms, as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td><strong>bwPrefInd</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports maximum PDSCH/PUSCH bandwidth preference indication.</td>
<td></td>
</tr>
<tr>
<td><strong>ca-BandwidthClass</strong></td>
<td></td>
</tr>
<tr>
<td>The CA bandwidth class supported by the UE as defined in TS 36.101 [42, Table 5.6A-1]. The UE explicitly includes all the supported CA bandwidth class combinations in the band combination signalling. Support for one CA bandwidth class does not implicitly indicate support for another CA bandwidth class.</td>
<td></td>
</tr>
<tr>
<td><strong>ca-idleModeMeasurements</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether UE supports reporting measurements performed during RRC_IDLE.</td>
<td></td>
</tr>
<tr>
<td><strong>ca-idleModeValidityArea</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether UE supports validity area for IDLE measurements during RRC_IDLE.</td>
<td></td>
</tr>
<tr>
<td><strong>cch-InterfMitigation-RefRecTypeA, cch-InterfMitigation-RefRecTypeB, cch-InterfMitigation-MaxNumCCs</strong></td>
<td></td>
</tr>
<tr>
<td>The field <code>cch-InterfMitigation-RefRecTypeA</code> defines whether the UE supports Type A downlink control channel interference mitigation (CCH-IM) receiver &quot;LMMSE-IRC + CRS-IC&quot; for PDCCH/PCFICH/PHICH/EPDCCH receive processing (Enhanced downlink control channel performance requirements Type A in the TS 36.101 [6]). The field <code>cch-InterfMitigation-RefRecTypeB</code> defines whether the UE supports Type B downlink CCH-IM receiver &quot;E-LMMSE-IRC + CRS-IC&quot; for PDCCH/PCFICH/PHICH receive processing in synchronous networks (Enhanced downlink control channel performance requirements Type B in the TS 36.101 [6]). The UE supporting the capability defined by <code>cch-InterfMitigation-RefRecTypeB-r13</code> shall also support the capability defined by <code>cch-InterfMitigation-RefRecTypeA-r13</code>.</td>
<td></td>
</tr>
<tr>
<td>If the UE sets one or more of the fields <code>cch-InterfMitigation-RefRecTypeA</code> and <code>cch-InterfMitigation-RefRecTypeB</code> to &quot;supported&quot;, the UE shall include the parameter <code>cch-InterfMitigation-MaxNumCCs</code> to indicate that the UE supports CCH-IM on at least one arbitrary downlink CC for up to <code>cch-InterfMitigation-MaxNumCCs</code> downlink CC CA configuration. The UE shall not include the parameter <code>cch-InterfMitigation-MaxNumCCs</code> if neither <code>cch-InterfMitigation-RefRecTypeA</code> nor <code>cch-InterfMitigation-RefRecTypeB</code> is present. The UE may not perform CCH-IM on more than 1 DL CCs. For example, the UE sets &quot;cch-InterfMitigation-MaxNumCCs = 3&quot; to indicate that UE supports CCH-IM on at least one DL CC for supported non-CA, 2DL CA and 3DL CA configurations. For CA scenarios, the CCH-IM is guaranteed to be supported on at least one arbitrary component carrier.</td>
<td></td>
</tr>
<tr>
<td><strong>cdma2000-NW-Sharing</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports network sharing for CDMA2000.</td>
<td></td>
</tr>
<tr>
<td><strong>ce-ClosedLoopTxAntennaSelection</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports UL closed-loop Tx antenna selection in CE mode A, as specified in TS 36.212 [22].</td>
<td></td>
</tr>
<tr>
<td><strong>ce-CQI-AlternativeTable</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports alternative CQI table in CE mode A. See TS 36.213 [22].</td>
<td></td>
</tr>
<tr>
<td><strong>ce-CRS-IntfMitig</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether UE supports CRS interference mitigation, i.e., value <code>supported</code> indicates UE does not rely on the CRS outside certain PRBs and subframes as defined in TS 36.133 [16], subclauses 3.6.1.2 and 3.6.1.3, and TS 36.213 [23] when operating in coverage enhancement mode.</td>
<td></td>
</tr>
<tr>
<td><strong>ce-HARQ-AckBundling</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports HARQ-ACK bundling in half duplex FDD in CE mode A, as specified in TS 36.212 [22] and TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>ce-ModeA, ce-ModeB</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports operation in CE mode A and/or B, as specified in TS 36.211 [21] and TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>ceMeasurements</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports intra-frequency RSRQ measurements and inter-frequency RSRP and RSRQ measurements in RRC_CONNECTED, as specified in TS 36.133 [16] and TS 36.304 [4].</td>
<td></td>
</tr>
<tr>
<td><strong>ce-PDSCH-64QAM</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports 64QAM for non-repeated unicast PDSCH in CE mode A.</td>
<td></td>
</tr>
<tr>
<td>UE-EUTRA-Capability field descriptions</td>
<td>FDD/ TDD diff</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>ce-PDSCH-FlexibleStartPRB-CE-ModeA, ce-PDSCH-FlexibleStartPRB-CE-ModeB, ce-PUSCH-FlexibleStartPRB-CE-ModeA, ce-PUSCH-FlexibleStartPRB-CE-ModeB</td>
<td>-</td>
</tr>
<tr>
<td>This field indicates whether UE supports flexible starting PRB for PDSCH/PUSCH when operating in coverage enhancement mode A/B, as specified in TS 36.211 [21] and TS 36.213 [22].</td>
<td></td>
</tr>
<tr>
<td>ce-PDSCH-PUSCH-Enhancement</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports new numbers of repetitions for PUSCH and modulation restrictions for PDSCH/PUSCH in CE mode A as specified in TS 36.212 [22] and TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td>ce-PDSCH-PUSCH-MaxBandwidth</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates the maximum supported PDSCH/PUSCH channel bandwidth in CE mode A and B, as specified in TS 36.212 [22] and TS 36.213 [23]. Value bw5 corresponds to 5 MHz and value bw20 corresponds to 20 MHz. If the field is absent the maximum PDSCH/PUSCH channel bandwidth in CE mode A and B is 1.4 MHz. If the setting of this parameter is 20 MHz, the max supported PUSCH channel bandwidth in CE mode A is 5 MHz. The maximum PUSCH channel bandwidth in CE mode B is 1.4 MHz regardless of the setting of this parameter. Parameter: transmission bandwidth configuration, see TS 36.101 [42, table 5.6-1].</td>
<td></td>
</tr>
<tr>
<td>ce-PDSCH-TenProcesses</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports 10 DL HARQ processes in FDD in CE mode A.</td>
<td></td>
</tr>
<tr>
<td>ce-PUCCH-Enhancement</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports repetition levels 64 and 128 for PUCCH in CE Mode B, as specified in TS 36.211 [21] and in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td>ce-PUSCH-SubPRB-Allocation</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports sub-PRB resource allocation for PUSCH in CE mode A or B, as specified in TS 36.211 [21], TS 36.212 [22] and TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td>ce-RetuningSymbols</td>
<td>No</td>
</tr>
<tr>
<td>Indicates the number of retuning symbols in CE mode A and B as specified in TS 36.211 [21]. Value n0 corresponds to 0 retuning symbols and value n1 corresponds to 1 retuning symbol. If the field is absent the number of retuning symbols in CE mode A and B is 2.</td>
<td></td>
</tr>
<tr>
<td>ce-SchedulingEnhancement</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports dynamic HARQ-ACK delay for HD-FDD in CE mode A as specified in TS 36.212 [22] and TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td>ce-SRS-Enhancement</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports SRS coverage enhancement in TDD with support of SRS combs 2 and 4 as specified in TS 36.213 [23]. This field can be included only if ce-SRS-EnhancementWithoutComb4 is not included.</td>
<td></td>
</tr>
<tr>
<td>ce-SRS-EnhancementWithoutComb4</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SRS coverage enhancement in TDD with support of SRS comb 2 but without support of SRS comb 4 as specified in TS 36.213 [23]. This field can be included only if ce-SRS-Enhancement is not included.</td>
<td></td>
</tr>
<tr>
<td>ce-SwitchWithoutHO</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports switching between normal mode and enhanced coverage mode without handover.</td>
<td></td>
</tr>
<tr>
<td>ce-UL-HARQ-ACK-Feedback</td>
<td>-</td>
</tr>
<tr>
<td>This field indicates whether UE supports uplink HARQ ACK feedback when operating in coverage enhancement. as specified in TS36.213 [22].</td>
<td></td>
</tr>
<tr>
<td>channelMeasRestriction</td>
<td>TBD</td>
</tr>
<tr>
<td>Indicates for a particular transmission mode whether the UE supports channel measurement restriction.</td>
<td></td>
</tr>
<tr>
<td>codebook-HARQ-ACK</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports determining HARQ ACK codebook size based on the DAI-based solution and/or the number of configured CCs. The first bit is set to “1” if the UE supports the DAI-based codebook size determination. The second bit is set to “1” if the UE supports the codebook determination based on the number of configured CCs.</td>
<td></td>
</tr>
<tr>
<td>commMultipleTx</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports multiple transmissions of sidelink communication to different destinations in one SC period. If commMultipleTx-r13 is set to supported then the UE support 8 transmitting sidelink processes.</td>
<td></td>
</tr>
<tr>
<td>commSimultaneousTx</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports simultaneous transmission of EUTRA and sidelink communication (on different carriers) in all bands for which the UE indicated sidelink support in a band combination (using commSupportedBandsPerBC).</td>
<td></td>
</tr>
<tr>
<td>UE-EUTRA-Capability field descriptions</td>
<td>FDD/ TDD diff</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>commSupportedBands</strong></td>
<td>Indicates the bands on which the UE supports sidelink communication, by an independent list of bands i.e. separate from the list of supported E-UTRA band, as indicated in supportedBandListEUTRA.</td>
</tr>
<tr>
<td><strong>commSupportedBandsPerBC</strong></td>
<td>Indicates, for a particular band combination, the bands on which the UE supports simultaneous reception of EUTRA and sidelink communication. If the UE indicates support simultaneous transmission (using commSimultaneousTx), it also indicates, for a particular band combination, the bands on which the UE supports simultaneous transmission of EUTRA and sidelink communication. The first bit refers to the first band included in commSupportedBands, with value 1 indicating sidelink is supported.</td>
</tr>
<tr>
<td><strong>configN (in MIMO-CA-ParametersPerBoBCPerTM)</strong></td>
<td>If signalled, the field indicates for a particular transmission mode whether the UE supports non-precoded EBF/ FD-MIMO (class A) related configuration N for the concerned band combination.</td>
</tr>
<tr>
<td><strong>configN (in MIMO-UE-ParametersPerTM)</strong></td>
<td>Indicates for a particular transmission mode whether the UE supports non-precoded EBF/ FD-MIMO (class A) related configuration N for band combinations for which the concerned capabilities are not signalled.</td>
</tr>
<tr>
<td><strong>crossCarrierScheduling</strong></td>
<td>Indicates whether the UE supports cross carrier scheduling beyond 5 DL CCs. No</td>
</tr>
<tr>
<td><strong>crossCarrierScheduling-BSC</strong></td>
<td>Indicates whether the UE supports cross carrier scheduling beyond 5 DL CCs. No</td>
</tr>
<tr>
<td><strong>crossCarrierSchedulingLAA-DL</strong></td>
<td>Indicates whether the UE supports cross-carrier scheduling from a licensed carrier for LAA cell(s) for downlink. This field can be included only if downlinkLAA is included.</td>
</tr>
<tr>
<td><strong>crossCarrierSchedulingLAA-UL</strong></td>
<td>Indicates whether the UE supports cross-carrier scheduling from a licensed carrier for LAA cell(s) for uplink. This field can be included only if uplinkLAA is included.</td>
</tr>
<tr>
<td><strong>crs-DiscoverySignalsMeas</strong></td>
<td>Indicates whether the UE supports CRS based discovery signals measurement, and PDSCH/EPDCCH RE mapping with zero power CSI-RS configured for discovery signals. FFS</td>
</tr>
<tr>
<td><strong>crs-InterfHandl</strong></td>
<td>Indicates whether the UE supports CRS interference handling. Yes</td>
</tr>
<tr>
<td><strong>crs-InterfMitigationTM10</strong></td>
<td>Indicates whether the UE supports CRS interference mitigation in transmission mode 10. The UE supporting the crs-InterfMitigationTM10 capability shall also support the crs-InterfHandl capability.</td>
</tr>
<tr>
<td><strong>crs-InterfMitigationTM1toTM9</strong></td>
<td>Indicates whether the UE supports CRS interference mitigation (IM) while operating in the following transmission modes (TM): TM 1, TM 2, ..., TM 8 and TM 9. The UE shall not include the field if it does not support CRS IM in TMs 1-9. If the field is present, the UE supports CRS-IM on at least one arbitrary downlink CC for up to crs-InterfMitigationTM1toTM9-r13 downlink CC CA configuration. The UE signals crs-InterfMitigationTM1toTM9-r13 value to indicate the maximum crs-InterfMitigationTM1toTM9-r13 downlink CC CA configuration where UE may apply CRS IM. For example, the UE sets &quot;crs-InterfMitigationTM1toTM9-r13 = 3&quot; to indicate that the UE supports CRS-IM on at least one DL CC for supported non-CA, 2DL CA and 3DL CA configurations. The UE supporting the crs-InterfMitigationTM1toTM9-r13 capability shall also support the crs-InterfHandl-r11 capability.</td>
</tr>
<tr>
<td><strong>crs-IntfMitig</strong></td>
<td>Indicates whether the UE supports CRS interference mitigation as specified in TS 36.133 [16], subclause 3.6.1.1.</td>
</tr>
<tr>
<td><strong>crs-LessDwPTS</strong></td>
<td>Indicates whether the UE supports TDD special subframe configuration 10 without CRS transmission on the 5th symbol of DwPTS, i.e. ssp10-CRS-LessDwPTS, as specified in TS 36.211 [17].</td>
</tr>
<tr>
<td><strong>csi-ReportingAdvanced, csi-ReportingAdvancedMaxPorts</strong></td>
<td>Indicates the maximum number of CSI-RS ports supported by the UE for advanced CSI reporting. n8 corresponds to 8 CSI-RS ports, n12 corresponds to 12 CSI-RS ports and so on. The UE shall not include both csi-ReportingAdvanced and csi-ReportingAdvancedMaxPorts for a band of a band combination. The field csi-ReportingAdvanced is included to indicate the UE supports advanced CSI reporting with 32 ports in the band of the band combination.</td>
</tr>
<tr>
<td><strong>csi-RS-DiscoverySignalsMeas</strong></td>
<td>Indicates whether the UE supports CSI-RS based discovery signals measurement. If this field is included, the UE shall also include crs-DiscoverySignalsMeas. FFS</td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>csi-RS-DRS-RRM-MeasurementsLAA</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports performing RRM measurements on LAA cell(s) based on CSI-RS-based DRS. This field can be included only if downlinkLAA is included.</td>
<td>-</td>
</tr>
<tr>
<td>csi-RS-EnhancementsTDD</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates for a particular transmission mode whether the UE supports CSI-RS enhancements applicable for TDD.</td>
<td>Yes</td>
</tr>
<tr>
<td>csi-SubframeSet</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports REL-12 DL CSI subframe set configuration, REL-12 DL CSI subframe set dependent CSI measurement/feedback, configuration of up to 2 CSI-IM resources for a CSI process with no more than 4 CSI-IM resources for all CSI processes of one frequency if the UE supports tm10, configuration of two ZP-CSI-RS for tm1 to tm9, PDSCH RE mapping with two ZP-CSI-RS configurations, and EPDCCH RE mapping with two ZP-CSI-RS configurations if the UE supports EPDCCH. This field is only applicable for UEs supporting TDD.</td>
<td>-</td>
</tr>
<tr>
<td>dataInactMon</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports the data inactivity monitoring as specified in TS 36.321 [6].</td>
<td>-</td>
</tr>
<tr>
<td>dc-Support</td>
<td>-</td>
</tr>
<tr>
<td>Including this field indicates that the UE supports synchronous DC and power control mode 1. Including this field for a band combination entry comprising of single band entry indicates that the UE supports intra-band contiguous DC. Including this field for a band combination entry comprising of two or more band entries, indicates that the UE supports DC for these bands and that the serving cells corresponding to a band entry shall belong to one cell group (i.e. MCG or SCG). Including field asynchronous indicates that the UE supports asynchronous DC and power control mode 2. Including this field for a TDD/FDD band combination indicates that the UE supports TDD/FDD DC for this band combination.</td>
<td>-</td>
</tr>
<tr>
<td>delayBudgetReporting</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports delay budget reporting.</td>
<td>No</td>
</tr>
<tr>
<td>demodulationEnhancements</td>
<td>-</td>
</tr>
<tr>
<td>This field defines whether the UE supports advanced receiver in SFN scenario as specified in TS 36.101 [42].</td>
<td>-</td>
</tr>
<tr>
<td>deviceType</td>
<td>-</td>
</tr>
<tr>
<td>UE may set the value to &quot;noBenFromBatConsumpOpt&quot; when it does not foresee to particularly benefit from NW-based battery consumption optimisation. Absence of this value means that the device does benefit from NW-based battery consumption optimisation.</td>
<td>-</td>
</tr>
<tr>
<td>diffFallbackCombReport</td>
<td>-</td>
</tr>
<tr>
<td>Indicates that the UE supports reporting of UE radio access capabilities for the CA band combinations asked by the eNB as well as, if any, reporting of different UE radio access capabilities for their fallback band combination as specified in TS 36.331 [5]. The UE does not report fallback combinations if their UE radio access capabilities are the same as the ones for the CA band combination asked by the eNB.</td>
<td>-</td>
</tr>
<tr>
<td>differentFallbackSupported</td>
<td>-</td>
</tr>
<tr>
<td>Indicates that the UE supports different capabilities for at least one fallback case of this band combination.</td>
<td>-</td>
</tr>
<tr>
<td>directSCellActivation</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports having an SCell configured in activated SCell state.</td>
<td>-</td>
</tr>
<tr>
<td>directSCellHibernation</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports having an SCell configured in dormant SCell state.</td>
<td>-</td>
</tr>
<tr>
<td>discInterFreqTx</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE support sidelink discovery announcements either a) on the primary frequency only or b) on other frequencies also, regardless of the UE configuration (e.g. CA, DC). The UE may set discInterFreqTx to supported when having a separate transmitter or if it can request sidelink discovery transmission gaps.</td>
<td>-</td>
</tr>
<tr>
<td>discoverySignalsInDeactSCell</td>
<td>FFS</td>
</tr>
<tr>
<td>Indicates whether the UE supports the behaviour on DL signals and physical channels when SCell is deactivated and discovery signals measurement is configured as specified in TS 36.211 [21, 6.11A]. This field is included only if UE supports carrier aggregation and includes cns-DiscoverySignalsMeas.</td>
<td>FFS</td>
</tr>
<tr>
<td>discPeriodicSLSS</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports periodic (i.e. not just one time before sidelink discovery announcement) Sidelink Synchronization Signal (SLSS) transmission and reception for sidelink discovery.</td>
<td>-</td>
</tr>
<tr>
<td>discScheduledResourceAlloc</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmission of discovery announcements based on network scheduled resource allocation.</td>
<td>-</td>
</tr>
<tr>
<td>UE-EUTRA-Capability field descriptions</td>
<td>FDD/ TDD diff</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>disc-UE-SelectedResourceAlloc</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmission of discovery announcements based on UE autonomous resource selection.</td>
<td></td>
</tr>
<tr>
<td><strong>disc-SLSS</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports Sidelink Synchronization Signal (SLSS) transmission and reception for sidelink discovery.</td>
<td></td>
</tr>
<tr>
<td><strong>discSupportedBands</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates the bands on which the UE supports sidelink discovery. One entry corresponding to each supported E-UTRA band, listed in the same order as in supportedBandListEUTRA.</td>
<td></td>
</tr>
<tr>
<td><strong>discSupportedProc</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates the number of processes supported by the UE for sidelink discovery.</td>
<td></td>
</tr>
<tr>
<td><strong>discSysInfoReporting</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports reporting of system information for inter-frequency/PLMN sidelink discovery.</td>
<td></td>
</tr>
<tr>
<td><strong>dl-256QAM</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 256QAM in DL on the band.</td>
<td></td>
</tr>
<tr>
<td><strong>dl-1024QAM</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 1024QAM in DL on the band.</td>
<td></td>
</tr>
<tr>
<td><strong>dl-1024QAM-Slot</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 1024QAM in DL on the band for slot TTI operation.</td>
<td></td>
</tr>
<tr>
<td><strong>dl-1024QAM-SubslotTA-1</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 1024QAM in DL on the band for subslot TTI operation with TA set 1.</td>
<td></td>
</tr>
<tr>
<td><strong>dl-1024QAM-SubslotTA-2</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 1024QAM in DL on the band for subslot TTI operation with TA set 2.</td>
<td></td>
</tr>
<tr>
<td><strong>dmrs-BasedSPDCCH-MBSFN</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports sDCI monitoring in DMRS based SPDCCH for MBSFN subframe. If UE supports this, it also provides the corresponding DMRS based SPDCCH capability in min-Proc-TimelineSubslot.</td>
<td></td>
</tr>
<tr>
<td><strong>dmrs-BasedSPDCCH-nonMBSFN</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports sDCI monitoring in DMRS based SPDCCH for non-MBSFN subframe. If UE supports this, it also provides the corresponding DMRS based SPDCCH capability in min-Proc-TimelineSubslot.</td>
<td></td>
</tr>
<tr>
<td><strong>dmrs-Enhancements (in MIMO-CA-ParametersPerBoBCPerTM)</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>dmrs-Enhancements (in MIMO-UE-ParametersPerTM)</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>dmrs-LessUpPTS</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports not to transmit DMRS for PUSCH in UpPTS.</td>
<td></td>
</tr>
<tr>
<td><strong>dmrs-PositionPattern</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports uplink DMRS position pattern 'D D D' in subslot #5 with application of the 1/6 as the TBS scaling factor.</td>
<td></td>
</tr>
<tr>
<td><strong>dmrs-RepetitionSubslotPDSCH</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports back-to-back 3/4-layer DMRS reception in two consecutive subslots across subframe boundary for subslot-PDSCH.</td>
<td></td>
</tr>
<tr>
<td><strong>dmrs-SharingSubslotPDSCH</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports DMRS sharing in two consecutive subslots across subframe boundary for subslot-PDSCH.</td>
<td></td>
</tr>
<tr>
<td><strong>dormantSCellState</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports Dormant SCell state (i.e. SCell state with CQI and RRM measurement reporting but no PDCCH monitoring).</td>
<td></td>
</tr>
<tr>
<td><strong>downlinkLAA</strong></td>
<td>-</td>
</tr>
<tr>
<td>Presence of the field indicates that the UE supports downlink LAA operation including identification of downlink transmissions on LAA cell(s) for full downlink subframes, decoding of common downlink control signalling on LAA cell(s), CSI feedback for LAA cell(s), RRM measurements on LAA cell(s) based on CRS-based DRS.</td>
<td></td>
</tr>
<tr>
<td><strong>drb-TypeSCG</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SCG bearer.</td>
<td></td>
</tr>
<tr>
<td><strong>drb-TypeSplit</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports split bearer except for PDCP data transfer in UL.</td>
<td></td>
</tr>
<tr>
<td>field</td>
<td>description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>dtm</td>
<td>Indicates whether the UE supports DTM in GERAN.</td>
</tr>
<tr>
<td>earlyData-UP</td>
<td>Indicates whether the UE supports UP-EDT.</td>
</tr>
<tr>
<td>e-CSFB-1XRTT</td>
<td>Indicates whether the UE supports enhanced CS fallback to CDMA2000 1xRTT or not.</td>
</tr>
<tr>
<td>e-CSFB-ConcPS-Mobi1XRTT</td>
<td>Indicates whether the UE supports concurrent enhanced CS fallback to CDMA2000 1xRTT and PS handover/redirection to CDMA2000 HRPD.</td>
</tr>
<tr>
<td>e-CSFB-dual-1XRTT</td>
<td>Indicates whether the UE supports enhanced CS fallback to CDMA2000 1xRTT for dual Rx/Tx configuration. This bit can only be set to supported if tx-Config1XRTT and rx-Config1XRTT are both set to dual.</td>
</tr>
<tr>
<td>e-HARQ-Pattern-FDD</td>
<td>Indicates whether the UE supports enhanced HARQ pattern for TTI bundling operation for FDD.</td>
</tr>
<tr>
<td>emptyUnicastRegion</td>
<td>Indicates whether the UE supports unicast reception in subframes with empty unicast control region as described in TS 36.213 [23] Section 12. This field can be included only if unicast-fembsMixedSCell and crossCarrierScheduling are included.</td>
</tr>
<tr>
<td>en-DC</td>
<td>Indicates whether the UE supports EN-DC.</td>
</tr>
<tr>
<td>endingDwPTS</td>
<td>Indicates whether the UE supports reception ending with a subframe occupied for a DwPTS-duration as described in TS 36.211 [21] and TS 36.213 [23]. This field can be included only if downlinkLAA is included.</td>
</tr>
<tr>
<td>Enhanced-4TxCodebook</td>
<td>Indicates whether the UE supports enhanced 4Tx codebook.</td>
</tr>
<tr>
<td>en-DC</td>
<td>Indicates whether the UE supports EN-DC.</td>
</tr>
<tr>
<td>epdcch-SPT-differentCells</td>
<td>Indicates whether the UE supports EPDCCH and short processing time on different serving cells.</td>
</tr>
<tr>
<td>epdcch-STTI-differentCells</td>
<td>Indicates whether the UE supports EPDCCH and sTTI on different serving cells.</td>
</tr>
<tr>
<td>e-RedirectionUTRA</td>
<td>Indicates whether the UE supports enhanced redirection to UTRA TDD to multiple carrier frequencies both with and without using related SIB provided by RRCConnectionRelease or not.</td>
</tr>
<tr>
<td>eventB2</td>
<td>Indicates whether the UE supports event B2. A UE supporting NR SA operation shall set this bit to supported.</td>
</tr>
<tr>
<td>extendedFreqPriorities</td>
<td>Indicates whether the UE supports extended E-UTRA frequency priorities indicated by cellReselectionSubPriority field. A UE supporting NR SA operation shall set this bit to supported.</td>
</tr>
<tr>
<td>extendedLCID-Duplication</td>
<td>Indicates whether the UE supports use of extended LCIDs 11-17 for PDCP duplication.</td>
</tr>
<tr>
<td>extendedLongDRX</td>
<td>Indicates whether the UE supports extended long DRX cycle values of 5.12s and 10.24s in RRC_CONNECTED.</td>
</tr>
<tr>
<td>extendedMAC-LengthField</td>
<td>Indicates whether the UE supports the MAC header with L field of size 16 bits as specified in TS 36.321 [6, 6.2.1].</td>
</tr>
<tr>
<td>extendedMaxMeasId</td>
<td>Indicates whether the UE supports extended number of measurement identities as defined by maxMeasId-r12.</td>
</tr>
<tr>
<td>extendedMaxObjectId</td>
<td>Indicates whether the UE supports extended number of measurement object identities as defined by maxObjectId-r13.</td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>extendedNumberOfDRBs</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports up to 15 DRBs. The UE shall support any combination of RLC AM and RLC UM entities for the configured DRBs.</td>
<td></td>
</tr>
<tr>
<td>extendedPollByte</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports extended pollByte values as defined by pollByte-r14.</td>
<td></td>
</tr>
<tr>
<td>extendedRLC-LI-Field</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 15 bit RLC length indicator.</td>
<td></td>
</tr>
<tr>
<td>extendedRLC-SN-SO-Field</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 16 bits of RLC sequence number and segmentation offset.</td>
<td></td>
</tr>
<tr>
<td>extendedRSRQ-LowerRange</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports the extended RSRQ lower value range from -34dB to -19.5dB in measurement configuration and reporting as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td>fdd-HARQ-TimingTDD</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether UE supports FDD HARQ timing for TDD SCell when configured with TDD PCell.</td>
<td></td>
</tr>
<tr>
<td>featureGroupIndicators, featureGroupIndRel9Add, featureGroupIndRel10</td>
<td>Yes</td>
</tr>
<tr>
<td>The definitions of the bits in the bit string are described in Annex B.1 (for featureGroupIndicators and featureGroupIndRel9Add) and in Annex C.1 (for featureGroupIndRel10).</td>
<td></td>
</tr>
<tr>
<td>fembsMixedCell</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception with 15 kHz subcarrier spacings via MBSFN from FemBSM/Unicast mixed cells on a frequency indicated in an MBMSInterestIndication message.</td>
<td></td>
</tr>
<tr>
<td>fembsDedicatedCell</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception with 15 kHz subcarrier spacings via MBSFN from MBMS-dedicated cells on a frequency indicated in an MBMSInterestIndication message.</td>
<td></td>
</tr>
<tr>
<td>flexibleUM-AM-Combinations</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports any combination of RLC UM and RLC AM bearers as long as the total number of bearers is at most 8, regardless of what FGI20 indicates.</td>
<td></td>
</tr>
<tr>
<td>flightPathPlan</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports reporting of flight path plan information.</td>
<td></td>
</tr>
<tr>
<td>fourLayerTM3-TM4</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 4-layer spatial multiplexing for TM3 and TM4.</td>
<td></td>
</tr>
<tr>
<td>fourLayerTM3-TM4-perCC</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 4-layer spatial multiplexing for TM3 and TM4 for the component carrier.</td>
<td></td>
</tr>
<tr>
<td>frameStructureType-SPT</td>
<td>-</td>
</tr>
<tr>
<td>This field indicates the supported FS-type(s) for short processing time. The UE capability is reported per band combination. The reported FS-type(s) apply to the reported maxNumberCCs-SPT-r15 for the given band combination.</td>
<td></td>
</tr>
<tr>
<td>freqBandPriorityAdjustment</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports the prioritization of frequency bands in multiBandInfoList over the band in freqBandIndicator as defined by freqBandIndicatorPriority-r12.</td>
<td></td>
</tr>
<tr>
<td>freqBandRetrieval</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports reception of requestedFrequencyBands.</td>
<td></td>
</tr>
<tr>
<td>halfDuplex</td>
<td>-</td>
</tr>
<tr>
<td>If halfDuplex is set to true, only half duplex operation is supported for the band, otherwise full duplex operation is supported.</td>
<td></td>
</tr>
<tr>
<td>heightMeas</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports the measurement events H1/H2.</td>
<td></td>
</tr>
<tr>
<td>immMeasBT</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports Bluetooth measurements in RRC connected mode.</td>
<td></td>
</tr>
<tr>
<td>immMeasWLAN</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports WLAN measurements in RRC connected mode.</td>
<td></td>
</tr>
<tr>
<td>incMonEUTRA</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports increased number of E-UTRA carrier monitoring in RRC_IDLE and RRC_CONNECTED, as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td>incMonUTRA</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports increased number of UTRA carrier monitoring in RRC_IDLE and RRC_CONNECTED, as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td>inDeviceCoexInd</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports in-device coexistence indication as well as autonomous denial functionality.</td>
<td></td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

#### inDeviceCoexInd-HardwareSharingInd
Indicates whether the UE supports indicating hardware sharing problems when sending the `InDeviceCoexIndication`, as well as omitting the TDM assistance information. A UE that supports hardware sharing indication shall also indicate support of LAA operation.

#### inDeviceCoexInd-UL-CA
Indicates whether the UE supports UL CA related in-device coexistence indication. This field can be included only if `inDeviceCoexInd` is included. The UE supports `inDeviceCoexInd-UL-CA` in the same duplexing modes as it supports `inDeviceCoexInd`.

#### interBandTDD-CA-WithDifferentConfig
Indicates whether the UE supports inter-band TDD carrier aggregation with different UL/DL configuration combinations. The first bit indicates UE supports the configuration combination of SCell DL subframes are a subset of PCell and PSCell by SIB1 configuration and the configuration combination of SCell DL subframes are a superset of PCell and PSCell by SIB1 configuration; the second bit indicates UE supports the configuration combination of SCell DL subframes are neither superset nor subset of PCell and PSCell by SIB1 configuration. This field is included only if UE supports inter-band TDD carrier aggregation.

#### interferenceMeasRestriction
Indicates whether the UE supports interference measurement restriction.

#### interFreqBandList
One entry corresponding to each supported E-UTRA band listed in the same order as in `supportedBandListEUTRA`.

#### interFreqNeedForGaps
Indicates need for measurement gaps when operating on the E-UTRA band given by the entry in `bandListEUTRA` or on the E-UTRA band combination given by the entry in `bandCombinationListEUTRA` and measuring on the E-UTRA band given by the entry in `interFreqBandList`.

#### interFreqProximityIndication
Indicates whether the UE supports proximity indication for inter-frequency E-UTRAN CSG member cells.

#### interFreqRSTD-Measurement
Indicates whether the UE supports inter-frequency RSTD measurements for OTDOA positioning [54].

#### interFreqSI-AcquisitionForHO
Indicates whether the UE supports, upon configuration of `si-RequestForHO` by the network, acquisition and reporting of relevant information using autonomous gaps by reading the SI from a neighbouring inter-frequency cell.

#### interRAT-BandList
One entry corresponding to each supported band of another RAT listed in the same order as in `interRAT-Parameters`. The NR bands reported in `SupportedBandListNR` are excluded from this list.

#### interRAT-NeedForGaps
Indicates need for DL measurement gaps when operating on the E-UTRA band given by the entry in `bandListEUTRA` or on the E-UTRA band combination given by the entry in `bandCombinationListEUTRA` and measuring on the inter-RAT band given by the entry in `interRAT-BandList`.

#### interRAT-ParametersWLAN
Indicates whether the UE supports WLAN measurements configured by `MeasObjectWLAN` with corresponding quantity and report configuration in the supported WLAN bands.

#### interRAT-PS-HO-ToGERAN
Indicates whether the UE supports inter-RAT PS handover to GERAN or not.

#### intraBandContiguousCC-InfoList
Indicates, per serving carrier of which the corresponding bandwidth class includes multiple serving carriers (i.e. bandwidth class B, C, D and so on), the maximum number of supported layers for spatial multiplexing in DL and the maximum number of CSI processes supported. The number of entries is equal to the number of component carriers in the corresponding bandwidth class. The UE shall support the setting indicated in each entry of the list regardless of the order of entries in the list. The UE shall include the field only if it supports 4-layer spatial multiplexing in transmission mode 3/4 for a subset of component carriers in the corresponding bandwidth class, or if the maximum number of supported layers for at least one component carrier is higher than `supportedMIMO-CapabilityDL-r10` in the corresponding bandwidth class, or if the number of CSI processes for at least one component carrier is higher than `supportedCSI-Proc-r11` in the corresponding band. This field may also be included for bandwidth class A but in such a case without including any sub-fields in `IntraBandContiguousCC-Info-r12` (see NOTE 6).
<table>
<thead>
<tr>
<th>UE-EUTRA-Capability field descriptions</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>intraFreqA3-CE-ModeA</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE when operating in CE Mode A supports eventA3 for intra-frequency neighbouring cells.</td>
<td></td>
</tr>
<tr>
<td><strong>intraFreqA3-CE-ModeB</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE when operating in CE Mode B supports eventA3 for intra-frequency neighbouring cells.</td>
<td></td>
</tr>
<tr>
<td><strong>intraFreq-CE-NeedForGaps</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates need for measurement gaps when operating in CE on the E-UTRA band given by the entry in supportedBandListEUTRA.</td>
<td></td>
</tr>
<tr>
<td><strong>intraFreqHO-CE-ModeA</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE when operating in CE Mode A supports intra-frequency handover.</td>
<td></td>
</tr>
<tr>
<td><strong>intraFreqHO-CE-ModeB</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE when operating in CE Mode B supports intra-frequency handover.</td>
<td></td>
</tr>
<tr>
<td><strong>intraFreqProximityIndication</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports proximity indication for intra-frequency E-UTRAN CSG member cells.</td>
<td></td>
</tr>
<tr>
<td><strong>intraFreqSI-AcquisitionForHO</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports, upon configuration of si-RequestForHO by the network, acquisition and reporting of relevant information using autonomous gaps by reading the SI from a neighbouring intra-frequency cell.</td>
<td></td>
</tr>
<tr>
<td><strong>k-Max (in MIMO-CA-ParametersPerBoBCPerTM)</strong></td>
<td>No</td>
</tr>
<tr>
<td>If signalled, the field indicates for a particular transmission mode the maximum number of NZP CSI RS resource configurations supported within a CSI process applicable for the concerned band combination.</td>
<td></td>
</tr>
<tr>
<td><strong>k-Max (in MIMO-UE-ParametersPerTM)</strong></td>
<td>TBD</td>
</tr>
<tr>
<td>Indicates for a particular transmission mode the maximum number of NZP CSI RS resource configurations supported within a CSI process applicable for band combinations for which the concerned capabilities are not signalled.</td>
<td></td>
</tr>
<tr>
<td><strong>laa-PUSCH-Mode1</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports LAA PUSCH mode 1 as defined in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>laa-PUSCH-Mode2</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports LAA PUSCH mode 2 as defined in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>laa-PUSCH-Mode3</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports LAA PUSCH mode 3 as defined in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>locationReport</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports reporting of its geographical location information to eNB.</td>
<td></td>
</tr>
<tr>
<td><strong>loggedMBSFNMeasurements</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports logged measurements for MBSFN. A UE indicating support for logged measurements for MBSFN shall also indicate support for logged measurements in Idle mode.</td>
<td></td>
</tr>
<tr>
<td><strong>loggedMeasBT</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports Bluetooth measurements in RRC idle mode.</td>
<td></td>
</tr>
<tr>
<td><strong>loggedMeasurementsIdle</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports logged measurements in Idle mode.</td>
<td></td>
</tr>
<tr>
<td><strong>loggedMeasWLAN</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports WLAN measurements in RRC idle mode.</td>
<td></td>
</tr>
<tr>
<td><strong>logcialChannelISR-ProhibitTimer</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports the logicalChannelISR-ProhibitTimer as defined in TS 36.321 [6].</td>
<td></td>
</tr>
<tr>
<td><strong>longDRX-Command</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports Long DRX Command MAC Control Element.</td>
<td></td>
</tr>
<tr>
<td><strong>lwa</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports LTE-WLAN Aggregation (LWA). The UE which supports LWA shall also indicate support of interRAT-ParametersWLAN-r13.</td>
<td></td>
</tr>
<tr>
<td><strong>lwa-BufferSize</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports the layer 2 buffer sizes for &quot;with support for split bearers&quot; as defined in Table 4.1-3 and 4.1A-3 of TS 36.306 [5] for LWA.</td>
<td></td>
</tr>
<tr>
<td><strong>lwa-HO-WithoutWT-Change</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports handover where LWA configuration is retained without WT change and using LWA end-marker for PDCP key change indication for LWA operation.</td>
<td></td>
</tr>
<tr>
<td><strong>lwa-RLC-UM</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports RLC UM for LWA bearer.</td>
<td></td>
</tr>
<tr>
<td><strong>lwa-SplitBearer</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports the split LWA bearer (as defined in TS 36.300 [9]).</td>
<td></td>
</tr>
<tr>
<td><strong>UE-EUTRA-Capability field descriptions</strong></td>
<td><strong>FDD/ TDD diff</strong></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td><strong>lwa-UL</strong></td>
<td>Indicates whether the UE supports UL transmission over WLAN for LWA bearer.</td>
</tr>
<tr>
<td><strong>lwip</strong></td>
<td>Indicates whether the UE supports LTE/WLAN Radio Level Integration with IPsec Tunnel (LWIP). The UE which supports LWIP shall also indicate support of interRAT-ParametersWLAN-r13.</td>
</tr>
<tr>
<td><strong>lwip-Aggregation-DL, lwip-Aggregation-UL</strong></td>
<td>Indicates whether the UE supports aggregation of LTE and WLAN over DL/UL LWIP. The UE that indicates support of LWIP aggregation over DL or UL shall also indicate support of lwip.</td>
</tr>
<tr>
<td><strong>makeBeforeBreak</strong></td>
<td>Indicates whether the UE supports intra-frequency Make-Before-Break handover, and whether the UE which indicates parametersWLAN-r13 supports intra-frequency Make-Before-Break SeNB change, as defined in TS 36.300 [9].</td>
</tr>
<tr>
<td><strong>maximumCCsRetrieval</strong></td>
<td>Indicates whether the UE supports reception of requestedMaxCCsDL and requestedMaxCCsUL.</td>
</tr>
<tr>
<td><strong>maxLayersMIMO-Indication</strong></td>
<td>Indicates whether the UE supports the network configuration of maxLayersMIMO. If the UE supports fourLayerTM3-TM4 or intraBandContiguousCC-InfoList, UE supports the configuration of maxLayersMIMO for these two cases regardless of indicating maxLayersMIMO-Indication.</td>
</tr>
<tr>
<td><strong>maxNumberCCs-SPT</strong></td>
<td>Indicates the maximum number of supported CCs for short processing time. The UE capability is reported per band combination. The reported number of carriers applies to all the FS-type(s) frameStructureType-SPT-r15 supported in a given band combination. Absence of the field indicates that 0 number of CCs are supported for short processing time.</td>
</tr>
<tr>
<td><strong>maxNumberDL-CCs, maxNumberUL-CCs</strong></td>
<td>Indicates for each TTI combination &quot;STTI-SupportedCombinations&quot;, the maximum number of supported DL CCs/UL CCs for short TTI. Absence of the field indicates that 0 number of CCs are supported for short TTI.</td>
</tr>
<tr>
<td><strong>maxNumberDecoding</strong></td>
<td>Indicates the maximum number of blind decodes in UE-specific search space per UE in one subframe for CA with more than 5 CCs as defined in TS 36.213 [23] which is supported by the UE. The number of blind decodes supported by the UE is the field value * 32. Only values 5 to 32 can be used in this version of the specification.</td>
</tr>
<tr>
<td><strong>maxNumberROHC-ContextSessions</strong></td>
<td>Set to the maximum number of concurrently active ROHC contexts supported by the UE, excluding context sessions that leave all headers uncompressed. cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on. The network ignores this field if the UE supports none of the ROHC profiles in supportedROHC-Profiles. If the UE indicates both maxNumberROHC-ContextSessions and maxNumberROHC-ContextSessions-r14, same value shall be indicated.</td>
</tr>
<tr>
<td><strong>mbms-MaxBW</strong></td>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception via MRB on a frequency indicated in an MBMSInterestIndication message, where (according to supportedBandCombination) the carriers that are or can be configured as serving cells in the MC and the SC are not synchronized. If this field is included, the UE shall also include mbms-SCell and mbms-NonServingCell. The field indicates that the UE supports the feature for xDD if mbms-SCell and mbms-NonServingCell are supported for xDD.</td>
</tr>
<tr>
<td><strong>mbms-AsyncDC</strong></td>
<td>Indicates whether the UE supports maximum bandwidth (T) for MBMS reception, see TS 36.213 [23, 11.1]. If the value is set to implicitValue, the corresponding value of T is calculated as specified in TS 36.213 [23, 11.1]. If the value is set to explicitValue, the actual value of T = explicitValue * 40 MHz.</td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>mbms-NonServingCell</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception via MRB on a frequency indicated in an MBMSInterestIndication message, where (according to supportedBandCombination and to network synchronization properties) a serving cell may be additionally configured. If this field is included, the UE shall also include the mbms-SCell field.</td>
<td></td>
</tr>
<tr>
<td>mbms-ScalingFactor1dot25, mbms-ScalingFactor7dot5</td>
<td>-</td>
</tr>
<tr>
<td>Indicates parameter $\frac{A_{1.25}}{A_{7.5}}$, i.e., scaling factor for processing one unit of bandwidth corresponding to subcarrier spacing of 1.25 kHz / 7.5 kHz, with respect to one unit of bandwidth corresponding to subcarrier spacing of 15 kHz. See TS 36.213 [23, 11.1]. This field is included only if subcarrierSpacingMBMS-khz1dot25 / subcarrierSpacingMBMS-khz7dot5 is included. This field shall be included if mbms-MaxBW and subcarrierSpacingMBMS-khz1dot25 / subcarrierSpacingMBMS-khz7dot5 are included.</td>
<td></td>
</tr>
<tr>
<td>mbms-SCell</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception via MRB on a frequency indicated in an MBMSInterestIndication message, when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated).</td>
<td></td>
</tr>
<tr>
<td>measurementEnhancements</td>
<td>-</td>
</tr>
<tr>
<td>This field defines whether UE supports measurement enhancements in high speed scenario as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td>measGapPatterns</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE that supports NR supports gap patterns 4 to 11. The first/ leftmost bit covers pattern 4, and so on. Value 1 indicates that the UE supports the concerned gap pattern. See TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td>mfb1-UTRA</td>
<td>-</td>
</tr>
<tr>
<td>It indicates if the UE supports the signalling requirements of multiple radio frequency bands in a UTRA FDD cell, as defined in TS 25.307 [65].</td>
<td></td>
</tr>
<tr>
<td>MIMO-BeamformedCapabilityList</td>
<td>No</td>
</tr>
<tr>
<td>A list of pairs of (k-Max, n-MaxList) values with the n\textsuperscript{th} entry indicating the values that the UE supports for each CSI process in case n CSI processes would be configured.</td>
<td></td>
</tr>
<tr>
<td>MIMO-CapabilityDL</td>
<td>-</td>
</tr>
<tr>
<td>The number of supported layers for spatial multiplexing in DL. The field may be absent for category 0 and category 1 UE in which case the number of supported layers is 1.</td>
<td></td>
</tr>
<tr>
<td>MIMO-CapabilityUL</td>
<td>-</td>
</tr>
<tr>
<td>The number of supported layers for spatial multiplexing in UL. Absence of the field means that the number of supported layers is 1.</td>
<td></td>
</tr>
<tr>
<td>MIMO-CA-ParametersPerBoBC</td>
<td>-</td>
</tr>
<tr>
<td>A set of MIMO parameters provided per band of a band combination. In case a subfield is absent, the concerned capabilities are the same as indicated at the per UE level (i.e. by MIMO-UE-ParametersPerTM).</td>
<td></td>
</tr>
<tr>
<td>mimo-CBSR-AdvancedCSI</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports CBSR for advanced CSI reporting with and without amplitude restriction as defined in TS 36.213 [23], section 7.2.</td>
<td></td>
</tr>
<tr>
<td>min-Proc-TimelineSubslot</td>
<td>-</td>
</tr>
<tr>
<td>Minimum processing timeline for subslot operation. The minimum processing timeline can belong to one of two sets of associated processing and maximum TA operation. The sets supported can be different for 1os CRS-based SPDCCH, 2os CRS-based SPDCCH and DMRS-based SPDCCH. The sequence applies to: 1. 1os CRS based SPDCCH 2. 2os CRS based SPDCCH 3. DMRS based SPDCCH</td>
<td></td>
</tr>
<tr>
<td>modifiedMPR-Behavior</td>
<td>-</td>
</tr>
<tr>
<td>Field encoded as a bit map, where at least one bit N is set to “1” if UE supports modified MPR/A-MPR behaviour N, see TS 36.101 [42]. All remaining bits of the field are set to “0”. The leading / leftmost bit (bit 0) corresponds to modified MPR/A-MPR behaviour 0, the next bit corresponds to modified MPR/A-MPR behaviour 1 and so on. Absence of this field means that UE does not support any modified MPR/A-MPR behaviour.</td>
<td></td>
</tr>
<tr>
<td>multiACK CSI-reporting</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports multi-cell HARQ ACK and periodic CSI reporting and SR on PUCCH format 3.</td>
<td></td>
</tr>
<tr>
<td>multiBandInfoReport</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports the acquisition and reporting of multi band information for reportCGI.</td>
<td></td>
</tr>
<tr>
<td>multiClusterPUSCH-WithinCC</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports the mechanisms defined for cells broadcasting NS-PmaxList.</td>
<td></td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>multipleCellsMeasExtension</td>
<td>-</td>
</tr>
<tr>
<td>indicates whether UE supports numberOfTriggeringCells in the report configuration.</td>
<td></td>
</tr>
<tr>
<td>multipleTimingAdvance</td>
<td>-</td>
</tr>
<tr>
<td>indicates whether the UE supports multiple timing advances for each band combination listed in supportedBandCombination. If the band combination comprised of more than one band entry (i.e., inter-band or intra-band non-contiguous band combination), the field indicates that the same or different timing advances on different band entries are supported. If the band combination comprised of one band entry (i.e., intra-band contiguous band combination), the field indicates that the same or different timing advances across component carriers of the band entry are supported.</td>
<td></td>
</tr>
<tr>
<td>multipleUplinkSPS</td>
<td>-</td>
</tr>
<tr>
<td>indicates whether the UE supports multiple uplink SPS and reporting SPS assistance information. A UE indicating multipleUplinkSPS shall also support V2X communication via Uu, as defined in TS 36.300 [9].</td>
<td></td>
</tr>
<tr>
<td>must-CapabilityPerBand</td>
<td>-</td>
</tr>
<tr>
<td>indicates that UE supports MUST as specified in 36.212 [22 5.3.3.1] on the band in the band combination.</td>
<td></td>
</tr>
<tr>
<td>must-TM234-UpTo2Tx-r14</td>
<td>-</td>
</tr>
<tr>
<td>indicates that the UE supports MUST operation for TM2/3/4 using up to 2Tx.</td>
<td></td>
</tr>
<tr>
<td>must-TM89-UpToOneInterferingLayer-r14</td>
<td>-</td>
</tr>
<tr>
<td>indicates that the UE supports MUST operation for TM8/9 with assistance information for up to 1 interfering layer.</td>
<td></td>
</tr>
<tr>
<td>must-TM89-UpToThreeInterferingLayers-r14</td>
<td>-</td>
</tr>
<tr>
<td>indicates that the UE supports MUST operation for TM8/9 with assistance information for up to 3 interfering layers.</td>
<td></td>
</tr>
<tr>
<td>must-TM10-UpToOneInterferingLayer-r14</td>
<td>-</td>
</tr>
<tr>
<td>indicates that the UE supports MUST operation for TM10 with assistance information for up to 1 interfering layer.</td>
<td></td>
</tr>
<tr>
<td>must-TM10-UpToThreeInterferingLayers-r14</td>
<td>-</td>
</tr>
<tr>
<td>indicates that the UE supports MUST operation for TM10 with assistance information for up to 3 interfering layers.</td>
<td></td>
</tr>
<tr>
<td>naics-Capability-List</td>
<td>No</td>
</tr>
<tr>
<td>indicates that UE supports NAICS, i.e. receiving assistance information from serving cell and using it to cancel or suppress interference of neighbouring cell(s) for at least one band combination. If not present, UE does not support NAICS for any band combination. The field numberOfNAICS-CapableCC indicates the number of component carriers where the NAICS processing is supported and the field numberOfAggregatedPRB indicates the maximum aggregated bandwidth across these of component carriers (expressed as a number of PRBs) with the restriction that NAICS is only supported over the full carrier bandwidth. The UE shall indicate the combination of {numberOfNAICS-CapableCC, numberOfNAICS-CapableCC} for every supported numberOfNAICS-CapableCC, e.g. if a UE supports (x) CC, (y) PRBs and (x-n) CC, (y-m) PRBs where (n \geq 1) and (m \geq 0), the UE shall indicate both.</td>
<td></td>
</tr>
<tr>
<td>- For numberOfNAICS-CapableCC = 1, UE signals one value for numberOfAggregatedPRB from the range (50, 75, 100);</td>
<td></td>
</tr>
<tr>
<td>- For numberOfNAICS-CapableCC = 2, UE signals one value for numberOfAggregatedPRB from the range (50, 75, 100, 125, 150, 175, 200);</td>
<td></td>
</tr>
<tr>
<td>- For numberOfNAICS-CapableCC = 3, UE signals one value for numberOfAggregatedPRB from the range (50, 75, 100, 125, 150, 175, 200, 225, 250, 275, 300);</td>
<td></td>
</tr>
<tr>
<td>- For numberOfNAICS-CapableCC = 4, UE signals one value for numberOfAggregatedPRB from the range (50, 100, 150, 200, 250, 300, 350, 400);</td>
<td></td>
</tr>
<tr>
<td>- For numberOfNAICS-CapableCC = 5, UE signals one value for numberOfAggregatedPRB from the range (50, 100, 150, 200, 250, 300, 350, 400, 450, 500).</td>
<td></td>
</tr>
<tr>
<td>ncsg</td>
<td>No</td>
</tr>
<tr>
<td>indicates whether the UE supports measurement NCSG Pattern Id 0, 1, 2 and 3, as specified in TS 36.133 [16]. If this field is included and the UE supports asynchronous DC, the UE shall support NCSG Pattern Id 0, 1, 2 and 3. If this field is included but the UE does not support asynchronous DC, only NCSG Pattern Id 0 and 1 shall be supported</td>
<td></td>
</tr>
<tr>
<td><strong>UE-EUTRA-Capability field descriptions</strong></td>
<td><strong>FDD/TDD diff</strong></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td><strong>n-MaxList (in MIMO-UE-ParametersPerTM)</strong></td>
<td>TBD</td>
</tr>
<tr>
<td>Indicates for a particular transmission mode the maximum number of NZP CSI RS ports supported within a CSI process applicable for band combinations for which the concerned capabilities are not signalled. For $k$-Max values exceeding 1, the UE shall include the field and signal $k$-Max minus 1 bits. The first bit indicates $n$-Max2, with value 0 indicating 8 and value 1 indicating 16. The second bit indicates $n$-Max3, with value 0 indicating 8 and value 1 indicating 16. The third bit indicates $n$-Max4, with value 0 indicating 8 and value 1 indicating 32. The fourth bit indicates $n$-Max5, with value 0 indicating 16 and value 1 indicating 32. The fifth bit indicates $n$-Max6, with value 0 indicating 16 and value 1 indicating 32. The sixth bit indicates $n$-Max7, with value 0 indicating 16 and value 1 indicating 32. The seventh bit indicates $n$-Max8, with value 0 indicating 16 and value 1 indicating 64.</td>
<td></td>
</tr>
<tr>
<td><strong>n-MaxList (in MIMO-CA-ParametersPerBoBCPerTM)</strong></td>
<td>No</td>
</tr>
<tr>
<td>If signalled, the field indicates for a particular transmission mode the maximum number of NZP CSI RS ports supported within a CSI process applicable for band the concerned combination. Further details are as indicated for n-MaxList in MIMO-UE-ParametersPerTM.</td>
<td></td>
</tr>
<tr>
<td><strong>NonContiguousUL-RA-WithinCC-List</strong></td>
<td>No</td>
</tr>
<tr>
<td>One entry corresponding to each supported E-UTRA band listed in the same order as in supportedBandListEUTRA.</td>
<td></td>
</tr>
<tr>
<td><strong>nonPrecoded (in MIMO-UE-ParametersPerTM)</strong></td>
<td>TBD</td>
</tr>
<tr>
<td>Indicates for a particular transmission mode the UE capabilities concerning non-precoded EBF/FD-MIMO operation (class A) for band combinations for which the concerned capabilities are not signalled.</td>
<td></td>
</tr>
<tr>
<td><strong>nonPrecoded (in MIMO-CA-ParametersPerBoBCPerTM)</strong></td>
<td>-</td>
</tr>
<tr>
<td>If signalled, the field indicates for a particular transmission mode, the UE capabilities concerning non-precoded EBF/FD-MIMO operation (class A) applicable for the concerned band combination.</td>
<td></td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>nonUniformGap</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports measurement non uniform Pattern Id 1, 2, 3 and 4 as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td><strong>noResourceRestrictionForTTIBundling</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports TTI bundling operation without resource allocation restriction.</td>
<td></td>
</tr>
<tr>
<td><strong>nonCSG-SI-Reporting</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether UE will report PLMN list from non-CSG cells.</td>
<td></td>
</tr>
<tr>
<td><strong>numberOfBlindDecodesUSS</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the maximum number of blind decodes in UE specific search space in one subframe for CCs configured with sTTI operation supported by the UE. The number of blind decodes supported by the UE is the field value X*68. Field value ranges from 4 to 32.</td>
<td></td>
</tr>
<tr>
<td><strong>otdoa-UE-Assisted</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports UE-assisted OTDOA positioning [54].</td>
<td></td>
</tr>
<tr>
<td><strong>outOfOrderDelivery</strong></td>
<td></td>
</tr>
<tr>
<td>Same as &quot;outOfOrderDelivery&quot; defined in TS 38.306 [87].</td>
<td></td>
</tr>
<tr>
<td><strong>outOfSequenceGrantHandling</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports PUSCH transmissions with out of sequence UL grants as defined in TS 36.213 [22]. This field can be included only if uplinkLAA is included.</td>
<td></td>
</tr>
<tr>
<td><strong>overheatingInd</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports overheating assistance information.</td>
<td></td>
</tr>
<tr>
<td><strong>pdcch-CandidateReductions</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports PDCCH candidate reduction on UE specific search space as specified in TS 36.213 [23, 9.1.1].</td>
<td></td>
</tr>
<tr>
<td><strong>pdcp-Duplication</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports PDCP duplication.</td>
<td></td>
</tr>
<tr>
<td><strong>pdcp-SN-Extension</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports 15 bit length of PDCP sequence number.</td>
<td></td>
</tr>
<tr>
<td><strong>pdcp-SN-Extension-18bits</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports 18 bit length of PDCP sequence number.</td>
<td></td>
</tr>
<tr>
<td><strong>pdcp-TransferSplitUL</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports PDCP data transfer split in UL for the drb-TypeSplit as specified in TS 36.323 [8].</td>
<td></td>
</tr>
<tr>
<td><strong>pdsch-CollisionHandling</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports PDSCH collision handling as specified in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>pdsch-RepSubframe</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports subframe PDSCH repetition.</td>
<td></td>
</tr>
<tr>
<td><strong>pdsch-RepSlot</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports slot PDSCH repetition.</td>
<td></td>
</tr>
<tr>
<td><strong>pdsch-RepSubslot</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports subslot PDSCH repetition. This field is only applicable for UEs supporting FDD.</td>
<td></td>
</tr>
<tr>
<td><strong>pdsch-SlotSubslotPDSCH-Decoding</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports decoding of PDSCH and slot-PDSCH/subslot-PDSCH assigned with C-RNTI/SPS C-RNTI in the same subframe for a given carrier.</td>
<td></td>
</tr>
<tr>
<td><strong>perServingCellMeasurementGap</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports per serving cell measurement gap indication, as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td><strong>phy-TDD-ReConfig-FDD-PCell</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports TDD UL/DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI on a FDD PCell, and HARQ feedback according to UL and DL HARQ reference configurations. This bit can only be set to supported only if the UE supports FDD PCell and phy-TDD-ReConfig-TDD-PCell is set to supported.</td>
<td></td>
</tr>
<tr>
<td><strong>phy-TDD-ReConfig-TDD-PCell</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports TDD UL/DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI on a TDD PCell, and HARQ feedback according to UL and DL HARQ reference configurations, and PUCCH format 3.</td>
<td></td>
</tr>
<tr>
<td><strong>pmi-Disabling</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports power class 14 dBm when operating in CE mode A or B for all the bands that are supported by the UE, as specified in TS 36.101 [42].</td>
<td></td>
</tr>
<tr>
<td><strong>powerPrefInd</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports power preference indication.</td>
<td></td>
</tr>
<tr>
<td>UE-EUTRA-Capability field descriptions</td>
<td>FDD/TDD diff</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>powerUci-SlotPUSCH, powerUci-SubslotPUSCH</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports BPRE derivation based on the actual derived O_CQI. The parameter uplinkPower-CSIPayload configures the UE to derive BPRE based on either the actual value of O_CQI or the largest value of O_CQI across all RI values. If the UE does not support the capability, the UE will derive BPRE based on the largest value of O_CQI across all RI values.</td>
<td></td>
</tr>
<tr>
<td>prach-Enhancements</td>
<td>-</td>
</tr>
<tr>
<td>This field defines whether the UE supports random access preambles generated from restricted set type B in high speed scenario as specified in TS 36.211 [21].</td>
<td></td>
</tr>
<tr>
<td>processingTimelineSet</td>
<td>-</td>
</tr>
<tr>
<td>Indicates, for each SPDCCH configuration, support for a set of TA values. Each set consists of two different processing timelines and associated maximum TA. Set 1 indicates support for n+4 and n+6 and set 2 indicates support for n+6 and n+8, see TS 36.211 [21, 8.1]. The minimum processing timeline to use, out of the two options for a given set is configured by parameter proc-Timeline. Support of Set 1 implicitly means support of Set 2.</td>
<td></td>
</tr>
<tr>
<td>pucch-Format4</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports PUCCH format 4.</td>
<td></td>
</tr>
<tr>
<td>pucch-Format5</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports PUCCH format 5.</td>
<td></td>
</tr>
<tr>
<td>pucch-SCell</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports PUCCH on SCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-Enhancements</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports the PUSCH enhancement mode as specified in TS 36.211 [21] and TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td>pusch-FeedbackMode</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports PUSCH feedback mode 3-2.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-MaxConfigSlot</td>
<td>-</td>
</tr>
<tr>
<td>Indicates the max number of SPS configurations across all cells for slot PUSCH.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-MultiConfigSlot</td>
<td>-</td>
</tr>
<tr>
<td>Indicates the number of multiple SPS configurations of slot PUSCH for each serving cell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-MaxConfigSubframe</td>
<td>-</td>
</tr>
<tr>
<td>Indicates the max number of SPS configurations across all cells for subframe PUSCH.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-MultiConfigSubframe</td>
<td>-</td>
</tr>
<tr>
<td>Indicates the number of multiple SPS configurations of subframe PUSCH for each serving cell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-MaxConfigSubslot</td>
<td>-</td>
</tr>
<tr>
<td>Indicates the max number of SPS configurations across all cells for subslot PUSCH.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-MultiConfigSubslot</td>
<td>-</td>
</tr>
<tr>
<td>Indicates the number of multiple SPS configurations of subslot PUSCH for each serving cell. This field is only applicable for UEs supporting FDD.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SlotRepPCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for slot PUSCH for PCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SlotRepPSCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for slot PUSCH for PSCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SlotRepSCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for slot PUSCH for SCell other than PSCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SubframeRepPCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for subframe PUSCH for PCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SubframeRepPSCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for subframe PUSCH for PSCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SubframeRepSCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for subframe PUSCH for SCell other than PSCell.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SubslotRepPCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for subslot PUSCH for PCell. This field is only applicable for UEs supporting FDD.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SubslotRepPSCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for subslot PUSCH for PSCell. This field is only applicable for UEs supporting FDD.</td>
<td></td>
</tr>
<tr>
<td>pusch-SPS-SubslotRepSCell</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports SPS repetition for subslot PUSCH for SCell other than PSCell. This field is only applicable for UEs supporting FDD.</td>
<td></td>
</tr>
<tr>
<td>pusch-SRS-PowerControl-SubframeSet</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports subframe set dependent UL power control for PUSCH and SRS. This field is only applicable for UEs supporting TDD.</td>
<td></td>
</tr>
</tbody>
</table>
**UE-EUTRA-Capability field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>qcl-CRI-BasedCSI-Reporting</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports CRI based CSI feedback for the FeCoMP feature as specified in TS 36.213 [23], section 7.1.10.</td>
<td></td>
</tr>
<tr>
<td><strong>qcl-TypeC-Operation</strong></td>
<td></td>
</tr>
<tr>
<td>The UE uses this field to indicate the support of all of the following three features: QCL Type-C operation for FeCoMP, the capability to support separate PDSCH RE mapping for different PDSCH CWs in non-coherent joint transmission and the capability to support handling new DMRS port to MIMO layer mapping for the CWs, as specified in TS 36.213 [23], section 7.1.10.</td>
<td></td>
</tr>
<tr>
<td><strong>qoe-MeasReport</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports QoE Measurement Collection for streaming services.</td>
<td></td>
</tr>
<tr>
<td><strong>qoe-MTSI-MeasReport</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports QoE Measurement Collection for MTSI services.</td>
<td></td>
</tr>
<tr>
<td><strong>rach-Less</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports RACH-less handover, and whether the UE which indicates dc-Parameters supports RACH-less SeNB change, as defined in TS 36.300 [9].</td>
<td></td>
</tr>
<tr>
<td><strong>rach-Report</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports delivery of rachReport.</td>
<td></td>
</tr>
<tr>
<td><strong>rai-Support</strong></td>
<td>No</td>
</tr>
<tr>
<td>Defines whether the UE supports release assistance indication (RAI) as specified in TS 36.321 [6] for BL UEs.</td>
<td></td>
</tr>
<tr>
<td><strong>rclwi</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports RCLWI, i.e. reception of rclwi-Configuration. The UE which supports RCLWI shall also indicate support of interRAT-ParametersWLAN-r13. The UE which supports RCLWI and wlan-IW-RAN-Rules shall also support applying WLAN identifiers received in rclwi-Configuration for the access network selection and traffic steering rules when in RRC_IDLE.</td>
<td></td>
</tr>
<tr>
<td><strong>recommendedBitRate</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports the bit rate recommendation message from the eNB to the UE as specified in TS 36.321 [6, 6.1.3.13].</td>
<td></td>
</tr>
<tr>
<td><strong>recommendedBitRateQuery</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports the bit rate recommendation query message from the UE to the eNB as specified in TS 36.321 [6, 6.1.3.13]. If this field is included, the UE shall also include the recommendedBitRate field.</td>
<td></td>
</tr>
<tr>
<td><strong>reducedCP-Latency</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports reduced CP latency.</td>
<td></td>
</tr>
<tr>
<td><strong>reducedIntNonContComb</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports receiving requestReducedIntNonContComb that requests the UE to exclude supported intra-band non-contiguous CA band combinations other than included in capability signalling as specified in TS 36.306 [5], section 4.3.5.21.</td>
<td></td>
</tr>
<tr>
<td><strong>reducedIntNonContCombRequested</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates that the UE excluded supported intra-band non-contiguous CA band combinations other than included in capability signalling as specified in TS 36.306 [5, 4.3.5.21].</td>
<td></td>
</tr>
<tr>
<td><strong>reportCGI-NR-EN-DC</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports Inter-RAT report CGI procedure towards NR cell when it is configured with EN-DC.</td>
<td></td>
</tr>
<tr>
<td><strong>reportCGI-NR-NoEN-DC</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports Inter-RAT report CGI procedure towards NR cell when it is not configured with EN-DC.</td>
<td></td>
</tr>
<tr>
<td><strong>retuningTimeInfoBandList</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates, for a particular pair of bands, the RF retuning time when switching between the band pair to transmit SRS on a PUSCH-less SCell as specified in 36.212 [22] and 36.213 [23]. If included, the UE shall include a number of entries as indicated in the following, and listed in the same order, as in bandParameterList for the concerned band combination:</td>
<td></td>
</tr>
<tr>
<td>- For the first band, the UE shall include the same number of entries as in bandParameterList i.e. first entry corresponds to first band in bandParameterList and so on,</td>
<td></td>
</tr>
<tr>
<td>- For the second band, the UE shall include one entry less i.e. first entry corresponds to the second band in bandParameterList and so on</td>
<td></td>
</tr>
<tr>
<td>- And so on</td>
<td></td>
</tr>
<tr>
<td><strong>requestedBands</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the frequency bands requested by E-UTRAN.</td>
<td></td>
</tr>
<tr>
<td><strong>requestedCCsDL, requestedCCsUL</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the maximum number of CCs requested by E-UTRAN.</td>
<td></td>
</tr>
<tr>
<td><strong>requestedDiffFallbackCombList</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the CA band combinations for which report of different UE capabilities is requested by E-UTRAN.</td>
<td></td>
</tr>
<tr>
<td><strong>UE-EUTRA-Capability field descriptions</strong></td>
<td><strong>FDD/ TDD diff</strong></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>rf-RetuningTimeDL</td>
<td></td>
</tr>
<tr>
<td>Indicates the interruption time on DL reception within a band pair during the RF retuning for switching between the band pair to transmit SRS on a PUSCH-less SCell. n0 represents 0 OFDM symbols, n0dot5 represents 0.5 OFDM symbols, n1 represents 1 OFDM symbol and so on. This field is mandatory present if switching between the band pair is supported.</td>
<td></td>
</tr>
<tr>
<td>rf-RetuningTimeUL</td>
<td></td>
</tr>
<tr>
<td>Indicates the interruption time on UL transmission within a band pair during the RF retuning for switching between the band pair to transmit SRS on a PUSCH-less SCell. n0 represents 0 OFDM symbols, n0dot5 represents 0.5 OFDM symbols, n1 represents 1 OFDM symbol and so on. This field is mandatory present if switching between the band pair is supported.</td>
<td></td>
</tr>
<tr>
<td>rlc-AM-Ooo-Delivery</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports out-of-order delivery from RLC to PDCP for RLC AM.</td>
<td></td>
</tr>
<tr>
<td>rlc-UM-Ooo-Delivery</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports out-of-order delivery from RLC to PDCP for RLC UM.</td>
<td></td>
</tr>
<tr>
<td>rlm-ReportSupport</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports RLM event and information reporting.</td>
<td></td>
</tr>
<tr>
<td>rohc-ContextContinue</td>
<td></td>
</tr>
<tr>
<td>Same as &quot;continueROHC-Context&quot; defined in TS 38.306 [87].</td>
<td></td>
</tr>
<tr>
<td>rohc-ContextMaxSessions</td>
<td></td>
</tr>
<tr>
<td>Same as &quot;maxNumberROHC-ContextSessions&quot; defined in TS 38.306 [87].</td>
<td></td>
</tr>
<tr>
<td>rohc-Profiles</td>
<td></td>
</tr>
<tr>
<td>Same as &quot;supportedROHC-Profiles&quot; defined in TS 38.306 [87].</td>
<td></td>
</tr>
<tr>
<td>rohc-ProfilesUL-Only</td>
<td></td>
</tr>
<tr>
<td>Same as &quot;uplinkOnlyROHC-Profiles&quot; defined in TS 38.306 [87].</td>
<td></td>
</tr>
<tr>
<td>rsrqMeasWideband</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE can perform RSRQ measurements with wider bandwidth.</td>
<td></td>
</tr>
<tr>
<td>rsrq-OnAllSymbols</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE can perform RSRQ measurement on all OFDM symbols and also support the extended RSRQ upper value range from -3dB to 2.5dB in measurement configuration and reporting as specified in TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td>rs-SINR-Meas</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE can perform RS-SINR measurements in RRC_CONNECTED as specified in TS 36.214 [48].</td>
<td></td>
</tr>
<tr>
<td>rssi-AndChannelOccupancyReporting</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports performing measurements and reporting of RSSI and channel occupancy. This field can be included only if downlinkLAA is included.</td>
<td></td>
</tr>
<tr>
<td>scptm-AsyncDC</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception via SC-MRB on a frequency indicated in an MBMSInterestIndication message, where (according to supportedBandCombination) the carriers that are or can be configured as serving cells in the MCG and the SCG are not synchronized. If this field is included, the UE shall also include scptm-SCCell and scptm-NonServingCell.</td>
<td></td>
</tr>
<tr>
<td>scptm-NonServingCell</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception via SC-MRB on a frequency indicated in an MBMSInterestIndication message, where (according to supportedBandCombination and to network synchronization properties) a serving cell may be additionally configured. If this field is included, the UE shall also include the scptm-SCCell field.</td>
<td></td>
</tr>
<tr>
<td>scptm-Parameters</td>
<td>Yes</td>
</tr>
<tr>
<td>Presence of the field indicates that the UE supports SC-PTM reception as specified in TS 36.306 [5].</td>
<td></td>
</tr>
<tr>
<td>scptm-SCell</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports MBMS reception via SC-MRB on a frequency indicated in an MBMSInterestIndication message, when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated).</td>
<td></td>
</tr>
<tr>
<td>scptm-ParallelReception</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE in RRC_CONNECTED supports parallel reception in the same subframe of DL-SCH transport blocks transmitted using C-RNTI/Semi-Persistent Scheduling C-RNTI and using SC-RNTI/G-RNTI as specified in TS 36.306 [5].</td>
<td></td>
</tr>
<tr>
<td>secondSlotStartingPosition</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports reception of subframes with second slot starting position as described in TS 36.211 [21] and TS 36.213 [23]. This field can be included only if downlinkLAA is included.</td>
<td></td>
</tr>
<tr>
<td>semiStaticCFI</td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports the semi-static configuration of CFI for subframe/slot/sub-slot operation.</td>
<td></td>
</tr>
<tr>
<td>UE-EUTRA-Capability field descriptions</td>
<td>FDD/ TDD diff</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>semiStaticCFI-Pattern</strong></td>
<td>Indicates whether the UE supports the semi-static configuration of CFI pattern for subframe/slot/sub-slot operation. This field is only applicable for UEs supporting TDD.</td>
</tr>
<tr>
<td><strong>shortCQI-ForSCellActivation</strong></td>
<td>Indicates whether the UE supports additional CQI reporting periodicity after SCell activation.</td>
</tr>
<tr>
<td><strong>shortMeasurementGap</strong></td>
<td>Indicates whether the UE supports 3ms measurement gap lengths as specified in TS 36.133 [16].</td>
</tr>
<tr>
<td><strong>shortSPS-IntervalFDD</strong></td>
<td>Indicates whether the UE supports uplink SPS intervals shorter than 10 subframes in FDD mode.</td>
</tr>
<tr>
<td><strong>shortSPS-IntervalTDD</strong></td>
<td>Indicates whether the UE supports uplink SPS intervals shorter than 10 subframes in TDD mode.</td>
</tr>
<tr>
<td><strong>simultaneousPUCCH-PUSCH</strong></td>
<td>Indicates whether the UE supports simultaneous transmission of PUSCH/PUCCH and SlotOrSubslotPUSCH/SPUCCCH (if supported).</td>
</tr>
<tr>
<td><strong>simultaneousRx-Tx</strong></td>
<td>Indicates whether the UE supports simultaneous reception and transmission on different bands for each band combination listed in supportedBandCombination. This field is only applicable for inter-band TDD band combinations. A UE indicating support of simultaneousRx-Tx and dc-Support-r12 shall support different UL/DL configurations between PCell and PSCell.</td>
</tr>
<tr>
<td><strong>simultaneousTx-DifferentTx-Duration</strong></td>
<td>Indicates whether the UE supports simultaneous transmission of different transmission durations over different carriers. The different transmission durations can be of subframe, slot or subslot duration.</td>
</tr>
<tr>
<td><strong>skipFallbackCombinations</strong></td>
<td>Indicates whether UE supports receiving reception of requestSkipFallbackComb that requests UE to exclude fallback band combinations from capability signalling.</td>
</tr>
<tr>
<td><strong>skipFallbackCombRequested</strong></td>
<td>Indicates whether requestSkipFallbackComb is requested by E-UTRAN.</td>
</tr>
<tr>
<td><strong>skipMonitoringDCI-Format0-1A</strong></td>
<td>Indicates whether UE supports blind decoding reduction on UE specific search space by not monitoring DCI Format 0 and 1A as specified in TS 36.213 [23, 9.1.1].</td>
</tr>
<tr>
<td><strong>skipSubframeProcessing</strong></td>
<td>Indicates whether the UE supports aborting reception of PDSCH if the UE receives slot-PDSCH/subslot-PDSCH during an ongoing PDSCH reception and instead starts receiving the slot-PDSCH/subslot-PDSCH, as well as whether the UE supports aborting a PUSCH transmission if the UE gets a grant for a slot-PUSCH/ subslot-PUSCH transmission that overlaps with a grant received for a PUSCH transmission. The capability indicates the number of subframes that the UE may drop prior to the subframe in which it prioritizes the processing of slot/subslot PDSCH/PUSCH as described in TS 36.213 [23], sections 7.1 and 8.0. Separate capability for UL and DL and per sTTI length in each direction: skipProcessingDL-Slot, skipProcessingDL-Subslot, skipProcessingUL-Slot and skipProcessingUL-Subslot.</td>
</tr>
<tr>
<td><strong>skipUplinkDynamic</strong></td>
<td>Indicates whether the UE supports skipping of UL transmission for an uplink grant indicated on PDCCH if no data is available for transmission as described in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>skipUplinkSPS</strong></td>
<td>Indicates whether the UE supports skipping of UL transmission for a configured uplink grant if no data is available for transmission as described in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>sl-64QAM-Tx</strong></td>
<td>Indicates whether the UE supports 64QAM for the transmission of V2X sidelink communication.</td>
</tr>
<tr>
<td><strong>sl-CongestionControl</strong></td>
<td>Indicates whether the UE supports Channel Busy Ratio measurement and reporting of Channel Busy Ratio measurement results to eNB for V2X sidelink communication.</td>
</tr>
<tr>
<td><strong>slotPDSCH-TxDiv-TM8</strong></td>
<td>Indicates whether the UE supports TX diversity transmission using ports 7 and 8 for TM8 for slot PDSCH.</td>
</tr>
<tr>
<td><strong>slotPDSCH-TxDiv-TM9and10</strong></td>
<td>Indicates whether the UE supports TX diversity transmission using ports 7 and 8 for TM9/10 for slot PDSCH.</td>
</tr>
<tr>
<td><strong>slss-SupportedTxFreq</strong></td>
<td>Indicates whether the UE supports the SLSS transmission on single carrier or on multiple carriers in the case of sidelink carrier aggregation.</td>
</tr>
<tr>
<td><strong>UE-EUTRA-Capability field descriptions</strong></td>
<td><strong>FDD/TDD diff</strong></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>sls-TxRx</strong></td>
<td>Indicates whether the UE supports SLSS/PSBCH transmission and reception in UE autonomous resource selection mode and eNB scheduled mode in a band for V2X sidelink communication.</td>
</tr>
<tr>
<td><strong>sl-TxDiversity</strong></td>
<td>Indicates whether the UE supports transmit diversity for V2X sidelink communication. See TS 36.101 [42].</td>
</tr>
<tr>
<td><strong>sn-SizeLo</strong></td>
<td>Same as &quot;shortSN&quot; defined in TS 38.306 [87].</td>
</tr>
<tr>
<td><strong>spatialBundling-HARQ-ACK</strong></td>
<td>Indicates whether UE supports HARQ-ACK spatial bundling on PUCCH or PUSCH as specified in TS 36.213 [23], sections 7.3.1 and 7.3.2.</td>
</tr>
<tr>
<td><strong>spdcch-differentRS-types</strong></td>
<td>Indicates whether the UE supports monitoring of sPDCCH on RB sets with different RS types within a TTI.</td>
</tr>
<tr>
<td><strong>spdcch-Reuse</strong></td>
<td>Indicates whether the UE supports L1 based SPDCCH reuse.</td>
</tr>
<tr>
<td><strong>sps-CyclicShift</strong></td>
<td>Indicates whether the UE supports RRC configuration of cyclic shift for DMRS for UL SPS using 1ms TTI.</td>
</tr>
<tr>
<td><strong>sps-ServingCell</strong></td>
<td>Indicates whether the UE supports multiple UL/DL SPS configurations simultaneously active on different serving cells as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>sps-STTI</strong></td>
<td>Indicates whether the UE supports SPS in DL and/or UL for slot or subslot based PDSCH and PUSCH, respectively.</td>
</tr>
<tr>
<td><strong>srs-DCI7-TriggeringFS2</strong></td>
<td>Indicates whether the UE supports SRS triggering via DCI format 7 for FS2.</td>
</tr>
<tr>
<td><strong>srs-Enhancements</strong></td>
<td>Indicates whether the UE supports SRS enhancements.</td>
</tr>
<tr>
<td><strong>srs-EnhancementsTDD</strong></td>
<td>Indicates whether the UE supports TDD specific SRS enhancements.</td>
</tr>
<tr>
<td><strong>srs-MaxSimultaneousCCs</strong></td>
<td>Indicates the maximum number of simultaneously configurable target CCs for SRS switching (i.e., CCs for which srs-SwitchFromServCellIndex is configured) supported by the UE.</td>
</tr>
<tr>
<td><strong>srs-UpPTS-6sym</strong></td>
<td>Indicates whether the UE supports up to 6-symbol SRS in UpPTS.</td>
</tr>
<tr>
<td><strong>srvc-FromUTRA-FDD-ToGERAN</strong></td>
<td>Indicates whether UE supports SRVCC handover from UTRA FDD PS HS to GERAN CS.</td>
</tr>
<tr>
<td><strong>srvc-FromUTRA-FDD-ToUTRA-FDD</strong></td>
<td>Indicates whether UE supports SRVCC handover from UTRA FDD PS HS to UTRA FDD CS.</td>
</tr>
<tr>
<td><strong>srvc-FromUTRA-TDD128-ToGERAN</strong></td>
<td>Indicates whether UE supports SRVCC handover from UTRA TDD 1.28Mcps PS HS to GERAN CS.</td>
</tr>
<tr>
<td><strong>srvc-FromUTRA-TDD128-ToUTRA-TDD128</strong></td>
<td>Indicates whether UE supports SRVCC handover from UTRA TDD 1.28Mcps PS HS to UTRA TDD 1.28Mcps CS.</td>
</tr>
<tr>
<td><strong>ss-CCH-InterfHandl</strong></td>
<td>Indicates whether the UE supports synchronisation signal and common channel interference handling.</td>
</tr>
<tr>
<td><strong>standaloneGNSS-Location</strong></td>
<td>Indicates whether the UE is equipped with a standalone GNSS receiver that may be used to provide detailed location information in RRC measurement report and logged measurements.</td>
</tr>
<tr>
<td><strong>sTTI-SPT-Supported</strong></td>
<td>Indicates whether the UE supports the features shortenedTTI and/or shortened-PT. If the UE supports shortenedTTI and/or shortened-PT features, the UE shall report the field sTTI-SPT-supported set to supported in capability signalling, irrespective of whether request-sTTI-SPT-Capability field is present or not.</td>
</tr>
<tr>
<td><strong>sTTI-FD-MIMO-Coexistence</strong></td>
<td>Indicates whether the UE supports CSI feedback for more than 8 NZP CSI-RS ports on subframe based PUSCH in any serving cell and supporting sTTI in any serving cell.</td>
</tr>
</tbody>
</table>
## UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>sTTI-SupportedCombinations</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the different combinations of short TTI lengths, see field description for dl-STTI-Length and ul-STTI-Length, that the UE supports in a single PUCCH group or in two PUCCH groups. An sTTI length combination is reported for DL first followed by UL. In case of two PUCCH groups the support for the primary PUCCH group is indicated first.</td>
<td></td>
</tr>
<tr>
<td><strong>subcarrierSpacingMBMS-khz7dot5, subcarrierSpacingMBMS-khz1dot25</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the supported subcarrier spacings for MBSFN subframes in addition to 15 kHz subcarrier spacing. subcarrierSpacingMBMS-khz1dot25 and subcarrierSpacingMBMS-khz7dot5 indicate that the UE supports 1.25 and 7.5 kHz respectively for MBSFN subframes as described in TS36.211 [21, 6.12]. This field is included only if fembsMixedCell or fembsDedicatedCell is included.</td>
<td></td>
</tr>
<tr>
<td><strong>subslotPDSCH-TxDiv-TM9and10</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates whether the UE supports TX diversity transmission using ports 7 and 8 for TM9/10 for subslot PDSCH.</td>
<td></td>
</tr>
<tr>
<td><strong>supportedBandCombination</strong></td>
<td></td>
</tr>
<tr>
<td>Includes the supported CA band combinations, if any, and may include all the supported non-CA bands.</td>
<td></td>
</tr>
<tr>
<td><strong>supportedBandCombinationAdd-r11</strong></td>
<td></td>
</tr>
<tr>
<td>Includes additional supported CA band combinations in case maximum number of CA band combinations of supportedBandCombination is exceeded.</td>
<td></td>
</tr>
<tr>
<td>SupportedBandCombinationAdd-v11d0, SupportedBandCombinationAdd-v1250, SupportedBandCombinationAdd-v1270, SupportedBandCombinationAdd-v1320, SupportedBandCombinationAdd-v1380, SupportedBandCombinationAdd-v1390, SupportedBandCombinationAdd-v1430, SupportedBandCombinationAdd-v1450, SupportedBandCombinationAdd-v1470, SupportedBandCombinationAdd-v1530</td>
<td>If included, the UE shall include the same number of entries, and listed in the same order, as in supportedBandCombinationAdd-r11.</td>
</tr>
<tr>
<td><strong>SupportedBandCombinationExt, SupportedBandCombination-v1090, SupportedBandCombination-v10i0, SupportedBandCombination-v1130, SupportedBandCombination-v1250, SupportedBandCombination-v1270, SupportedBandCombination-v1320, SupportedBandCombination-v1380, SupportedBandCombination-v1390, SupportedBandCombination-v1430, SupportedBandCombination-v1450, SupportedBandCombination-v1470, SupportedBandCombination-v1530</strong></td>
<td>If included, the UE shall include the same number of entries, and listed in the same order, as in supportedBandCombinationExt.</td>
</tr>
<tr>
<td><strong>supportedBandCombinationReduced</strong></td>
<td></td>
</tr>
<tr>
<td>Includes the supported CA band combinations, and may include the fallback CA combinations specified in TS 36.101 [42, 4.3A]. This field also indicates whether the UE supports reception of requestReducedFormat.</td>
<td></td>
</tr>
<tr>
<td>SupportedBandCombinationReduced-v1320, SupportedBandCombinationReduced-v1380, SupportedBandCombinationReduced-v1390, SupportedBandCombinationReduced-v1430, SupportedBandCombinationReduced-v1450, SupportedBandCombinationReduced-v1470, SupportedBandCombinationReduced-v1530</td>
<td>If included, the UE shall include the same number of entries, and listed in the same order, as in supportedBandCombinationReduced-r13.</td>
</tr>
<tr>
<td><strong>SupportedBandGERAN</strong></td>
<td></td>
</tr>
<tr>
<td>GERAN band as defined in TS 45.005 [20].</td>
<td>No</td>
</tr>
<tr>
<td><strong>SupportedBandList1XRTT</strong></td>
<td></td>
</tr>
<tr>
<td>One entry corresponding to each supported CDMA2000 1xRTT band class.</td>
<td></td>
</tr>
<tr>
<td><strong>SupportedBandListEUTRA</strong></td>
<td></td>
</tr>
<tr>
<td>Includes the supported E-UTRA bands. This field shall include all bands which are indicated in BandCombinationParameters.</td>
<td></td>
</tr>
<tr>
<td><strong>SupportedBandListEUTRA-v9e0, SupportedBandListEUTRA-v1250, SupportedBandListEUTRA-v1310, SupportedBandListEUTRA-v1320</strong></td>
<td>If included, the UE shall include the same number of entries, and listed in the same order, as in supportedBandListEUTRA (i.e. without suffix).</td>
</tr>
<tr>
<td><strong>SupportedBandListGERAN</strong></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td></td>
</tr>
<tr>
<td><strong>SupportedBandListEUTRA</strong></td>
<td></td>
</tr>
<tr>
<td>Includes the supported E-UTRA bands. This field shall include all bands which are indicated in BandCombinationParameters.</td>
<td></td>
</tr>
<tr>
<td><strong>SupportedBandListHHRPD</strong></td>
<td></td>
</tr>
<tr>
<td>One entry corresponding to each supported CDMA2000 HRPD band class.</td>
<td></td>
</tr>
<tr>
<td><strong>SupportedBandListNR</strong></td>
<td></td>
</tr>
<tr>
<td>Includes the NR bands supported by the UE.</td>
<td>No</td>
</tr>
<tr>
<td><strong>supportedBandListWLAN</strong></td>
<td></td>
</tr>
<tr>
<td>Indicates the supported WLAN bands by the UE.</td>
<td></td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>SupportedBandUTRA-FDD</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTRA band as defined in TS 25.101 [17].</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SupportedBandUTRA-TDD128</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTRA band as defined in TS 25.102 [18].</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SupportedBandUTRA-TDD384</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTRA band as defined in TS 25.102 [18].</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SupportedBandUTRA-TDD768</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTRA band as defined in TS 25.102 [18].</td>
<td>-</td>
</tr>
</tbody>
</table>

**supportedBandwidthCombinationSet**

The supportedBandwidthCombinationSet indicated for a band combination is applicable to all bandwidth classes indicated by the UE in this band combination.

Field encoded as a bit map, where bit N is set to “1” if UE support Bandwidth Combination Set N for this band combination, see 36.101 [42]. The leading / leftmost bit (bit 0) corresponds to the Bandwidth Combination Set 0, the next bit corresponds to the Bandwidth Combination Set 1 and so on. The UE shall neither include the field for a non-CA band combination, nor for a CA band combination for which the UE only supports Bandwidth Combination Set 0.

**supportedCellGrouping**

This field indicates for which mapping of serving cells to cell groups (i.e. MCG or SCG) the UE supports asynchronous DC. This field is only present for a band combination with more than two but less than six band entries where the UE supports asynchronous DC. If this field is not present but asynchronous operation is supported, the UE supports all possible mappings of serving cells to cell groups for the band combination. The bitmap size is selected based on the number of entries in the combinations, i.e., in case of three entries, the bitmap corresponding to threeEntries is selected and so on.

A bit in the bit string set to 1 indicates that the UE supports asynchronous DC for the cell grouping option represented by the concerned bit position. Each bit position represents a different cell grouping option, as illustrated by a table, see NOTE 5. A cell grouping option is represented by a number of bits, each representing a particular band entry in the band combination with the left-most bit referring to the band listed first in the band combination, etc. Value 0 indicates that the carriers of the corresponding band entry are mapped to a first cell group, while value 1 indicates that the carriers of the corresponding band entry are mapped to a second cell group. It is noted that the mapping table does not include entries with all bits set to the same value (0 or 1) as this does not represent a DC scenario (i.e. indicating that the UE supports that all carriers of the corresponding band entry are in one cell group).

**supportedCSI-Proc, stTTI-SupportedCSI-Proc**

Indicates the maximum number of CSI processes supported on a component carrier within a band. Value n1 corresponds to 1 CSI process, value n3 corresponds to 3 CSI processes, and value n4 corresponds to 4 CSI processes. If this field is included, the UE shall include the same number of entries listed in the same order as in BandParameters/STTI-SPT-BandParameters. If the UE supports at least 1 CSI process on any component carrier, then the UE shall include this field in all bands in all band combinations.

**supportedNAICS-2CRS-AP**

If included, the UE supports NAICS for the band combination. The UE shall include a bitmap of the same length, and in the same order, as in naics-Capability-List, to indicate 2 CRS AP NAICS capability of the band combination. The first/ leftmost bit points to the first entry of naics-Capability-List, the second bit points to the second entry of naics-Capability-List, and so on.

For band combinations with a single component carrier, UE is only allowed to indicate (numberOfNAICS-CapableCC, numberOfAggregatedPRB) = (1, 100) if NAICS is supported.

**supportedOperatorDic**

Indicates whether the UE supports operator defined dictionary. If UE supports operator defined dictionary, the UE shall report versionOfDictionary and associatedPLMN-ID of the stored operator defined dictionary. This parameter is not required to be present if the UE is in VPLMN. In this release of the specification, UE can only support one operator defined dictionary. The associatedPLMN-ID is only associated to the operator defined dictionary which has no relationship with UE’s HPLMN ID.

**supportRohcContextContinue**

Indicates whether the UE supports ROHC context continuation operation where the UE does not reset the current ROHC context upon handover.

**supportedROHC-Profiles**

Indicates the ROHC profiles that UE supports in both uplink and downlink.

**supportedUplinkOnlyROHC-Profiles**

Indicates the ROHC profiles that UE supports in uplink and not in downlink, see TS 36.323 [8].
**UE-EUTRA-Capability field descriptions**

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>supportedStandardDic</strong></td>
<td>Indicates whether the UE supports standard dictionary for SIP and SDP as specified in TS 36.323 [8].</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>supportedUDC</strong></td>
<td>Indicates whether the UE supports UL data compression, see TS 36.323 [8].</td>
<td>-</td>
</tr>
<tr>
<td><strong>tdd-SpecialSubframe</strong></td>
<td>Indicates whether the UE supports TDD special subframe defined in TS 36.211 [21]. A UE shall indicate <code>tdd-SpecialSubframe-r11</code> if it supports the TDD special subframes ssp7 and ssp9. A UE shall indicate <code>tdd-SpecialSubframe-r14</code> if it supports the TDD special subframe ssp10.</td>
<td>No</td>
</tr>
<tr>
<td><strong>tdd-FDD-CA-PCellDuplex</strong></td>
<td>The presence of this field indicates that the UE supports TDD/FDD CA in any supported band combination including at least one FDD band with <code>bandParametersUL</code> and at least one TDD band with <code>bandParametersUL</code>. The first bit is set to &quot;1&quot; if UE supports the TDD PCell. The second bit is set to &quot;1&quot; if UE supports FDD PCell. This field is included only if the UE supports band combination including at least one FDD band with <code>bandParametersUL</code> and at least one TDD band with <code>bandParametersUL</code>. If this field is included, the UE shall set at least one of the bits as &quot;1&quot;. If this field is included with DC, then it is applicable within a CG, and the presence of this field indicates the capability of the UE to support TDD/FDD CA with at least one FDD band and at least one TDD band in the same CG, with the value indicating the support for TDD/FDD PCell (PSCell).</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>tdd-TTI-Bundling</strong></td>
<td>The presence of this field indicates whether the UE supporting TDD special subframe configuration 10 also supports TTI bundling for TDD configuration 2 and 3 when PUSCH transmission in UpPTS is configured, see TS 36.213 [23, 8.0]. If this field is present, the <code>tdd-SpecialSubframe-r14</code> shall be present.</td>
<td>-</td>
</tr>
<tr>
<td><strong>timeReferenceProvision</strong></td>
<td>Indicates whether the UE supports provision of time reference in DLInformationTransfer message.</td>
<td>-</td>
</tr>
<tr>
<td><strong>timerT312</strong></td>
<td>Indicates whether the UE supports T312.</td>
<td>No</td>
</tr>
<tr>
<td><strong>tm5-FDD</strong></td>
<td>Indicates whether the UE supports the PDSCH transmission mode 5 in FDD.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm5-TDD</strong></td>
<td>Indicates whether the UE supports the PDSCH transmission mode 5 in TDD.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm6-CE-ModeA</strong></td>
<td>Indicates whether the UE supports tm6 operation in CE mode A, see TS 36.213 [23, 7.2.3]. This field can be included only if <code>ce-ModeA</code> is included.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>tm8-slotPDSCH</strong></td>
<td>Indicates whether the UE supports configuration and decoding of TM8 for slot PDSCH in TDD.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm9-CE-ModeA</strong></td>
<td>Indicates whether the UE supports tm9 operation in CE mode A, see TS 36.213 [23, 7.2.3]. This field can be included only if <code>ce-ModeA</code> is included.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>tm9-CE-ModeB</strong></td>
<td>Indicates whether the UE supports tm9 operation in CE mode B, see TS 36.213 [23, 7.2.3]. This field can be included only if <code>ce-ModeB</code> is included.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>tm9-LAA</strong></td>
<td>Indicates whether the UE supports tm9 operation on LAA cell(s). This field can be included only if <code>downlinkLAA</code> is included.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm9-slotSubslot</strong></td>
<td>Indicates whether the UE supports configuration and decoding of TM9 for slot and/or subslot PDSCH for non-MBSFN.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm9-slotSubslotMBSFN</strong></td>
<td>Indicates whether the UE supports configuration and decoding of TM9 for slot and/or subslot PDSCH for MBSFN.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm9-With-8Tx-FDD</strong></td>
<td>Indicates whether the UE supports PDSCH transmission mode 9 with 8 CSI reference signal ports for FDD when not operating in CE mode.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>tm10-LAA</strong></td>
<td>Indicates whether the UE supports tm10 operation on LAA cell(s). This field can be included only if <code>downlinkLAA</code> is included.</td>
<td>-</td>
</tr>
<tr>
<td><strong>tm10-slotSubslot</strong></td>
<td>Indicates whether the UE supports configuration and decoding of TM10 for slot and/or subslot PDSCH for non-MBSFN.</td>
<td>-</td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>tm10-slotSubslotMBSFN</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports configuration and decoding of TM10 for slot and/or subslot PDSCH for MBSFN.</td>
<td></td>
</tr>
<tr>
<td>twoAntennaPortsForPUCCH</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmit antenna selection for this UL band in the band combination as described in TS 36.213 [23, 8.2 and 8.7].</td>
<td></td>
</tr>
<tr>
<td>twoStepSchedulingTimingInfo</td>
<td>-</td>
</tr>
<tr>
<td>Presence of this field indicates that the UE supports uplink scheduling using PUSCH trigger A and PUSCH trigger B (as defined in TS 36.213 [23]). This field also indicates the timing between the PUSCH trigger B and the earliest time the UE supports performing the associated UL transmission. For reception of PUSCH trigger B in subframe N, value nPlus1 indicates that the UE supports performing the UL transmission in subframe N+1, value nPlus2 indicates that the UE supports performing the UL transmission in subframe N+2, and so on. This field can be included only if uplinkLAA is included.</td>
<td></td>
</tr>
<tr>
<td>txAntennaSwitchDL, txAntennaSwitchUL</td>
<td>-</td>
</tr>
<tr>
<td>The presence of txAntennaSwitchUL indicates the UE supports transmit antenna selection for this UL band in the band combination as described in TS 36.213 [23, 8.2 and 8.7]. The field txAntennaSwitchDL indicates the entry number of the first-listed band with UL in the band combination that affects this DL. The field txAntennaSwitchUL indicates the entry number of the first-listed band with UL in the band combination that switches together with this UL. Value 1 means first entry, value 2 means second entry and so on. All DL and UL that switch together indicate the same entry number.</td>
<td></td>
</tr>
<tr>
<td>txDiv-PUCCH1b-ChSelect</td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmit diversity for PUCCH format 1b with channel selection.</td>
<td></td>
</tr>
<tr>
<td>txDiv-SPUCCH</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports Tx diversity on SPUCCH format 1/1a/1b/3.</td>
<td></td>
</tr>
<tr>
<td>uci-PUSCH-Ext</td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports an extension of UCI delivering more than 22 HARQ-ACK bits on PUSCH as specified in TS 36.212 [22, 5.2.2.6] and TS 36.213 [23, 8.6.3].</td>
<td></td>
</tr>
<tr>
<td>ue-AutonomousWithFullSensing</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmitting PSCCH/PSSCH using UE autonomous resource selection mode with full sensing (i.e., continuous channel monitoring) for V2X sidelink communication and the UE supports maximum transmit power associated with Power class 3 V2X UE, see TS 36.101 [42].</td>
<td></td>
</tr>
<tr>
<td>ue-AutonomousWithPartialSensing</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmitting PSCCH/PSSCH using UE autonomous resource selection mode with partial sensing (i.e., channel monitoring in a limited set of subframes) for V2X sidelink communication and the UE supports maximum transmit power associated with Power class 3 V2X UE, see TS 36.101 [42].</td>
<td></td>
</tr>
<tr>
<td>ue-Category</td>
<td>-</td>
</tr>
<tr>
<td>UE category as defined in TS 36.306 [5]. Set to values 1 to 12 in this version of the specification.</td>
<td></td>
</tr>
<tr>
<td>ue-CategoryUL</td>
<td>-</td>
</tr>
<tr>
<td>UE UL category as defined in TS 36.306 [5]. Value n14 corresponds to UE category 14, value m1 corresponds to UE category M1, value oneBis corresponds to UE category 1bis, value m2 corresponds to UE category M2. For ASN.1 compatibility, a UE indicating DL category 0, m1 or m2 shall also indicate any of the categories (1...5) in ue-Category (without suffix), which is ignored by the eNB, a UE indicating UE category oneBis shall also indicate UE category 1 in ue-Category (without suffix), and a UE indicating UE category m2 shall also indicate UE category m1. The field ue-CategoryUL is set to values 0, m1, oneBis, m2, 4, 6, 7, 9 to 16, n17, 18, 19, 20, 21, 22, 23, 24, 25, 26 in this version of the specification.</td>
<td></td>
</tr>
<tr>
<td>ue-CategorySL-C-TX</td>
<td>-</td>
</tr>
<tr>
<td>UE SL category for V2X transmission as defined in TS 36.306 [5]. Set to values 1 to 5 in this version of the specification.</td>
<td></td>
</tr>
<tr>
<td>ue-CategorySL-C-RX</td>
<td>-</td>
</tr>
<tr>
<td>UE SL category for V2X reception as defined in TS 36.306 [5]. Set to values 1 to 4 in this version of the specification.</td>
<td></td>
</tr>
<tr>
<td>ue-CA-PowerClass-N</td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports UE power class N in the E-UTRA band combination, see TS 36.101 [42] and TS 36.307 [78]. If ue-CA-PowerClass-N is not included, UE supports the default UE power class in the E-UTRA band combination, see TS 36.101 [42].</td>
<td></td>
</tr>
</tbody>
</table>
**UE-EUTRA-Capability field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ue-CE-NeedULGaps</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE needs uplink gaps during continuous uplink transmission in FDD as specified in TS 36.211 [21] and TS 36.306 [5].</td>
<td></td>
</tr>
<tr>
<td><strong>ue-PowerClass-N, ue-PowerClass-5</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports UE power class 1, 2, 4 or 5 in the E-UTRA band, see TS 36.101 [42] and TS 36.307 [79]. UE includes either ue-PowerClass-N or ue-PowerClass-5. If neither ue-PowerClass-N nor ue-PowerClass-5 is included, UE supports the default UE power class in the E-UTRA band, see TS 36.101 [42].</td>
<td></td>
</tr>
<tr>
<td><strong>ue-Rx-TxTimeDiffMeasurements</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports Rx - Tx time difference measurements.</td>
<td></td>
</tr>
<tr>
<td><strong>ue-SpecificRefSigsSupported</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports SSTD measurements between the PCell and the PSCell as specified in TS 36.214 [48] and TS 36.133 [16].</td>
<td></td>
</tr>
<tr>
<td><strong>ue-TxAntennaSelectionSupported</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Except for the supported band combinations for which bandParameterList-v1380 is included, TRUE indicates that the UE is capable of transmitting UE antenna selection such that all the supported bands in the band combination are affected by transmit antenna switching, as described in TS 36.213 [23, 8.7]. E-UTRAN ignores this field for band combinations for which bandParameterList-v1380 is included.</td>
<td></td>
</tr>
<tr>
<td><strong>ue-TxAntennaSelection-SRS-1T4R</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports selecting one antenna among four antennas to transmit SRS for the corresponding band of the band combination as described in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>ue-TxAntennaSelection-SRS-2T4R-2Pairs</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports selecting one antenna pair between two antenna pairs to transmit SRS simultaneously for the corresponding band of the band combination as described in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>ue-TxAntennaSelection-SRS-2T4R-3Pairs</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports selecting one antenna pair among three antenna pairs to transmit SRS simultaneously for the corresponding band of the band combination as described in TS 36.213 [23].</td>
<td></td>
</tr>
<tr>
<td><strong>ul-64QAM</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 64QAM in UL on the band. This field is only present when the field ue-CategoryUL indicates UL UE category that supports UL 64QAM, see TS 36.306 [5, Table 4.1A-2]. If the field is present for one band, the field shall be present for all bands including downlink only bands.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-256QAM</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 256QAM in UL on the band in the band combination. This field is only present when the field ue-CategoryUL indicates UL UE category that supports 256QAM in UL, see TS 36.306 [5, Table 4.1A-2]. The UE includes this field only if the field ul-256QAM-perCC-InfoList is not included.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-256QAM-perCC-InfoList</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates, per serving carrier of which the corresponding bandwidth class includes multiple serving carriers (i.e. bandwidth class B, C, D and so on), whether the UE supports 256QAM in the band combination. The number of entries is equal to the number of component carriers in the corresponding bandwidth class. The UE shall support the setting indicated in each entry of the list regardless of the order of entries in the list. This field is only present when the field ue-CategoryUL indicates UL UE category that supports 256QAM in UL, see TS 36.306 [5, Table 4.1A-2]. The UE includes this field only if the field ul-256QAM-perCC-InfoList is not included.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-256QAM-Slot</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 256QAM in UL for slot TTI operation on the band.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-256QAM-Subslot</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 256QAM in UL for subslot TTI operation on the band.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-AsyncHarqSharingDiff-TTI-Lengths</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports UL asynchronous HARQ sharing between different TTI lengths for an UL serving cell.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-CoMP</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports UL Coordinated Multi-Point operation.</td>
<td></td>
</tr>
<tr>
<td><strong>ul-PDCP-Delay</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports UL PDCP Packet Delay per QCI measurement as specified in TS 36.314 [71].</td>
<td></td>
</tr>
<tr>
<td><strong>ul-powerControlEnhancements</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports UplinkPowerControlDedicated.</td>
<td></td>
</tr>
<tr>
<td><strong>uplinkLAA</strong></td>
<td>-</td>
</tr>
<tr>
<td>Presence of the field indicates that the UE supports uplink LAA operation.</td>
<td></td>
</tr>
<tr>
<td>UE-EUTRA-Capability field descriptions</td>
<td>FDD/TDD diff</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td><strong>uss-BlindDecodingAdjustment</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports blind decoding adjustment on UE specific search space as defined in TS 36.213 [22]. This field can be included only if uplinkLAA is included.</td>
<td>-</td>
</tr>
<tr>
<td><strong>uss-BlindDecodingReduction</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports blind decoding reduction on UE specific search space by not monitoring DCI format 0A/0B/4A/4B as defined in TS 36.213 [22]. This field can be included only if uplinkLAA is included.</td>
<td>-</td>
</tr>
<tr>
<td><strong>unicastFrequencyHopping</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports frequency hopping for unicast MPDCCH/PDSCH (configured by mpdcch-pdsch-HoppingConfig) and unicast PUSCH (configured by pusch-HoppingConfig).</td>
<td>-</td>
</tr>
<tr>
<td><strong>unicast-fembmsMixedSCell</strong></td>
<td>No</td>
</tr>
<tr>
<td>Indicates whether the UE supports unicast reception from FeMBMS/Unicast mixed cell. This field is included only if UE supports carrier aggregation.</td>
<td>-</td>
</tr>
<tr>
<td><strong>utran-ProximityIndication</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports proximity indication for UTRAN CSG member cells.</td>
<td>-</td>
</tr>
<tr>
<td><strong>utran-SI-AcquisitionForHO</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports, upon configuration of si-RequestForHO by the network, acquisition and reporting of relevant information using autonomous gaps by reading the SI from a neighbouring UMTS cell.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-BandwidthClassTxSL, v2x-BandwidthClassRxSL</strong></td>
<td>-</td>
</tr>
<tr>
<td>The bandwidth class for V2X sidelink transmission and reception supported by the UE as defined in TS 36.101 [42, Table 5.6G.1-3]. The UE explicitly includes all the supported bandwidth class combinations for V2X sidelink transmission or reception in the band combination signalling. Support for one bandwidth class does not implicitly indicate support for another bandwidth class.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-eNB-Scheduled</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmitting PSCCH/PSSCH using dynamic scheduling, SPS in eNB scheduled mode for V2X sidelink communication, reporting SPS assistance information and the UE supports maximum transmit power associated with Power class 3 V2X UE, see TS 36.101 [42] in a band.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-EnhancedHighReception</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports reception of 30 PSCCH in a subframe and decoding of 204 RBs per subframe counting both PSCCH and PSSCH in a band for V2X sidelink communication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-HighPower</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports maximum transmit power associated with Power class 2 V2X UE for V2X sidelink transmission in a band, see TS 36.101 [42].</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-HighReception</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports reception of 20 PSCCH in a subframe and decoding of 136 RBs per subframe counting both PSCCH and PSSCH in a band for V2X sidelink communication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-nonAdjacentPSCCH-PSSCH</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports transmission and reception in the configuration of non-adjacent PSCCH and PSSCH for V2X sidelink communication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-numberTxRxTiming</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates the number of multiple reference TX/RX timings counted over all the configured sidelink carriers for V2X sidelink communication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-SupportedBandCombinationList</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates the supported band combination list on which the UE supports simultaneous transmission and/or reception of V2X sidelink communication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-SupportedTxBandCombListPerBC, v2x-SupportedRxBandCombListPerBC</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates, for a particular band combination of EUTRA, the supported band combination list among v2x-SupportedBandCombinationList on which the UE supports simultaneous transmission or reception of EUTRA and V2X sidelink communication respectively. The first bit refers to the first entry of v2x-SupportedBandCombinationList, with value 1 indicating V2X sidelink transmission/reception is supported.</td>
<td>-</td>
</tr>
<tr>
<td><strong>v2x-TxWithShortResvInterval</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports 20 ms and 50 ms resource reservation periods for UE autonomous resource selection and eNB scheduled resource allocation for V2X sidelink communication.</td>
<td>-</td>
</tr>
<tr>
<td><strong>voiceOverPS-UTRA-FDD</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports IMS voice according to GSMA IR.58 profile in UTRA FDD.</td>
<td>-</td>
</tr>
<tr>
<td><strong>voiceOverPS-UTRA-TDD128</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether UE supports IMS voice in UTRA TDD 1.28Mcps.</td>
<td>-</td>
</tr>
</tbody>
</table>
**UE-EUTRA-Capability field descriptions**

<table>
<thead>
<tr>
<th>Field Descriptions</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ims-VoiceOverNR-PDCP-MCG-Bearer</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports IMS voice over NR PDCP with only MCG RLC bearer.</td>
<td></td>
</tr>
<tr>
<td><strong>ims-VoiceOverNR-PDCP-SCG-Bearer</strong></td>
<td>Yes</td>
</tr>
<tr>
<td>Indicates whether the UE supports IMS voice over NR PDCP with only SCG RLC bearer.</td>
<td></td>
</tr>
<tr>
<td><strong>whiteCellList</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports EUTRA white cell listing to limit the set of cells applicable for measurements.</td>
<td></td>
</tr>
<tr>
<td><strong>wlan-IW-RAN-Rules</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports RAN-assisted WLAN interworking based on access network selection and traffic steering rules.</td>
<td></td>
</tr>
<tr>
<td><strong>wlan-IW-ANDSF-Policies</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports RAN-assisted WLAN interworking based on ANDSF policies.</td>
<td></td>
</tr>
<tr>
<td><strong>wlan-MAC-Address</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates the WLAN MAC address of this UE.</td>
<td></td>
</tr>
<tr>
<td><strong>wlan-PeriodicMeas</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports periodic reporting of WLAN measurements.</td>
<td></td>
</tr>
<tr>
<td><strong>wlan-ReportAnyWLAN</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates whether the UE supports reporting of WLANs not listed in the measObjectWLAN.</td>
<td></td>
</tr>
<tr>
<td><strong>wlan-SupportedDataRate</strong></td>
<td>-</td>
</tr>
<tr>
<td>Indicates the maximum WLAN data rate supported by the UE over all LWA bearers. Actual value of supported data rate is field value * 10 Mbps (i.e., value 1 corresponds to 10 Mbps, value 2 corresponds to 20 Mbps and so on).</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** The IE **UE-EUTRA-Capability** does not include AS security capability information, since these are the same as the security capabilities that are signalled by NAS. Consequently, AS need not provide "man-in-the-middle" protection for the security capabilities.

**NOTE 2:** The column FDD/ TDD diff indicates if the UE is allowed to signal, as part of the additional capabilities for an XDD mode i.e. within **UE-EUTRA-CapabilityAddXDD-Mode-xNM**, a different value compared to the value signalled elsewhere within **UE-EUTRA-Capability** (i.e. the common value, supported for both XDD modes). A '-' is used to indicate that it is not possible to signal different values (used for fields for which the field description is provided for other reasons). Annex E specifies for which TDD and FDD serving cells a UE supporting TDD/FDD CA shall support a capability for which it indicates support within the capability signalling.

**NOTE 2a:** From REL-15 onwards, the UE is not allowed to signal different values for FDD and TDD unless yes is indicated in column FDD/ TDD diff (i.e. no need to introduce field description solely for the purpose of indicate no).

**NOTE 3:** The **BandCombinationParameters** for the same band combination can be included more than once.

**NOTE 4:** UE CA and measurement capabilities indicate the combinations of frequencies that can be configured as serving frequencies.

**NOTE 5:** The grouping of the cells to the first and second cell group, as indicated by supportedCellGrouping, is shown in the table below. The leading / leftmost bit of supportedCellGrouping corresponds to the Bit String Position 1.
<table>
<thead>
<tr>
<th>Nr of Band Entries</th>
<th>5</th>
<th>4</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Bit-String</td>
<td>15</td>
<td>7</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bit String Position</th>
<th>00001</th>
<th>0001</th>
<th>001</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>00010</td>
<td>0010</td>
<td>010</td>
</tr>
<tr>
<td>3</td>
<td>00011</td>
<td>0011</td>
<td>011</td>
</tr>
<tr>
<td>4</td>
<td>00100</td>
<td>0100</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>00101</td>
<td>0101</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>00110</td>
<td>0110</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>00111</td>
<td>0111</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>01000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>01001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>01010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>01011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>01100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>01101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>01110</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>01111</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 6:** UE includes the `intraBandContiguousCC-InfoList-r12` also for bandwidth class A because of the presence conditions in `BandCombinationParameters-v1270`. For example, if UE supports CA_1A_41D band combination, if UE includes the field `intraBandContiguousCC-InfoList-r12` for band 41, the UE includes `intraBandContiguousCC-InfoList-r12` also for band 1.

**NOTE 7:** For a UE that indicates release X in field `accessStratumRelease` but supports a feature specified in release X+ N (i.e. early UE implementation), the ASN.1 comprehension requirement are specified in Annex F.

---

**UE-RadioPagingInfo**

The `UE-RadioPagingInfo` IE contains UE capability information needed for paging.

**UE-RadioPagingInfo** information element

```
-- ASN1START
UE-RadioPagingInfo-r12 ::= SEQUENCE {
    ue-Category-v1250 INTEGER (0) OPTIONAL,
    ...
    [[ ue-CategoryDL-v1310 ENUMERATED {ml} OPTIONAL,
      ce-ModeA-r13 ENUMERATED {true} OPTIONAL,
      ce-ModeB-r13 ENUMERATED {true} OPTIONAL ]],
    [[ wakeupSignal-r15 ENUMERATED {true} OPTIONAL,
      wakeupSignal-TDD-r15 ENUMERATED {true} OPTIONAL,
      wakeUpSignalMinGap-eDRX-r15 ENUMERATED {ms40, ms240, ms1000, ms2000} OPTIONAL,
      wakeUpSignalMinGap-eDRX-TDD-r15 ENUMERATED {ms40, ms240, ms1000, ms2000} OPTIONAL ]]
}
-- ASN1STOP
```
**UE-RadioPagingInfo field descriptions**

**ce-ModeA, ce-ModeB**
Indicates whether the UE supports operation in CE mode A and/or B, as specified in TS 36.211 [21] and TS 36.213 [23].

**ue-Category, ue-CategoryDL**
UE category as defined in TS 36.306 [5]. A category M2 UE shall always include the field `ue-CategoryDL-v1310` in this version of the specification.

**wakeUpSignal, wakeUpSignal-TDD**
Indicates whether the UE supports WUS for paging, as specified in TS 36.213 [22] and TS 36.304 [4]. If this field is included, the minimum gap between WUS and associated PO for DRX is fixed as 40 ms.

**wakeUpSignalMinGap-eDRX, wakeUpSignalMinGap-eDRX-TDD**
Indicates the minimum gap the UE supports between WUS and associated PO for eDRX as specified in TS 36.213 [22] and TS 36.304 [4]. Value ms40 corresponds to 40 ms, ms240 corresponds to 240 ms and so on. If this field is included, the UE shall also indicate support of WUS for paging.

---

**UE-TimersAndConstants**

The IE `UE-TimersAndConstants` contains timers and constants used by the UE in either RRC_CONNECTED or RRC_IDLE.

**UE-TimersAndConstants information element**

```
-- ASN1START

UE-TimersAndConstants ::= SEQUENCE {
  t300        ENUMERATED {           
   ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},
  t301        ENUMERATED {           
   ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},
  t310        ENUMERATED {           
   ms0, ms50, ms100, ms200, ms500, ms1000, ms2000},
  n310        ENUMERATED {           
   n1, n2, n3, n4, n6, n8, n10, n20},
  t311        ENUMERATED {           
   ms1000, ms3000, ms5000, ms10000, ms15000, ms20000, ms30000},
  n311        ENUMERATED {           
   n1, n2, n3, n4, n5, n6, n8, n10},
  ...,
[[ t300-v1310 ENUMERATED {           
    ms2500, ms3000, ms3500, ms4000, ms5000, ms6000, ms8000, ms10000} OPTIONAL, -- Need OR
   t301-v1310 ENUMERATED {           
    ms2500, ms3000, ms3500, ms4000, ms5000, ms6000, ms8000, ms10000} OPTIONAL -- Need OR
  ],
[[ t310-v1330 ENUMERATED {ms4000, ms6000} OPTIONAL -- Need OR
  ],
[[ t300-r15 ENUMERATED {ms4000, ms6000, ms8000, ms10000, ms15000, ms25000, ms40000, ms60000} OPTIONAL -- Cond EDT
  ]}

-- ASN1STOP
```

**UE-TimersAndConstants field descriptions**

**n3xy**
Constants are described in section 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on.

**t3xy**
Timers are described in section 7.3. Value ms0 corresponds with 0 ms, ms50 corresponds with 50 ms and so on. EUTRAN includes an extended value `t3xy-v1310` and `t3xy-v1330` only in the Bandwidth Reduced (BR) version of the SIB. UEs that support Coverage Enhancement (CE) mode B shall use the extended values `t3xy-v1310` and `t3xy-v1330`, if present, and ignore the value signaled by `t3xy` (without the suffix). `t300-r15` is only applicable for EDT. UE performing EDT shall use `t300-r15`, if present.
Conditional presence | Explanation
--- | ---
EDT | The field is optionally present. Need OR, if edt-Parameters is present in SIB2; otherwise the field is not present and the UE shall delete any existing value for this field.

---

**VisitedCellInfoList**

The IE *VisitedCellInfoList* includes the mobility history information of maximum of 16 most recently visited cells or time spent outside E-UTRA. The most recently visited cell is stored first in the list. The list includes cells visited in RRC_IDLE and RRC_CONNECTED states.

**VisitedCellInfoList** information element

```asn1
VisitedCellInfoList-r12 ::= SEQUENCE (SIZE (1..maxCellHistory-r12)) OF VisitedCellInfo-r12
VisitedCellInfo-r12 ::=    SEQUENCE {
  visitedCellId-r12     CHOICE {
    cellGlobalId-r12      CellGlobalIdEUTRA,
    pci-arfcn-r12       SEQUENCE {
      physCellId-r12       PhysCellId,
      carrierFreq-r12       ARFCN-ValueEUTRA-r9
    }                OPTIONAL,
  }
  timeSpent-r12      INTEGER (0..4095),
...}
```

**VisitedCellInfoList** field descriptions

**timeSpent**

This field indicates the duration of stay in the cell or outside E-UTRA approximated to the closest second. If the duration of stay exceeds 4095s, the UE shall set it to 4095s.

---

**WLAN-OffloadConfig**

The IE *WLAN-OffloadConfig* includes information for traffic steering between E-UTRAN and WLAN. The fields are applicable to both RAN-assisted WLAN interworking based on access network selection and traffic steering rules and RAN-assisted WLAN interworking based on ANDSF policies unless stated otherwise in the field description.

**WLAN-OffloadConfig** information element

```asn1
WLAN-OffloadConfig-r12 ::=    SEQUENCE {
  thresholdRSRP-r12      SEQUENCE {
    thresholdRSRP-Low-r12     RSRP-Range,
    thresholdRSRP-High-r12     RSRP-Range
  }                 OPTIONAL, -- Need OR
  thresholdRSRQ-r12      SEQUENCE {
    thresholdRSRQ-Low-r12     RSRQ-Range,
    thresholdRSRQ-High-r12     RSRQ-Range
  }                 OPTIONAL, -- Need OR
  thresholdRSRQ-OnAllSymbolsWithWB-r12 SEQUENCE {
    thresholdRSRQ-OnAllSymbolsWithWB-Low-r12   RSRQ-Range,
    thresholdRSRQ-OnAllSymbolsWithWB-High-r12   RSRQ-Range
  }                 OPTIONAL, -- Need OP
  thresholdRSRQ-OnAllSymbols-r12 SEQUENCE {
    thresholdRSRQ-OnAllSymbolsLow-r12   RSRQ-Range,
    thresholdRSRQ-OnAllSymbolsHigh-r12   RSRQ-Range
  }                 OPTIONAL, -- Need OP
  thresholdRSRQ-WB-r12     SEQUENCE {
    thresholdRSRQ-WB-Low-r12     RSRQ-Range,
    thresholdRSRQ-WB-High-r12     RSRQ-Range
  }                 OPTIONAL, -- Need OP
  thresholdChannelUtilization-r12 SEQUENCE {
    thresholdChannelUtilizationLow-r12   INTEGER (0..255),
    thresholdChannelUtilizationHigh-r12   INTEGER (0..255)
  }
```

**timeSpent**

This field indicates the duration of stay in the cell or outside E-UTRA approximated to the closest second. If the duration of stay exceeds 4095s, the UE shall set it to 4095s.
thresholdBackhaul-Bandwidth-r12  ::=  ENUMERATED
{r0, r4, r8, r16, r32, r64, r128, r256, r512,
 r1024, r2048, r4096, r8192, r16384, r32768, r65536, r131072,
 r262144, r524288, r1048576, r2097152, r4194304, r8388608,
 r16777216, r33554432, r67108864, r134217728, r268435456,
 r536870912, r1073741824, r2147483648, r4294967296}

-- ASN1STOP
**WLAN-OffloadConfig field descriptions**

**offloadPreferenceIndicator**
Indicates the offload preference indicator. Parameter: OPI in TS 24.312 [66]. Only applicable to RAN-assisted WLAN interworking based on ANDSF policies.

**thresholdBackhaulDLBandwidth-High**
Indicates the backhaul available downlink bandwidth threshold used by the UE for traffic steering to WLAN. Parameter: ThreshBackhaulRateDLWLAN, High in TS 36.304 [4]. Value in kilobits/second. Value rN corresponds to N kbps.

**thresholdBackhaulDLBandwidth-Low**
Indicates the backhaul available downlink bandwidth threshold used by the UE for traffic steering to E-UTRAN. Parameter: ThreshBackhaulRateDLWLAN, Low in TS 36.304 [4]. Value in kilobits/second. Value rN corresponds to N kbps.

**thresholdBackhaulULBandwidth-High**
Indicates the backhaul available uplink bandwidth threshold used by the UE for traffic steering to WLAN. Parameter: ThreshBackhaulRateULWLAN, High in TS 36.304 [4]. Value in kilobits/second. Value rN corresponds to N kbps.

**thresholdBackhaulULBandwidth-Low**
Indicates the backhaul available uplink bandwidth threshold used by the UE for traffic steering to E-UTRAN. Parameter: ThreshBackhaulRateULWLAN, Low in TS 36.304 [4]. Value in kilobits/second. Value rN corresponds to N kbps.

**thresholdChannelUtilization-High**
Indicates the WLAN channel utilization (BSS load) threshold used by the UE for traffic steering to E-UTRAN. Parameter: ThreshCHUtilWLAN, High in TS 36.304 [4].

**thresholdChannelUtilization-Low**
Indicates the WLAN channel utilization (BSS load) threshold used by the UE for traffic steering to WLAN. Parameter: ThreshCHUtilWLAN, Low in TS 36.304 [4].

**thresholdRSRP-High**
Indicates the RSRP threshold (in dBm) used by the UE for traffic steering to E-UTRAN. Parameter: ThreshServingOffloadULWLAN, HighP in TS 36.304 [4].

**thresholdRSRP-Low**
Indicates the RSRP threshold (in dBm) used by the UE for traffic steering to WLAN. Parameter: ThreshServingOffloadULWLAN, LowP in TS 36.304 [4].

**thresholdRSRQ-High, thresholdRSRQ-OnAllSymbolsHigh, thresholdRSRQ-WB-High, thresholdRSRQ-OnAllSymbolsWithWB-High**
Indicates the RSRQ threshold (in dB) used by the UE for traffic steering to E-UTRAN. Parameter: ThreshServingOffloadWLAN, HighQ in TS 36.304 [4]. The UE shall only apply one of threshold values of thresholdRSRQ-OnAllSymbolsWithWB-High, thresholdRSRQ-OnAllSymbolsHigh, thresholdRSRQ-WB-High and thresholdRSRQ-High as present in wlan-OffloadConfigCommon and forward this to upper layer. NOTE 1.

**thresholdRSRQ-Low, thresholdRSRQ-OnAllSymbolsLow, thresholdRSRQ-WB-Low, thresholdRSRQ-OnAllSymbolsWithWB-Low**
Indicates the RSRQ threshold (in dB) used by the UE for traffic steering to WLAN. Parameter: ThreshServingOffloadWLAN, LowQ in TS 36.304 [4]. The UE shall only apply one of threshold values of thresholdRSRQ-OnAllSymbolsWithWB-Low, thresholdRSRQ-OnAllSymbolsLow, thresholdRSRQ-WB-Low and thresholdRSRQ-Low as present in wlan-OffloadConfigCommon and forward this to upper layer. NOTE 1.

**thresholdWLAN-RSSI-High**
Indicates the WLAN RSSI threshold used by the UE for traffic steering to WLAN. Parameter: ThreshWLANRSSI, High in TS 36.304 [4]. Value 0 corresponds to -128dBm, 1 corresponds to -127dBm and so on.

**thresholdWLAN-RSSI-Low**
Indicates the WLAN RSSI threshold used by the UE for traffic steering to E-UTRAN. Parameter: ThreshWLANRSSI, Low in TS 36.304 [4]. Value 0 corresponds to -128dBm, 1 corresponds to -127dBm and so on.

**T-SteeringWLAN**
Indicates the timer value during which the rules should be fulfilled before starting traffic steering between E-UTRAN and WLAN. Parameter: TsteeringWLAN in TS 36.304 [4]. Only applicable to RAN-assisted WLAN interworking based on access network selection and traffic steering rules.

**NOTE 1:** Within SIB17, E-UTRAN includes the fields corresponding to same RSRQ types as included in SIB1. E.g. if E-UTRAN includes q-QualMinRSRQ-OnAllSymbols in SIB1 it also includes thresholdRSRQ-OnAllSymbols in SIB17. Within the RRCConnectionReconfiguration message E-UTRAN only includes thresholdRSRQ, setting the value according to the RSRQ type used for E-UTRAN. The UE shall apply the RSRQ fields (RSRQ threshold, high and low) corresponding to one RSRQ type i.e. the same as it applies for E-UTRAN.

### 6.3.7 MBMS information elements
The IE **MBMS-NotificationConfig** specifies the MBMS notification related configuration parameters, that are applicable for all MBSFN areas.

### MBMS-NotificationConfig information element

#### MBMS-NotificationConfig field descriptions

- **notificationOffset**
  Indicates, together with the `notificationRepetitionCoeff`, the radio frames in which the MCCH information change notification is scheduled i.e. the MCCH information change notification is scheduled in radio frames for which: \( \text{SFN mod notification repetition period} = \text{notificationOffset} \).

- **notificationRepetitionCoeff**
  Actual change notification repetition period common for all MCCHs that are configured= shortest modification period/ `notificationRepetitionCoeff`. The 'shortest modification period' corresponds with the lowest value of `mcch-ModificationPeriod` of all MCCHs that are configured. Value n2 corresponds to coefficient 2, and so on.

- **notificationSF-Index**
  Indicates the subframe used to transmit MCCH change notifications on PDCCH. FDD: Value 1, 2, 3, 4, 5 and 6 correspond with subframe #1, #2, #3, #6, #7, and #8 respectively. Value 7, 8, 9 and 10 correspond with subframe #0, #4, #5 and #9 respectively. If `notificationSF-Index-v1430` is included, UE ignores `notificationSF-Index-r9`. TDD: Value 1, 2, 3, 4, and 5 correspond with subframe #3, #4, #7, #8, and #9 respectively.

The IE **MBMS-ServiceList** provides the list of MBMS services which the UE is receiving or interested to receive.

### MBMS-ServiceList information element

The IE **MBSFN-AreaId** identifies an MBSFN area by means of a locally unique value at lower layers i.e. it concerns parameter \( N_{ID}^{MBSFN} \) in TS 36.211 [21, 6.10.2.1].

### MBSFN-AreaId information element
The IE `MBSFN-AreaInfoList` contains the information required to acquire the MBMS control information associated with one or more MBSFN areas.

### MBSFN-AreaInfoList information element

```asn1
MBSFN-AreaInfoList-r9 ::= SEQUENCE {SIZE(1..maxMBSFN-Area}) OF MBSFN-AreaInfo-r9

MBSFN-AreaInfo-r9 ::= SEQUENCE {
  mbsfn-AreaId-r9      MBSFN-AreaId-r12,
  non-MBSFNregionLength ENUMERATED {s1, s2},
  notificationIndicator-r9   INTEGER (0..7),
  mcch-Config-r9      SEQUENCE {
    mcch-RepetitionPeriod-r9     ENUMERATED {rf32, rf64, rf128, rf256},
    mcch-Offset-r9     INTEGER (0..10),
    mcch-ModificationPeriod-r9 ENUMERATED {rf512, rf1024},
    sf-AllocInfo-r9     BIT STRING (SIZE(6)),
    signallingMCS-r9    ENUMERATED {n2, n7, n13, n19}
  },
  ...,
  [[ mcch-Config-r14    SEQUENCE {
      mcch-RepetitionPeriod-v14-r30 ENUMERATED {rf1, rf2, rf4, rf8, rf16 } OPTIONAL, -- Need OR
      mcch-ModificationPeriod-v14-r30 ENUMERATED {rf1, rf2, rf4, rf8, rf16, rf32, rf64, rf128, rf256, spare7} OPTIONAL -- Need OR
    }]
    subcarrierSpacingMBMS-r14 ENUMERATED {khz-7dot5, khz-1dot25} OPTIONAL -- Need OR
  ]
}
```

---

---
**MBSFN-AreaInfoList** field descriptions

**mcch-ModificationPeriod**
Defines periodically appearing boundaries, i.e. radio frames for which SFN mod \(mcch-ModificationPeriod = 0\). The contents of different transmissions of MCCH information can only be different if there is at least one such boundary in between them. In case \(mcch-ModificationPeriod\)-v1430 is configured, the UE shall ignore the \(mcch-ModificationPeriod\)-r9.

**mcch-Offset**
Indicates, together with the \(mcch-RepetitionPeriod\), the radio frames in which MCCH is scheduled i.e. MCCH is scheduled in radio frames for which: SFN mod \(mcch-Offset\).

**mcch-RepetitionPeriod**
Defines the interval between transmissions of MCCH information, in radio frames. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on. In case \(mcch-RepetitionPeriod\)-v1430 is configured, the UE shall ignore the \(mcch-RepetitionPeriod\)-r9.

**non-MBSFNregionLength**
Indicates how many symbols from the beginning of the subframe constitute the non-MBSFN region. This value applies in all subframes of the MBSFN area used for PMCH transmissions as indicated in the MSI. The values s1 and s2 correspond with 1 and 2 symbols, respectively: see TS 36.211 [21, Table 6.7-1].

**notificationIndicator**
Indicates which PDCCH bit is used to notify the UE about change of the MCCH applicable for this MBSFN area. Value 0 corresponds with the least significant bit as defined in TS 36.212 [22, 5.3.3.1] and so on.

**sf-AllocInfo**
Indicates the subframes of the radio frames indicated by the \(mcch-RepetitionPeriod\) and \(mcch-Offset\), that may carry MCCH. Value "1" indicates that the corresponding subframe is allocated. The following mapping applies:

- **FDD**: The first/leftmost bit defines the allocation for subframe #1 of the radio frame indicated by \(mcch-RepetitionPeriod\) and \(mcch-Offset\), the second bit for #2, the third bit for #3, the fourth bit for #6, the fifth bit for #7 and the sixth bit for #8.
- **TDD**: The first/leftmost bit defines the allocation for subframe #3 of the radio frame indicated by \(mcch-RepetitionPeriod\) and \(mcch-Offset\), the second bit for #4, third bit for #7, fourth bit for #8, fifth bit for #9. Uplink subframes are not allocated. The last bit is not used.

**signallingMCS**
Indicates the MCS applicable for the subframes indicated by the field \(sf-AllocInfo\) and for each (P)MCH that is configured for this MBSFN area, for the first subframe allocated to the (P)MCH within each MCH scheduling period (which may contain the MCH scheduling information provided by MAC). Value n2 corresponds with the value 2 for parameter \(\text{MCS}\) in TS 36.213 [23, Table 7.1.7.1-1], and so on.

**subcarrierSpacingMBMS**
The value indicates subcarrier spacing for MBSFN subframes and khz-7dot5 refers to 7.5kHz subcarrier spacing and khz-1dot25 refers to 1.25 kHz subcarrier spacing as defined in TS36.211 [21, 6.12]. These subframes do not have non-MBSFN region. If \(\text{subcarrierSpacingMBMS}\) is present, then \(\text{non-MBSFNregionLength}\) shall be ignored. EUTRAN configures parameter \(\text{subcarrierSpacingMBMS}\) only when the MBSFN subframes have subcarrier spacing other than 15kHz.

---

**MBSFN-SubframeConfig**
The IE **MBSFN-SubframeConfig** defines subframes that are reserved for MBSFN in downlink.

**MBSFN-SubframeConfig** information element

```asn1
MBSFN-SubframeConfig ::= SEQUENCE {
  radioframeAllocationPeriod ENUMERATED {n1, n2, n4, n8, n16, n32},
  radioframeAllocationOffset INTEGER (0..7),
  subframeAllocation CHOICE {
    oneFrame BIT STRING (SIZE(6)),
    fourFrames BIT STRING (SIZE(24))
  }
}
MBSFN-SubframeConfig-v1430 ::= SEQUENCE {
  subframeAllocation-v1430 CHOICE {
    oneFrame-v1430 BIT STRING (SIZE(2)),
    fourFrames-v1430 BIT STRING (SIZE(8))
  }
}
```
MBSFN-SubframeConfig field descriptions

fourFrames
A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:

FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #1, #2, #3, #6, #7, and #8 in the sequence of the four radio-frames.

TDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #3, #4, #7, #8, and #9 in the sequence of the four radio-frames. The last four bits are not used. E-UTRAN allocates uplink subframes only if eimta-MainConfig is configured.

fourFrames-v1430
A bit-map indicating MBSFN subframe allocation in four consecutive radio frames, "1" denotes that the corresponding subframe is allocated for MBSFN. The bitmap is interpreted as follows:

FDD: Starting from the first radioframe and from the first/leftmost bit in the bitmap, the allocation applies to subframes #4 and #9 in the sequence of the four radio-frames.

oneFrame
"1" denotes that the corresponding subframe is allocated for MBSFN. The following mapping applies:

FDD: The first/leftmost bit defines the MBSFN allocation for subframe #1, the second bit for #2, third bit for #3, fourth bit for #6, fifth bit for #7, sixth bit for #8.

TDD: The first/leftmost bit defines the allocation for subframe #3, the second bit for #4, third bit for #7, fourth bit for #8, fifth bit for #9. E-UTRAN allocates uplink subframes only if eimta-MainConfig is configured. The last bit is not used.

oneFrame-v1430
"1" denotes that the corresponding subframe is allocated for MBSFN. The following mapping applies:

FDD: The first/leftmost bit defines the MBSFN allocation for subframe #4 and the second bit for #9.

radioFrameAllocationPeriod, radioFrameAllocationOffset
Radio-frames that contain MBSFN subframes occur when equation SFN mod radioFrameAllocationPeriod = radioFrameAllocationOffset is satisfied. Value n1 for radioframeAllocationPeriod denotes value 1, n2 denotes value 2, and so on. When fourFrames is used for subframeAllocation, the equation defines the first radio frame referred to in the description below. Values n1 and n2 are not applicable when fourFrames is used.

subframeAllocation
Defines the subframes that are allocated for MBSFN within the radio frame allocation period defined by the radioFrameAllocationPeriod and the radioFrameAllocationOffset.

—

PMCH-InfoList
The IE PMCH-InfoList specifies configuration of all PMCHs of an MBSFN area, while IE PMCH-InfoListExt includes additional PMCHs, i.e. extends the PMCH list using the general principles specified in 5.1.2. The information provided for an individual PMCH includes the configuration parameters of the sessions that are carried by the concerned PMCH. For all PMCH that E-UTRAN includes in PMCH-InfoList, the list of ongoing sessions has at least one entry.

PMCH-InfoList information element

```asn1
-- ASN1START
PMCH-InfoList-r9 ::= SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF PMCH-Info-r9
PMCH-InfoListExt-r12 ::= SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF PMCH-InfoExt-r12
PMCH-Info-r9 ::= SEQUENCE {
    pmch-Config-r9        PMCH-Config-r9,
    mbms-SessionInfoList-r9   MBMS-SessionInfoList-r9,
    ...
}
PMCH-InfoExt-r12 ::= SEQUENCE {
    pmch-Config-r12        PMCH-Config-r12,
    mbms-SessionInfoList-r12   MBMS-SessionInfoList-r9,
    ...
}
MBMS-SessionInfoList-r9 ::= SEQUENCE (SIZE (0..maxSessionPerPMCH)) OF MBMS-SessionInfo-r9
MBMS-SessionInfo-r9 ::= SEQUENCE {
    tmgi-r9        TMGI-r9,
    sessionId-r9      OCTET STRING (SIZE (1)) OPTIONAL, -- Need OR
    logicalChannelIdentity-r9   INTEGER (0..maxSessionPerPMCH-1),
    ...
}
PMCH-Config-r9 ::= SEQUENCE {
    sf-AllocEnd-r9      INTEGER (0..1535),
```
dataMCS-r9 ::= INTEGER (0..28),
mch-SchedulingPeriod-r9 ::= ENUMERATED {
  rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024),
  ...
}

PMCH-Config-r12 ::= SEQUENCE {
  sf-AllocEnd-r12 ::= INTEGER (0..1535),
  dataMCS-r12 ::= CHOICE {
    normal-r12 ::= INTEGER (0..28),
    higherOrder-r12 ::= INTEGER (0..27)
  },
  mch-SchedulingPeriod-r12 ::= ENUMERATED {
    rf4, rf8, rf16, rf32, rf64, rf128, rf256, rf512, rf1024),
    ...
  },
  mch-SchedulingPeriod-v1430 ::= ENUMERATED {rf1, rf2} OPTIONAL -- Need OR
}

TMGI-r9 ::= SEQUENCE {
  plmn-Id-r9 ::= CHOICE {
    plmn-Index-r9 ::= INTEGER (1..maxPLMN-r11),
    explicitValue-r9 ::= PLMN-Identity
  },
  serviceId-r9 ::= OCTET STRING (SIZE (3))
}

-- ASN1STOP

**PMCH-InfoList field descriptions**

**dataMCS**
Indicates the value for parameter MC in TS 36.213 [23], which defines the MCS applicable for the subframes of this (P)MCH as indicated by the field commonSF-Alloc. Value normal corresponds to Table 7.1.7.1-1 and value higherOrder corresponds to Table 7.1.7.1-1A. The MCS does however neither apply to the subframes that may carry MCCH i.e. the subframes indicated by the field sf-AllocInfo within SystemInformationBlockType13 nor for the first subframe allocated to this (P)MCH within each MCH scheduling period (which may contain the MCH scheduling information provided by MAC).

**mch-SchedulingPeriod**
Indicates the MCH scheduling period i.e. the periodicity used for providing MCH scheduling information at lower layers (MAC) applicable for an MCH. Value rf8 corresponds to 8 radio frames, rf16 corresponds to 16 radio frames and so on. The mch-SchedulingPeriod starts in the radio frames for which: SFN mod mch-SchedulingPeriod = 0. E-UTRAN configures mch-SchedulingPeriod of the (P)MCH listed first in PMCH-InfoList to be smaller than or equal to mch-RepetitionPeriod. In case mch-SchedulingPeriod-v1430 is configured, the UE shall ignore mch-SchedulingPeriod-r12.

**plmn-Index**
Index of the entry across the plmn-IdentityList fields within SystemInformationBlockType1.

**sessionId**
Indicates the optional MBMS Session Identity, which together with TMGI identifies a transmission or a possible retransmission of a specific MBMS session: see TS 29.061 [51, Sections 20.5, 17.7.11, 17.7.15]. The field is included whenever upper layers have assigned a session identity i.e. one is available for the MBMS session in E-UTRAN.

**serviceld**
Uniquely identifies the identity of an MBMS service within a PLMN. The field contains octet 3 - 5 of the IE Temporary Mobile Group Identity (TMGI) as defined in TS 24.008 [49]. The first octet contains the third octet of the TMGI, the second octet contains the fourth octet of the TMGI and so on.

**sf-AllocEnd**
Indicates the last subframe allocated to this (P)MCH within a period identified by field commonSF-AllocPeriod. The subframes allocated to (P)MCH corresponding with the nth entry in pmch-InfoList are the subsequent subframes starting from either the next subframe after the subframe identified by sf-AllocEnd of the (n-1)th listed (P)MCH or, for n=1, the first subframe defined by field commonSF-Alloc, through the subframe identified by sf-AllocEnd of the nth listed (P)MCH. Value 0 corresponds with the first subframe defined by field commonSF-Alloc.
6.3.7a SC-PTM information elements

-- SC-MTCH-InfoList

The IE SC-MTCH-InfoList provides the list of ongoing MBMS sessions transmitted via SC-MRB and for each MBMS session, the associated G-RNTI and scheduling information.

**SC-MTCH-InfoList information element**

```plaintext
-- ASN1START

SC-MTCH-InfoList-r13 ::= SEQUENCE { SIZE (0..maxSC-MTCH-r13) } OF SC-MTCH-Info-r13

SC-MTCH-Info-r13 ::= SEQUENCE (
  mbmsSessionInfo-r13 MBMSSessionInfo-r13,
  g-RNTI-r13 BIT STRING(SIZE(16)),
  sc-mtch-schedulingInfo-r13 SC-MTCH-SchedulingInfo-r13 OPTIONAL, -- Need OP
  sc-mtch-neighbourCell-r13 BIT STRING (SIZE(maxNeighCell-SCPTM-r13)) OPTIONAL, -- Need OP
  ...
[ p-a-r13 ENUMERATED { dB-6, dB-4dot77, dB-3, dB-1dot77, dB0, dB1, dB2, dB3 } OPTIONAL -- Need ON
  ]
}

MBMSSessionInfo-r13 ::= SEQUENCE {
  tmgi-r13 TMGI-r9,
  sessionId-r13 OCTET STRING (SIZE (1)) OPTIONAL -- Need OR
}

SC-MTCH-SchedulingInfo-r13 ::= SEQUENCE {
  onDurationTimerSCPTM-r13 ENUMERATED {
    psf1, psf2, psf3, psf4, psf5, psf6, psf8, psf10, psf20, psf30, psf40, psf50, psf60, psf80, psf100, psf200},
  drx-InactivityTimerSCPTM-r13 ENUMERATED {
    psf0, psf1, psf2, psf4, psf8, psf10, psf20, psf40, psf80, psf160, psf320, psf640, psf960, psf1280, psf1920, psf2560},
  schedulingPeriodStartOffsetSCPTM-r13 CHOICE {
    sf10 INTEGER(0..10),
    sf20 INTEGER(0..20),
    sf32 INTEGER(0..32),
    sf40 INTEGER(0..40),
    sf64 INTEGER(0..64),
    sf80 INTEGER(0..80),
    sf128 INTEGER(0..128),
    sf160 INTEGER(0..160),
    sf256 INTEGER(0..256),
    sf320 INTEGER(0..320),
    sf512 INTEGER(0..512),
    sf640 INTEGER(0..640),
    sf1024 INTEGER(0..1024),
    sf2048 INTEGER(0..2048),
    sf4096 INTEGER(0..4096),
    sf8192 INTEGER(0..8192),
  },
  ...
}

-- ASN1STOP
```
**SC-MTCH-InfoList field descriptions**

**drx-InactivityTimerSCPTM**
Timer for SC-MTCH in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf0 corresponds to 0 PDCCH sub-frame and behaviour as specified in 7.3.2 applies, psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.

**g-RNTI**
G-RNTI used to scramble the scheduling and transmission of a SC-MTCH.

**mbmsSessionInfo**
Indicates the ongoing MBMS session in a SC-MTCH.

**onDurationTimerSCPTM**
Timer for SC-MTCH reception in TS 36.321 [6]. Value in number of PDCCH sub-frames. Value psf1 corresponds to 1 PDCCH sub-frame, psf2 corresponds to 2 PDCCH sub-frames and so on.

**p-a**
Parameter: $P'_a$, for the SC-MTCH per G-RNTI, see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

**schedulingPeriodStartOffsetSCPTM**
SCPTM-SchedulingCycle and SCPTM-SchedulingOffset in TS 36.321 [6]. The value of SCPTM-SchedulingCycle is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of SCPTM-SchedulingOffset is in number of sub-frames. The E-UTRAN does not configure a maximum value 2048 for sf2048, 4096 for sf4096 or 8192 for sf8192.

**sc-mtch-neighbourCell**
Indicates neighbour cells which also provide this service on SC-MTCH. The first bit is set to 1 if the service is provided on SC-MTCH in the first cell in scptmNeighbourCellList, otherwise it is set to 0. The second bit is set to 1 if the service is provided on SC-MTCH in the second cell in scptmNeighbourCellList, and so on. If this field is absent, the UE shall assume that this service is not available on SC-MTCH in any neighbour cell.

**sc-mtch-schedulingInfo**
DRX information for the SC-MTCH. If this field is absent, the SC-MTCH may be scheduled in any subframe.

---

**SC-MTCH-InfoList-BR**

The IE SC-MTCH-InfoList-BR provides the list of ongoing MBMS sessions transmitted via SC-MRB and for each MBMS session, the associated G-RNTI and scheduling information.

**SC-MTCH-InfoList-BR information element**

```
-- ASN1START
SC-MTCH-InfoList-BR-r14 ::= SEQUENCE (SIZE (0..maxSC-MTCH-BR-r14)) OF SC-MTCH-Info-BR-r14

SC-MTCH-Info-BR-r14 ::= SEQUENCE {
  sc-mtch-CarrierFreq-r14     ARFCN-ValueEUTRA-r9,
  mbmsSessionInfo-r14      MBMSSessionInfo-r13,
  g-RNTI-r14        BIT STRING(SIZE(16)),
  sc-mtch-schedulingInfo-r14   SC-MTCH-SchedulingInfo-BR-r14    OPTIONAL, -- Need OP
  sc-mtch-neighbourCell-r14    BIT STRING (SIZE(maxNeighCell-SCPTM-r13)) OPTIONAL, -- Need OP
  mpdcch-Narrowband-SC-MTCH-r14    INTEGER (1..maxAvailNarrowBands-r13),
  mpdcch-NumRepetition-SC-MTCH-r14  ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256},
  mpdcch-StartSF-SC-MTCH-r14     CHOICE {
    fdd-r14        ENUMERATED {v1, v1dot5, v2, v2dot5, v4, v5, v8, v10},
    tdd-r14        ENUMERATED {v1, v2, v4, v5, v8, v10, v20},
  },
  mpdcch-PDSCH-HoppingConfig-SC-MTCH-r14  ENUMERATED {on, off},
  mpdcch-GenerateConfig-SC-MTCH-r14    ENUMERATED {ce-ModeA, ce-ModeB},
  mpdcch-Offset-SC-MTCH-r14     ENUMERATED {bw1dot4, bw5},
  mpdcch-PDSCH-CEmodeConfig-SC-MTCH-r14  ENUMERATED {zero, one Eighth, one Quarter, three Eighth, one Half, five Eighth, three Quarter, seven Eighth},
  p-a-r14          ENUMERATED { dB-6, dB-4 dot 77, dB-3, dB-1 dot 77, dB0, dB1, dB2, dB3}    OPTIONAL, -- Need OR
  ...
}

SC-MTCH-SchedulingInfo-BR-r14::= SEQUENCE {
  onDurationTimerSCPTM-r14        ENUMERATED {
```
drx-InactivityTimerSCPTM-r14

    ENUMERATED {
        psf0, psf1, psf2, psf4, psf8, psf16,
        psf32, psf64, psf128, psf256, psf512,
        psf1024, psf2048, psf4096, psf8192, psf16384},

schedulingPeriodStartOffsetSCPTM-r14

    CHOICE {
        sf10    INTEGER(0..9),
        sf20    INTEGER(0..19),
        sf32    INTEGER(0..31),
        sf40    INTEGER(0..39),
        sf64    INTEGER(0..63),
        sf80    INTEGER(0..79),
        sf128   INTEGER(0..127),
        sf160   INTEGER(0..159),
        sf256   INTEGER(0..255),
        sf320   INTEGER(0..319),
        sf512   INTEGER(0..511),
        sf640   INTEGER(0..639),
        sf1024  INTEGER(0..1023),
        sf2048  INTEGER(0..2047),
        sf4096  INTEGER(0..4095),
        sf8192  INTEGER(0..8191)
    },

-- ASN1STOP
**SC-MTCH-InfoList-BR field descriptions**

**drx-InactivityTimerSCPTM**
Timer for SC-MTCH in TS 36.321 [6]. Value in number of MPDCCH sub-frames. Value psf0 corresponds to 0 MPDCCH sub-frame and behaviour as specified in 7.3.2 applies, psf1 corresponds to 1 MPDCCH sub-frame, psf2 corresponds to 2 MPDCCH sub-frames and so on.

**g-RNTI**
G-RNTI used to scramble the scheduling and transmission of a SC-MTCH

**mbmsSessionInfo**
Indicates the ongoing MBMS session in a SC-MTCH.

**mpdcch-Narrowband-SC-MTCH**
Narrowband for MPDCCH for SC-MTCH, see TS 36.213 [23].

**mpdcch-NumRepetitions-SC-MTCH**
The maximum number of MPDCCH repetitions the UE needs to monitor for SC-MTCH, see TS 36.213 [23].

**mpdcch-Offset-SC-MTCH**
Fractional period offset of starting subframes for MPDCCH search space for SC-MTCH, see TS 36.213 [23].

**mpdcch-PDSCH-CEmodeConfig-SC-MTCH**
Coverage enhancement mode configuration for MPDCCH/PDSCH for SC-MTCH, see TS 36.213 [23].

**mpdcch-PDSCH-HoppingConfig-SC-MTCH**
Frequency hopping configuration for MPDCCH/PDSCH for SC-MTCH, see TS 36.213 [23].

**mpdcch-PDSCH-MaxBandwidth-SC-MTCH**
Maximum PDSCH channel bandwidth for SC-MTCH, see TS 36.213 [23]. Value bw1dot4 corresponds to 1.4 MHz channel bandwidth and value bw5 corresponds to 5 MHz channel bandwidth. Corresponding maximum TBS are specified in TS 36.213 [23, 7.1.7.2].

**mpdcch-StartSF-SC-MTCH**
Starting subframes configuration of the MPDCCH search space for SC-MTCH, see TS 36.213 [23].

**onDurationTimerSCPTM**
Timer for SC-MTCH reception in TS 36.321 [6]. Value in number of MPDCCH sub-frames. Value psf300 corresponds to 300 MPDCCH sub-frames, psf400 corresponds to 400 MPDCCH sub-frames and so on.

**schedulingPeriodStartOffsetSCPTM**
SCPTM-SchedulingCycle and SCPTM-SchedulingOffset in TS 36.321 [6]. The value of SCPTM-SchedulingCycle is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of SCPTM-SchedulingOffset is in number of sub-frames.

**sc-mtch-CarrierFreq**
Downlink carrier used for multicast SC-MTCH transmissions.

**sc-mtch-neighbourCell**
Indicates neighbour cells which also provide this service on SC-MTCH. The first bit is set to 1 if the service is provided on SC-MTCH in the first cell in scptmNeighbourCellList, otherwise it is set to 0. The second bit is set to 1 if the service is provided on SC-MTCH in the second cell in scptmNeighbourCellList, and so on. If this field is absent, the UE shall assume that this service is not available on SC-MTCH in any neighbour cell.

**sc-mtch-schedulingInfo**
DRX information for the SC-MTCH. If this field is absent, DRX is not used for SC-MTCH reception.

**p-a**
Parameter: $P_a$ for the SC-MTCH per G-RNTI, see TS 36.213 [23, 5.2]. Value dB-6 corresponds to -6 dB, dB-4.77 corresponds to -4.77 dB etc.

---

**SCPTM-NeighbourCellList**

The IE SCPTM-NeighbourCellList indicates a list of neighbour cells where ongoing MBMS sessions provided via SC-MR in the current cells are also provided.

```asn1
-- ASN1START
SCPTM-NeighbourCellList-r13 ::= SEQUENCE (SIZE (1..maxNeighCell-SCPTM-r13)) OF PCI-ARFCN-r13
PCI-ARFCN-r13 ::= SEQUENCE {
  physCellId-r13 ::= PhysCellId,
  carrierFreq-r13 ::= ARFCN-ValueEUTRA-r9 OPTIONAL }
-- ASN1STOP
```
### SCPTM-NeighbourCellList field description

<table>
<thead>
<tr>
<th>carrierFreq</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates the frequency of the neighbour cell indicated by physCellId. Absence of the IE means that the neighbour cell is on the same frequency as the current cell.</td>
</tr>
</tbody>
</table>

### 6.3.8 Sidelink information elements

#### `SL-AnchorCarrierFreqList-V2X`

The IE `SL-AnchorCarrierFreqList-V2X` specifies the SL V2X anchor frequencies i.e. frequencies that include inter-cARRIER resource configuration for V2X sidelink communication.

**`SL-AnchorCarrierFreqList-V2X` information element**

```plaintext
-- ASN1START
SL-AnchorCarrierFreqList-V2X-r14 ::= SEQUENCE (SIZE (1..maxFreqV2X-r14)) OF ARFCN-ValueEUTRA-r9
-- ASN1STOP
```

#### `SL-CBR-CommonTxConfigList`

The IE `SL-CBR-CommonTxConfigList` indicates the list of PSSCH transmission parameters (such as MCS, sub-channel number, retransmission number, CR limit) in `sl-CBR-PSSCH-TxConfigList`, and the list of CBR ranges in `cbr-RangeCommonConfigList`, to configure congestion control to the UE for V2X sidelink communication.

**`SL-CBR-CommonTxConfigList` information element**

```plaintext
-- ASN1START
SL-CBR-CommonTxConfigList-r14 ::= SEQUENCE {
  cbr-RangeCommonConfigList-r14 SEQUENCE (SIZE (1..maxSL-V2X-CBRConfig-r14)) OF SL-CBR-Levels-Config-r14,
  sl-CBR-PSSCH-TxConfigList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxConfig-r14)) OF SL-CBR-PSSCH-TxConfig-r14
}
SL-CBR-Levels-Config-r14 ::= SEQUENCE (SIZE (1..maxCBR-Level-r14)) OF SL-CBR-r14
SL-CBR-PSSCH-TxConfig-r14 ::= SEQUENCE {
  cr-Limit-r14     INTEGER(0..10000),
  tx-Parameters-r14    SL-PSSCH-TxParameters-r14
}
SL-CBR-r14 ::=      INTEGER(0..100)
-- ASN1STOP
```

**`SL-CBR-CommonTxConfigList` field descriptions**

<table>
<thead>
<tr>
<th><code>cbr-RangeCommonConfigList</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates the list of CBR ranges. Each entry of the list indicates in <code>SL-CBR-Levels-Config</code> the upper bound of the CBR range for the respective entry. The upper bounds of the CBR ranges are configured in ascending order for consecutive entries of <code>cbr-RangeCommonConfigList</code>. For the first entry of <code>cbr-RangeCommonConfigList</code> the lower bound of the CBR range is 0.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><code>cr-Limit</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates the maximum limit on the occupancy ratio. Value 0 corresponds to 0, value 1 to 0.0001, value 2 to 0.0002, and so on (i.e. in steps of 0.0001) until value 10000, which corresponds to 1.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><code>sl-CBR-PSSCH-TxConfigList</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates the list of available PSSCH transmission parameters (such as MCS, sub-channel number, retransmission number and CR limit) configurations.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><code>SL-CBR</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value 0 corresponds to 0, value 1 to 0.01, value 2 to 0.02, and so on.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><code>tx-Parameters</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates PSSCH transmission parameters.</td>
</tr>
</tbody>
</table>
The IE \textit{SL-CBR-PPPP-TxConfigList} indicates the mapping between PSSCH transmission parameter (such as MCS, PRB number, retransmission number, CR limit) sets by using the indexes of the configurations provided in \textit{sl-CBR-PSSCH-TxConfigList}, CBR ranges by an index to the entry of the CBR range configuration in \textit{cbr-RangeCommonConfigList}, and PPPP ranges. It also indicates the default PSSCH transmission parameters to be used when CBR measurement results are not available.

\textbf{SL-CBR-PPPP-TxConfigList} information element

```
-- ASN1START

SL-CBR-PPPP-TxConfigList-r14 ::= SEQUENCE (SIZE (1..8)) OF SL-PPPP-TxConfigIndex-r14

SL-PPPP-TxConfigIndex-r14 ::= SEQUENCE {
    priorityThreshold-r14   SL-Priority-r13,
    defaultTxConfigIndex-r14  INTEGER(0..maxCBR-Level-1-r14),
    cbr-ConfigIndex-r14    INTEGER(0..maxSL-V2X-CBRConfig-1-r14),
    tx-ConfigIndexList-r14  SEQUENCE (SIZE (1..maxCBR-Level-r14)) OF Tx-ConfigIndex-r14
}

Tx-ConfigIndex-r14 ::= INTEGER(0..maxSL-V2X-TxConfig-l-r14)

SL-CBR-PPPP-TxConfigList-v1530 ::= SEQUENCE (SIZE (1..8)) OF SL-PPPP-TxConfigIndex-v1530

SL-PPPP-TxConfigIndex-v1530 ::= SEQUENCE {
    mcs-PSSCH-RangeList-r15    SEQUENCE (SIZE (1..maxCBR-Level-r14)) OF MCS-PSSCH-Range-r15
    OPTIONAL  --Need OR
}

MCS-PSSCH-Range-r15 ::= SEQUENCE{
    minMCS-PSSCH-r15   INTEGER (0..31),
    maxMCS-PSSCH-r15   INTEGER (0..31)
}

SL-CBR-PPPP-TxConfigList-r15 ::= SEQUENCE (SIZE (1..8)) OF SL-PPPP-TxConfigIndex-r15

SL-PPPP-TxConfigIndex-r15 ::= SEQUENCE {
    priorityThreshold-r15   SL-Priority-r13,
    defaultTxConfigIndex-r15  INTEGER(0..maxCBR-Level-1-r14),
    cbr-ConfigIndex-r15    INTEGER(0..maxSL-V2X-CBRConfig-1-r14),
    tx-ConfigIndexList-r15  SEQUENCE (SIZE (1..maxCBR-Level-r14)) OF Tx-ConfigIndex-r14,
    mcs-PSSCH-RangeList-r15    SEQUENCE (SIZE (1..maxCBR-Level-r14)) OF MCS-PSSCH-Range-r15
}

-- ASN1STOP
```
**SL-CBR-PPP-TxConfigList field descriptions**

- **cbr-ConfigIndex**
  Indicates the CBR ranges to be used by an index to the entry of the CBR range configuration in `cbr-RangeCommonConfigList`.

- **defaultTxConfigIndex**
  Indicates the PSSCH transmission parameters to be used by the UEs which do not have available CBR measurement results, by means of an index to the corresponding entry in `tx-ConfigIndexList`. Value 0 indicates the first entry in `tx-ConfigIndexList`. The field is ignored if the UE has available CBR measurement results.

- **mcs-PSSCH-RangeList**
  If included, this field applies to the PPPP(s) indicated by the `priorityThreshold` and each entry in this field sequentially corresponds to each CBR range indicated by `cbr-ConfigIndex`.

- **minMCS-PSSCH, maxMCS-PSSCH**
  Indicates the minimum and maximum MCS values which correspond to both the MCS table in Table 8.6.1-1 in TS 36.213 [23] and the MCS table supporting 64QAM in Table 14.1.1-2 in TS 36.213 [23] used for transmission on PSSCH.

- **priorityThreshold**
  Indicates the upper bound of PPPP range which is associated with the configurations in `cbr-ConfigIndex` and in `tx-ConfigIndexList`. The upper bounds of the PPPP ranges are configured in ascending order for consecutive entries of `SL-PPP-TxConfigIndex` in `SL-CBR-PPP-TxConfigList`. For the first entry of `SL-PPP-TxConfigIndex`, the lower bound of the PPPP range is 1.

**SL-CBR-PPP-TxConfigList-v1530**
If included, E-UTRAN shall include the same number of entries, and listed in the same order, as in `SL-CBR-PPP-TxConfigList-r14`.

- **tx-ConfigIndexList**
  Indicates the list of the PSSCH transmission parameters and CR limit by the indexes to the entries of the configurations in `SL-CBR-PPP-TxConfigList`. Each index in `tx-ConfigIndexList` sequentially maps to each CBR range indicated by `cbr-ConfigIndex`.

---

**SL-CommConfig**

The IE `SL-CommConfig` specifies the dedicated configuration information for sidelink communication. In particular it concerns the transmission resource configuration for sidelink communication on the primary frequency.

**SL-CommConfig information element**

```asn1
-- ASN1START
SL-CommConfig-r12 ::= SEQUENCE {  
  commTxResources-r12  CHOICE {  
    release NULL,  
    setup CHOICE {  
      scheduled-r12 SEQUENCE {  
        sl-RNTI-r12 C-RNTI,  
        sl-Mac-MainConfig-r12 SL-MacMainConfigSL-r12,  
        sl-CommTxConfig-r12 SL-CommResourcePool-r12,  
        mcs-r12 INTEGER (0..28) OPTIONAL -- Need OP  
      },  
      ue-Selected-r12 SEQUENCE {  
        poolToAddModList-r12 SL-CommTxPoolToAddModList-r12 OPTIONAL, -- Need ON  
        poolToReleaseList-r12 SL-TxPoolToReleaseList-r12 OPTIONAL, -- Need ON  
      }  
    }  
  }  
}
...
[[ SL-CommConfig-v1310 ::= SEQUENCE {  
    release NULL,  
    setup CHOICE {  
      scheduled-v1310 SEQUENCE {  
        logicalChGroupInfoList-r13 LogicalChGroupInfoList-r13,  
        multipleTx-r13 BOOLEAN },  
      ue-Selected-v1310 SEQUENCE {  
        poolToAddModList-r13 SL-CommTxPoolToAddModList-r13 OPTIONAL -- Need ON  
      }  
    }  
  }  
-- Need ON
```
LogicalChGroupInfoList-r13 ::= SEQUENCE (SIZE (1..maxLCG-r13)) OF SL-PriorityList-r13

SL-CommTxPoolToAddModList-r12 ::= SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-CommTxPoolToAddMod-r12

SL-CommTxPoolToAddModListExt-r13 ::= SEQUENCE (SIZE (1..maxSL-TxPool-v1310)) OF SL-CommTxPoolToAddModExt-r13

SL-CommTxPoolToAddMod-r12 ::= SEQUENCE {
  poolIdentity-r12  SL-TxPoolIdentity-r12,
  pool-r12       SL-CommResourcePool-r12
}

SL-CommTxPoolToAddModExt-r13 ::= SEQUENCE {
  poolIdentity-v1310     SL-TxPoolIdentity-v1310,
  pool-r13       SL-CommResourcePool-r12
}

MAC-MainConfigSL-r12 ::= SEQUENCE {
  periodic-BSR-TimerSL     PeriodicBSR-Timer-r12  OPTIONAL, -- Need ON
  retx-BSR-TimerSL      RetxBPR-Timer-r12
}

-- ASN1STOP

**SL-CommConfig field descriptions**

**commTxAllowRelayDedicated**
Indicates whether the UE is allowed to transmit relay related sidelink communication using the configured dedicated transmission resources i.e. either via scheduled or via UE selected resources.

**commTxPoolNormalDedicated**
Indicates a pool of transmission resources the UE is allowed to use while in RRC_CONNECTED.

**logicalChGroupInfoList**
Indicates for each logical channel group the list of associated priorities, used as specified in TS 36.321 [6], in order of increasing logical channel group identity.

**mcs**
Indicates the MCS as defined in TS 36.212 [23, 14.2.1]. If not configured, the selection of MCS is up to UE implementation.

**multipleTx**
Indicates whether the UE should perform multiple transmissions to different destinations in one SC period in accordance with TS 36.321 [6, 5.14.1.1]. Value TRUE indicates that multiple transmissions should be performed.

**sc-CommTxConfig**
Indicates a pool of resources for SC when E-UTRAN schedules Tx resources (i.e. when indices included in DCI format 5 indicate the actual data resources to be used as specified in TS 36.212 [22, 5.3.3.1.9]).

**scheduled**
Indicates the configuration for the case E-UTRAN schedules the transmission resources based on sidelink specific BSR from the UE.

**ue-Selected**
Indicates the configuration for the case the UE selects the transmission resources from a pool of resources configured by E-UTRAN.

-- ASN1STOP

**SL-CommResourcePool**

The IE `SL-CommResourcePool` and `SL-CommResourcePoolV2X` specifies the configuration information for an individual pool of resources for sidelink communication and V2X sidelink communication respectively. The IE covers the configuration of both the sidelink control information and the data.

**SL-CommResourcePool information element**

-- ASN1START
SL-CommTxPoolList-r12 ::= SEQUENCE {size (1..maxSL-TxPool-r12)) OF SL-CommResourcePool-r12
SL-CommTxPoolListExt-r13 ::= SEQUENCE {size (1..maxSL-TxPool-v1310)) OF SL-CommResourcePool-r12
SL-CommTxPoolListV2X-r14 ::= SEQUENCE {size (1..maxSL-V2X-TxPool-r14)) OF SL-CommResourcePoolV2X-r14
SL-CommRxPoolList-r12 ::= SEQUENCE {size (1..maxSL-RxPool-r12)) OF SL-CommResourcePool-r12
SL-CommRxPoolListV2X-r14 ::= SEQUENCE {size (1..maxSL-V2X-RxPool-r14)) OF SL-CommResourcePoolV2X-r14
SL-CommResourcePool-r12 ::= SEQUENCE {
  sc-CP-Len-r12  SL-CP-Len-r12,
  sc-Period-r12  SL-PeriodComm-r12,
  sc-TF-ResourceConfig-r12  SL-TF-ResourceConfig-r12,
  data-CP-Len-r12  SL-CP-Len-r12,
  dataHoppingConfig-r12  SL-HoppingConfigComm-r12,
  ue-SelectedResourceConfig-r12  SEQUENCE {
    data-TF-ResourceConfig-r12  SL-TF-ResourceConfig-r12,
    trpt-Subset-r12  SL-TRPT-Subset-r12 OPTIONAL -- Need OP
  } OPTIONAL, -- Need OR
  txParametersNCell-r12  SEQUENCE {
    tdd-Config-r12  TDD-Config OPTIONAL, -- Need OP
    syncConfigIndex-r12  INTEGER (0..15)
  } OPTIONAL, -- Need OR
  rxParametersNCell-r12  SEQUENCE {
    sizeSubchannel-r14  ENUMERATED {
      n4, n5, n6, n8, n9, n10, n12, n15, n16, n18, n20, n25, n30, n48, n50, n72, n75, n96, n100, spare1, spare2, spare3, spare4, spare5, spare6, spare7, spare8, spare9, spare10, spare11, spare12, spare13, spare14
    },
    numSubchannel-r14  ENUMERATED {n1, n3, n5, n8, n10, n15, n20, spare1},
    startRB-Subchannel-r14  INTEGER (0..99),
    startRB-PSCCH-PSSCH-r14  INTEGER (0..99) OPTIONAL, -- Need OR
    rxParametersNCell-r14  SEQUENCE {
      tdd-Config-r14  TDD-Config OPTIONAL, -- Need OP
      syncConfigIndex-r14  INTEGER (0..15)
    } OPTIONAL, -- Need OR
    dataTxParameters-r14  SL-TxParameters-r12 OPTIONAL, -- Cond Tx
    zoneID-r14  INTEGER (0..7) OPTIONAL, -- Need OR
    thresholdRSSI-CBR-r14  INTEGER (0..45) OPTIONAL, -- Need OR
    poolReportId-r14  SL-V2X-TxPoolReportIdentity-r14 OPTIONAL, -- Need OR
    cbr-pssch-TxConfigList-r14  SL-CBR-PPP-TxConfigList-r14 OPTIONAL, -- Need OR
    resourceSelectionConfigP2X-r14  SL-P2X-ResourceSelectionConfig-r14 OPTIONAL, -- Cond P2X
    syncAllowed-r14  SL-SyncAllowed-r14 OPTIONAL, -- Need OR
    restrictResourceReservationPeriod-r14  SL-RestrictResourceReservationPeriodList-r14 OPTIONAL, -- Need OR
  }",
  priorityList-r15  SL-PriorityList-r13 OPTIONAL, -- Cond Tx
  minT2ValueList-r15  SL-MinT2ValueList-r15 OPTIONAL, -- Need OR
cbr-pssch-TxConfigList-v1530  SL-CBR-PPP-TxConfigList-v1530 OPTIONAL -- Need OR
}]
SL-CommRxPoolListV2X-r14 ::= SEQUENCE {
  sl-OffsetIndicator-r14  SL-OffsetIndicator-r12 OPTIONAL, -- Need OR
  sl-Subframe-r14  SubframeBitmapSL-r14,
  adjacencyPSSCH-PSSCH-r14  BOOLEAN,
  sizeSubchannel-r14  ENUMERATED {
    n4, n5, n6, n8, n9, n10, n12, n15, n16, n18, n20, n25, n30, n48, n50, n72, n75, n96, n100, spare1, spare2, spare3, spare4, spare5, spare6, spare7, spare8, spare9, spare10, spare11, spare12, spare13, spare14
  },
  numSubchannel-r14  ENUMERATED {n1, n3, n5, n8, n10, n15, n20, spare1},
  startRB-Subchannel-r14  INTEGER (0..99),
  startRB-PSCCH-PSSCH-r14  INTEGER (0..99) OPTIONAL, -- Need OR
  rxParametersNCell-r14  SEQUENCE {
    tdd-Config-r14  TDD-Config OPTIONAL, -- Need OP
    syncConfigIndex-r14  INTEGER (0..15)
  } OPTIONAL, -- Need OR
  dataTxParameters-r14  SL-TxParameters-r12 OPTIONAL, -- Cond Tx
  zoneID-r14  INTEGER (0..7) OPTIONAL, -- Need OR
  thresholdRSSI-CBR-r14  INTEGER (0..45) OPTIONAL, -- Need OR
  poolReportId-r14  SL-V2X-TxPoolReportIdentity-r14 OPTIONAL, -- Need OR
  cbr-pssch-TxConfigList-r14  SL-CBR-PPP-TxConfigList-r14 OPTIONAL, -- Need OR
  resourceSelectionConfigP2X-r14  SL-P2X-ResourceSelectionConfig-r14 OPTIONAL, -- Cond P2X
  syncAllowed-r14  SL-SyncAllowed-r14 OPTIONAL, -- Need OR
  restrictResourceReservationPeriod-r14  SL-RestrictResourceReservationPeriodList-r14 OPTIONAL, -- Need OR
  sl-MinT2ValueList-r15  SL-MinT2ValueList-r15 OPTIONAL, -- Need OR
cbr-pssch-TxConfigList-v1530  SL-CBR-PPP-TxConfigList-v1530 OPTIONAL -- Need OR
}]

SL-CommRxPoolListV2X-r14 ::= SEQUENCE {
  sl-OffsetIndicator-r14  SL-OffsetIndicator-r12 OPTIONAL, -- Need OR
  sl-Subframe-r14  SubframeBitmapSL-r14,
  adjacencyPSSCH-PSSCH-r14  BOOLEAN,
  sizeSubchannel-r14  ENUMERATED {
    n4, n5, n6, n8, n9, n10, n12, n15, n16, n18, n20, n25, n30, n48, n50, n72, n75, n96, n100, spare1, spare2, spare3, spare4, spare5, spare6, spare7, spare8, spare9, spare10, spare11, spare12, spare13, spare14
  },
  numSubchannel-r14  ENUMERATED {n1, n3, n5, n8, n10, n15, n20, spare1},
  startRB-Subchannel-r14  INTEGER (0..99),
  startRB-PSCCH-PSSCH-r14  INTEGER (0..99) OPTIONAL, -- Need OR
  rxParametersNCell-r14  SEQUENCE {
    tdd-Config-r14  TDD-Config OPTIONAL, -- Need OP
    syncConfigIndex-r14  INTEGER (0..15)
  } OPTIONAL, -- Need OR
  dataTxParameters-r14  SL-TxParameters-r12 OPTIONAL, -- Cond Tx
  zoneID-r14  INTEGER (0..7) OPTIONAL, -- Need OR
  thresholdRSSI-CBR-r14  INTEGER (0..45) OPTIONAL, -- Need OR
  poolReportId-r14  SL-V2X-TxPoolReportIdentity-r14 OPTIONAL, -- Need OR
  cbr-pssch-TxConfigList-r14  SL-CBR-PPP-TxConfigList-r14 OPTIONAL, -- Need OR
  resourceSelectionConfigP2X-r14  SL-P2X-ResourceSelectionConfig-r14 OPTIONAL, -- Cond P2X
  syncAllowed-r14  SL-SyncAllowed-r14 OPTIONAL, -- Need OR
  restrictResourceReservationPeriod-r14  SL-RestrictResourceReservationPeriodList-r14 OPTIONAL, -- Need OR
  sl-MinT2ValueList-r15  SL-MinT2ValueList-r15 OPTIONAL, -- Need OR
cbr-pssch-TxConfigList-v1530  SL-CBR-PPP-TxConfigList-v1530 OPTIONAL -- Need OR
}]

SL-TRPT-Subset-r12 ::= BIT STRING (SIZE (3..5))

SL-V2X-TxPoolReportIdentity-r14 ::= INTEGER (1..maxSL-PoolToMeasure-r14)

SL-MinT2ValueList-r15 ::= SEQUENCE {priorityList-r15  SL-PriorityList-r13,
  minT2ValueList-r15  INTEGER (10..20)"}
### SL-CommResourcePool field descriptions

**adjacencyPSCCH-PSSCH**
Indicates whether a UE shall always transmit PSCCH and PSSCH in adjacent RBs (indicated by TRUE) or in non-adjacent RBs (indicated by FALSE) (see TS 36.213 [23]).

**cbr-psch-TxConfigList**
Indicates the mapping between PPPPs, CBR ranges by using indexes of the entry in cbr-RangeCommonConfigList, and PSSCH transmission parameters and CR limit by using indexes of the entry in sl-CBR-PSSCH-TxConfigList. If SL-CommResourcePoolV2X is included in MobilityControlInfoV2X, it refers to cbr-MobilityTxConfigList for cbr-RangeCommonConfigList and sl-CBR-PSSCH-TxConfigList. If SL-CommResourcePoolV2X is included in SL-V2X-ConfigDedicated, it refers to cbr-DedicatedTxConfigList for cbr-RangeCommonConfigList and sl-CBR-PSSCH-TxConfigList. Otherwise, it refers to cbr-CommonTxConfigList included in the SystemInformationBlockType21 or SystemInformationBlockType26. Otherwise, the field is absent.

**resourceSelectionConfigP2X**
Indicates the allowed resource selection mechanism(s), i.e. partial sensing and/or random selection, for P2X related V2X sidelink communication.

**restrictResourceReservationPeriod**
If configured, the field restrictResourceReservationPeriod configured in v2x-ResourceSelectionConfig shall be ignored for transmission on this pool.

**sc-Period**
Indicates the period over which resources are allocated in a cell for SC and over which scheduled and UE selected data transmissions occur, see PSCCH period in TS 36.213 [23]. Value in number of subframes. Value sf40 corresponds to 40 subframes, sf80 corresponds to 80 subframes and so on. E-UTRAN configures values sf40, sf80, sf160 and sf320 for FDD and for TDD config 1 to 5, values sf70, sf140 and sf280 for TDD config 0, and finally values sf60, sf120 and sf240 for TDD config 6.

**sizeSubchannel**
Indicates the number of PRBs of each subchannel in the corresponding resource pool (see TS 36.213 [23]). The value n5 denotes 5 PRBs; n6 denotes 6 PRBs and so on. E-UTRAN configures values n5, n6, n10, n15, n20, n25, n50, n75 and n100 in the case of adjacencyPSCCH-PSSCH set to TRUE; otherwise, E-UTRAN configures values n4, n5, n6, n8, n9, n10, n12, n15, n16, n18, n20, n30, n48, n72 and n96 in the case of adjacencyPSCCH-PSSCH set to FALSE.

**sl-minT2ValueList**
Indicates a list of minimum value sets for the parameter T2 which is used for UE autonomous resource selection in this resource pool (see TS 36.213 [23]).

**sl-OffsetIndicator**
Indicates the offset of the first subframe of a resource pool, i.e., the starting subframe of the repeating bitmap sl-Subframe, within a SFN cycle. If absent, the resource pool starts from first subframe of SFN=0. This field is not applicable to V2X sidelink communication.

**sl-Subframe**
Indicates the bitmap of the resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [23]).

**startRB-PSCCH-Pool**
Indicates the lowest RB index of the PSCCH pool (see TS 36.213 [23]). This field is absent when a pool is (pre)configured such that a UE always transmits SC and data in adjacent RBs in the same subframe.

**startRB-Subchannel**
Indicates the lowest RB index of the subchannel with the lowest index (see TS 36.213 [23]).

**syncAllowed**
Indicates the allowed synchronization reference(s) which is (are) allowed to use the configured resource pool.

**syncConfigIndex**
Indicates the synchronisation configuration that is associated with a reception pool, by means of an index to the corresponding entry of commSyncConfig in SystemInformationBlockType18 for sidelink communication, or by means of an index to the corresponding entry of v2x-SyncConfig in SystemInformationBlockType21 or SystemInformationBlockType26 for V2X sidelink communication.

**tdd-Config**
TDD configuration associated with the reception pool of the cell indicated by syncConfigIndex. Absence of the field indicates that the duplex mode is FDD and no TDD specific physical channel configuration is applicable.

**threshS-RSSI-CBR**
Indicates the S-RSSI threshold for determining the contribution of a sub-channel to the CBR measurement, as specified in TS 36.214 [48]. Value 0 corresponds to -112 dBm, value 1 to -110 dBm, value n to (-112 + n*2) dBm, and so on.
**SL-CommResourcePool field descriptions**

**adjacencyPSCCH-PSSCH**
Indicates whether a UE shall always transmit PSCCH and PSSCH in adjacent RBs (indicated by TRUE) or in non-adjacent RBs (indicated by FALSE) (see TS 36.213 [23]).

**trpt-Subset**
Indicates the subset of T-RPT available (see TS 36.213 [23, 14.1.1.1]). Consists of a bitmap which is used to indicate the set of available 'k' values to be used for sidelink communication (see TS 36.213 [23, 14.1.1.3]). If T-RPT subset configuration is not signaled/ preconfigured then UE assumes the whole T-RPT set is available.

**zoneID**
Indicates the zone ID for which the UE shall use this resource pool as described in 5.10.13.2. The field is absent in v2x-CommTxPoolExceptional, p2x-CommTxPoolNormalCommon, p2x-CommTxPoolNormal and v2x-CommRxPool in SIB21, in SIB26 or in mobilityControlInfoV2X.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tx</strong></td>
<td>The field is mandatory present when included in commTxPoolNormalDedicated, commTxPoolNormalDedicatedExt, commTxPoolNormalCommon, commTxPoolNormalCommonExt, commTxPoolExceptional, sc-CommTxConfig, v2x-CommTxPoolNormalCommon, v2x-CommTxPoolNormalExceptional, v2x-CommTxPoolNormalDedicated, p2x-CommTxPoolNormalCommon or v2x-CommTxPoolNormal and p2x-CommTxPoolNormal in v2x-InterFreqInfoList. Otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>P2X</strong></td>
<td>The field is mandatory present when included in p2x-CommTxPoolNormalCommon, v2x-CommTxPoolNormalDedicated in sl-V2X-ConfigDedicated for P2X related V2X sidelink communication or p2x-CommTxPoolNormal in v2x-InterFreqInfoList. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**SL-CommTxPoolSensingConfig**

The IE SL-CommTxPoolSensingConfig specifies V2X sidelink communication configurations used for UE autonomous resource selection.

**SL-CommTxPoolSensingConfig information element**

```asn1
-- ASN1START

SL-CommTxPoolSensingConfig-r14 ::= SEQUENCE {
  pssch-TxConfigList-r14     SL-PSSCH-TxConfigList-r14,
  thresPSSCH-RSRP-List-r14    SL-ThresPSSCH-RSRP-List-r14,
  restrictResourceReservationPeriod-r14 SL-RestrictResourceReservationPeriodList-r14
  OPTIONAL, -- Need OR
  probResourceKeep-r14    ENUMERATED {v0, v0dot2, v0dot4, v0dot6, v0dot8, spare3, spare2, spare1},
  p2x-SensingConfig-r14     SEQUENCE {
    minNumCandidateSF-r14    INTEGER (1..13),
    gapCandidateSensing-r14  BIT STRING (SIZE (10))
  }  OPTIONAL, -- Need OR
  sl-ReselectAfter-r14    ENUMERATED {n1, n2, n3, n4, n5, n6, n7, n8, n9, spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL -- Need OR
}

-- ASN1STOP
```
---

**SL-CommTxPoolSensingConfig** field descriptions

- **gapCandidateSensing**
  Indicates which subframe should be sensed when a certain subframe is considered as a candidate resource (see TS 36.213 [23]).

- **minNumCandidateSF**
  Indicates the minimum number of subframes that are included in the possible candidate resources.

- **p2x-SensingConfig**
  Indicates the sensing configuration for P2X related V2X sidelink communication transmission only.

- **probResourceKeep**
  Indicates the probability with which the UE keeps the current resource when the resource reselection counter reaches zero for sensing based UE autonomous resource selection (see TS 36.321 [6]).

- **pssch-TxConfigList**
  Indicates PSSCH TX parameters such as MCS, PRB number, retransmission number, associated to different UE absolute speeds and different synchronization reference types for UE autonomous resource selection (see TS 36.213 [23]).

- **restrictResourceReservationPeriod**
  Indicates which values are allowed for the signaling of the resource reservation period in PSCCH.

- **sl-ReselectAfter**
  Indicates the number of consecutive skipped transmissions before triggering resource reselection for V2X sidelink communication (see TS 36.321 [6]).

- **thresPSSCH-RSRP-List**
  Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted (see TS 36.213 [23]). A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold.

---

**SL-CP-Len**

The IE **SL-CP-Len** indicates the cyclic prefix length, see TS 36.211 [21].

**SL-CP-Len information element**

```
-- ASN1START
SL-CP-Len-r12 ::= ENUMERATED {normal, extended}
-- ASN1STOP
```

---

**SL-DiscConfig**

The IE **SL-DiscConfig** specifies the dedicated configuration information for sidelink discovery.

**SL-DiscConfig information element**

```
-- ASN1START
SL-DiscConfig-r12 ::= SEQUENCE {
  discTxResources-r12      CHOICE {
    release         NULL, setup      CHOICE {
      scheduled-r12      SEQUENCE {
        discTxConfig-r12     SL-DiscResourcePool-r12 OPTIONAL, -- Need ON
        discTF-IndexList-r12    SL-TF-IndexPairList-r12 OPTIONAL, -- Need ON
        discHoppingConfig-r12    SL-HoppingConfigDisc-r12 OPTIONAL, -- Need ON
      }, ue-Selected-r12     SEQUENCE {
        discTxPoolDedicated-r12   SL-TxPoolToReleaseList-r12 OPTIONAL, -- Need ON
        poolToAddModList-r12      SL-DiscTxPoolToAddModList-r12 OPTIONAL, -- Need ON
      } OPTIONAL, -- Need ON
    },
    ue-Selected-r12     SEQUENCE {
      discTxPoolDedicated-r12   SL-TxPoolToReleaseList-r12 OPTIONAL, -- Need ON
      poolToAddModList-r12      SL-DiscTxPoolToAddModList-r12 OPTIONAL, -- Need ON
    } OPTIONAL, -- Need ON
  }
  ...
  [[ discTF-IndexList-v1260      CHOICE {
    release         NULL, setup      SEQUENCE {
      discTF-IndexList-r12b    SL-TF-IndexPairList-r12b
    }
  ]]
}]
-- ASN1STOP
```
SL-DiscSysInfoToReportFreqList-r13 ::= SEQUENCE (SIZE (1..maxFreq)) OF ARFCN-ValueEUTRA-r9

SL-DiscTxInfoInterFreqListAdd-r13 ::= SEQUENCE (SIZE (1..maxFreq)) OF SL-DiscTxResourceInfoPerFreq-r13

SL-DiscTxResourceInfoPerFreq-r13 ::= SEQUENCE {
    discTxFreqToAddModList-r13    SEQUENCE (SIZE (1..maxFreq)) OF SL-DiscTxResource-r13 OPTIONAL, -- Need ON,
    discTxFreqToReleaseList-r13    SEQUENCE (SIZE (1..maxFreq)) OF ARFCN-ValueEUTRA-r9 OPTIONAL, -- Need ON,
    ...
}

SL-DiscTxResource-r13 ::= CHOICE {
    release        NULL,
    setup          CHOICE {
        scheduled-r13    SL-DiscTxConfigScheduled-r13,
        ue-Selected-r13   SL-DiscTxPoolDedicated-r13
    }
}

SL-DiscTxPoolToAddModList-r12 ::=  SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-DiscTxPoolToAddMod-r12

SL-DiscTxPoolToAddMod-r12 ::=  SEQUENCE {
    poolIdentity-r12     SL-TxPoolIdentity-r12,
    pool-r12             SL-DiscResourcePool-r12
}

SL-DiscTxConfigScheduled-r13 ::=   SEQUENCE {
    discTxConfig-r13     SL-DiscResourcePool-r12 OPTIONAL, -- Need ON,
    ...
}
SL-DiscConfig field descriptions

discCellSelectionInfo
Parameters that may be used by the UE to select/ reselect a cell on the concerned non serving frequency. If absent, the UE acquires the information from the target cell on the concerned frequency. See TS 36.304 [4, 11.4].

discSysInfoToReportConfig
Indicates the request to start a SidelinkUEInformation procedure for reporting system information acquired during an inter-frequency discovery procedure.

discTF-IndexList
Indicates a list of time-frequency resource indices pair where each pair of indices corresponds to one discovery message. E-UTRAN only configures discTF-IndexList-r12b when configuring the UE with scheduled SL discovery Tx resources. When receiving discTF-IndexList-r12b, the UE shall only consider this field (and hence ignore discTF-IndexList-r12, if included or previously configured).

discTxConfig
Indicates the resources configuration used when E-UTRAN schedules Tx resources (i.e. the fields discSF-Index and discPRB-Index indicate the actual resources to be used).

discTxInterFreqInfo
Indicates frequency applicable for the resources indicated by discTxResources-r12 (i.e. original resource field may cover first inter-frequency), and possibly resource allocations on additional frequencies as may be indicated by field discTxInInterFreqListAdd.

discTxRefCarrierDedicated
Indicates if the PCell or an SCell is to be used as reference for DL measurements and synchronization, instead of the DL frequency paired with the one used to transmit sidelink discovery announcements on, see TS 36.213 [23, 14.3.1].

discTxResources
Indicates the resources assigned to the UE for discovery announcements, which can either be a pool from which the UE may select or a set of resources specifically assigned for use by the UE.

discTxResourcesPS
Indicates the resources assigned to the UE for PS discovery announcements, which can either be a pool from which the UE may select or a set of resources specifically assigned for use by the UE.

SL-TF-IndexPair
A pair of indices, one for the time domain and one for the frequency domain, indicating the start of resources within the pool covered by discTxConfig, see TS 36.211 [21, 9.5.6] for one discovery message. The upper limits of discSF-Index and discPRB-Index are defined in TS 36.213 [23, 14.3.1].
SL-DiscResourcePool

The IE *SL-DiscResourcePool* specifies the configuration information for an individual pool of resources for sidelink discovery.

**SL-DiscResourcePool** information element

```
-- ASN1START
SL-DiscTxPoolList-r12 ::= SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-DiscResourcePool-r12
SL-DiscRxPoolList-r12 ::= SEQUENCE (SIZE (1..maxSL-RxPool-r12)) OF SL-DiscResourcePool-r12
SL-DiscResourcePool-r12 ::= SEQUENCE {
  cp-Len-r12      SL-CP-Len-r12,
  discPeriod-r12   ENUMERATED {rf32, rf64, rf128,
                              rf256, rf512, rf1024, rf16-v1310, spare},
  numRetx-r12     INTEGER (0..3),
  numRepetition-r12 INTEGER (1..50),
  tf-ResourceConfig-r12   SL-TF-ResourceConfig-r12,
  txParameters-r12    SEQUENCE {
    txParametersGeneral-r12  SL-TxParameters-r12,
    ue-SelectedResourceConfig-r12 SEQUENCE {
      poolSelection-r12    CHOICE {
        rsrpBased-r12     SL-PoolSelectionConfig-r12,
        random-r12      NULL
      },
      txProbability-r12   ENUMERATED {p25, p50, p75, p100}
    } OPTIONAL  -- Need OR
  } OPTIONAL, -- Cond Tx
  rxParameters-r12    SEQUENCE {
    tdd-Config-r12     TDD-Config OPTIONAL, -- Need OR
    syncConfigIndex-r12   INTEGER (0..15)
  } OPTIONAL, -- Need OR
  ...,
[[ discPeriod-v1310   CHOICE {
    release        NULL,
    setup         ENUMERATED {rf4, rf6, rf7, rf8,
                               rf12, rf14, rf24, rf28}
  } OPTIONAL, -- Need ON
  rxParamAddNeighFreq-r13 CHOICE {
    release        NULL,
    setup         SEQUENCE {
      physCellId-r13   PhysCellIdList-r13
    }
  } OPTIONAL, -- Need ON
  txParamAddNeighFreq-r13 CHOICE {
    release        NULL,
    setup         SEQUENCE {
      physCellId-r13   PhysCellIdList-r13,
      p-Max           P-Max OPTIONAL, -- Need OP
      tdd-Config-r13   TDD-Config OPTIONAL, -- Cond TDD-OR
      tdd-Config-v1130 TDD-Config-v1130 OPTIONAL, -- Cond TDD-OR
      freqInfo         SEQUENCE {
        ul-CarrierFreq  ARFCN-ValueEUTRA OPTIONAL, -- Need OP
        ul-Bandwidth   ENUMERATED {n6, n15, n25, n50, n75, n100}
        additionalSpectrumEmission AdditionalSpectrumEmission
      },
      referenceSignalPower  INTEGER (-60..50),
      syncConfigIndex-r13   INTEGER (0..15)
    }
  } OPTIONAL, -- Need OR
} OPTIONAL, -- Need ON
[[ txParamAddNeighFreq-v1370 CHOICE {
    release        NULL,
    setup         SEQUENCE {
      freqInfo-v1370  SEQUENCE {
        additionalSpectrumEmission-v1370 AdditionalSpectrumEmission-v1010
      }
    }
  } OPTIONAL, -- Need ON
]}
PhysCellIdList-r13 ::= SEQUENCE (SIZE (1.. maxSL-DiscCells-r13)) OF PhysCellId
-- ASN1END
```
SL-PoolSelectionConfig-r12 ::= SEQUENCE {
    threshLow-r12    RSRP-RangeSL2-r12,
    threshHigh-r12   RSRP-RangeSL2-r12
}

--- ASN1STOP

SL-DiscResourcePool field descriptions

discPeriod
Indicates the period over which resources are allocated in a cell for discovery message transmission/reception, see PSCH period in TS 36.213 [23]. Value in number of radio frames. Value rf32 corresponds to 32 radio frames, rf64 corresponds to 64 radio frames and so on. The extended values apply for PS discovery (not only for sidelink relaying). When broadcasting an extended value, E-UTRAN sets the original field to spare to ensure legacy UEs ignore the concerned pool entry.

numRepetition
Indicates the number of times subframeBitmap is repeated for mapping to subframes that occurs within a discPeriod. The highest value E-UTRAN uses is value 5 for FDD and TDD configuration 0, value 13 for TDD configuration 1, value 25 for TDD configuration 2, value 17 for TDD configuration 3, value 25 for TDD configuration 4, value 50 for TDD configuration 5 and value 7 for TDD configuration 6. E-UTRAN configures numRepetition and subframeBitmap such that the mapped subframes do not exceed the discPeriod.

poolSelection
Indicates the mechanism for selecting a (transmission) pool when multiple candidates are provided. E-UTRAN configures the same value (i.e. a pool selection method) for all candidate pools within one pool list (discTxPoolCommon or discTxPoolDedicated) but the pool selection method in different pool lists may or may not be the same.

syncConfigIndex
Indicates the synchronisation configuration that is associated with a reception or transmission pool, by means of an index to the corresponding entry of discSyncConfig in SystemInformationBlockType19.

threshLow, threshHigh
Specifies the thresholds used to select a resource pool in RSRP based pool selection. The E-UTRAN should configure threshLow and threshHigh such that the UE selects only one resource pool upon RSRP based pool selection.

txProbability
Indicates the probability of transmitting announcement in a discovery period when configured with a pool of resources, see TS 36.321 [6].

Conditional presence

<table>
<thead>
<tr>
<th>TDD-OR</th>
<th>The field is optional present for TDD, need OR: it is not present for FDD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx</td>
<td>The field is mandatory present when included in discTxPoolDedicated or discTxPoolCommon. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

SL-DiscSysInfoReport

The IE SL-DiscSysInfoReport contains the parameters related to sidelink discovery acquired from system information of inter-frequency cells (including inter-PLMN).

SL-DiscSysInfoReport information element

--- ASN1START

SL-DiscSysInfoReport-r13 ::= SEQUENCE {
    plmn-IdentityList-r13   PLMN-IdentityList   OPTIONAL,
    cellIdentity-r13        CellIdentity        OPTIONAL,
    carrierFreqInfo-r13     ARFCN-ValueEUTRA-r9 OPTIONAL,
    discRxResources-r13     SL-DiscRxPoolList-r12 OPTIONAL,
    discTxPoolCommon-r13    SL-DiscTxPoolList-r12 OPTIONAL,
    discTxPowerInfo-r13     SL-DiscTxPowerInfoList-r12 OPTIONAL,
    discSyncConfig-r13      SL-SyncConfigNFreq-r13 OPTIONAL,
    discCellSelectionInfo-r13  SEQUENCE {
        q-RxLevMin-r13      Q-RxLevMin,     OPTIONAL
        q-RxLevMinOffset-r13 INTEGER (1..8) OPTIONAL
    }
    cellReselectionInfo-r13  SEQUENCE {
        q-Hyst-r13                  ENUMERATED {db0, db1, db2, db3, db4, db5, db6, db8, db10, db12, db14, db16, db18, db20, db22, db24},
        q-RxLevMin-r13              Q-RxLevMin,     OPTIONAL
        t-ReselectionEUTRA-r13     T-Reselection
    }
}

--- ASN1STOP
SL-DiscSysInfoReport field descriptions

- **carrierFreqInfo**
  Indicates the frequency of the cell from which the UE acquired the system information relevant for discovery.

- **cellIdentity**
  Indicates the identity of the cell from which the UE acquired the system information relevant for discovery.

- **plmn-IdentityList**
  Indicates the list of PLMN identity of the cell from which the UE acquired the system information relevant for discovery.

---

**SL-DiscTxPowerInfo**

The IE **SL-DiscTxPowerInfo** specifies power control parameters for one or more power classes.

**SL-DiscTxPowerInfo** information element

---

**discMaxTxPower**

Indicates the P-Max parameter used to calculate the maximum transmit power a UE configured with the concerned range class, see TS 24.333 [70, 4.2.11]. The first entry in **SL-DiscTxPowerInfoList** corresponds to UE range class 'short', the second entry corresponds to 'medium' and the third entry corresponds to 'long'.

---

**SL-GapConfig**

The IE **SL-GapConfig** indicates the gaps, requested or assigned, to enable the UE to receive or transmit sidelink discovery, intra or inter frequency (including inter-PLMN).

**SL-GapConfig** information element
---

**SL-GapConfig field descriptions**

- **gapOffset**
  Indicates the offset from the start of SFN 0 to the start of the first **gapPeriod**. If the SFN period is not an integer multiple of **gapPeriod**, no subframes within this period (i.e. from SFN 0 to offset) are considered part of the gap.

- **gapPeriod**
  Indicates the period by which **gapSubframeBitmap** is repeated.

- **gapSubframeBitmap**
  Indicates the subframes of one or more individual gaps, not only covering the subframes of the associated discovery resources but also including e.g. re-tuning and synchronisation delays. The UE and E-UTRAN signal bit strings of valid sizes only i.e. sizes equal to or less than **gapPeriod**. Value 1 indicates that the UE is allowed to use the subframe for sidelink discovery.

---

**SL-GapRequest**

The IE **SL-GapRequest** indicates the gaps requested by the UE to receive or transmit sidelink discovery, intra or inter frequency (including inter-PLMN).

**SL-GapRequest information element**

---

**SL-HoppingConfig**

The IE **SL-HoppingConfig** indicates the hopping configuration used for sidelink.

**SL-HoppingConfig information element**
**SL-HoppingConfig field descriptions**

| a | Per cell parameter: $N_{PSDCH}^{(1)}$ see TS 36.213 [23, 14.3.1]. |
| b | Per UE parameter: $N_{PSDCH}^{(2)}$ see TS 36.213 [23, 14.3.1]. |
| c | Per cell parameter: $N_{PSDCH}^{(3)}$ see TS 36.213 [23, 14.3.1]. |

**hoppingParameter**
Affects the hopping performed as specified in TS 36.213 [23, 14.1.1.2 and 14.1.1.4]. In case value 504 is received, the value used by the UE is 510.

**numSubbands**
Parameter: $N_a$ see TS 36.211 [21, 9.3.6].

**rb-Offset**
Parameter: $N_{RB}^{HO}$, see TS 36.211 [21, 9.3.6].

---

**SL-InterFreqInfoListV2X**

The IE `SL-InterFreqInfoListV2X` indicates synchronization and resource allocation configurations of the neighboring frequency for V2X sidelink communication.

**SL-InterFreqInfoListV2X information element**

```plaintext
-- ASN1START
SL-InterFreqInfoListV2X-r14 ::= SEQUENCE (SIZE (0..maxFreqV2X-1-r14)) OF SL-InterFreqInfoV2X-r14

SL-InterFreqInfoV2X-r14 ::= SEQUENCE {
  plmn-IdentityList-r14    PLMN-IdentityList   OPTIONAL,  -- Need OP
  v2x-CommCarrierFreq-r14  ARFCN-ValueEUTRA-r9,
  sl-MaxTxPower-r14        P-Max    OPTIONAL,  -- Need OR
  sl-Bandwidth-r14         ENUMERATED {n6, n15, n25, n50, n75, n100} OPTIONAL,  -- Need OR
  v2x-SchedulingPool-r14   SL-CommResourcePoolV2X-r14    OPTIONAL,  -- Need OR
  v2x-UE-ConfigList-r14   SL-V2X-UE-ConfigList-r14 OPTIONAL,  -- Need OR
  ...,
}[ [ additionalSpectrumEmissionV2X-r14  CHOICE {
    additionalSpectrumEmission-r14  AdditionalSpectrumEmission,
    additionalSpectrumEmission-v1440  AdditionalSpectrumEmission-v1010
  }  OPTIONAL  -- Need ON
  ],
  [ v2x-FreqSelectionConfigList-r15 SL-V2X-FreqSelectionConfigList-r15 OPTIONAL  --Need OR
  ] ]

-- ASN1STOP
```
### SL-InterFreqInfoListV2X field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>plmn-IdentityList</td>
<td>Indicates PLMN identities of this frequency for reception of V2X sidelink communication. If this field is not present, the UE considers this frequency for reception of V2X sidelink communication concerns the first PLMN entry in the <code>plmn-IdentityList</code> in <code>SystemInformationBlockType1</code>.</td>
</tr>
<tr>
<td>sl-MaxTxPower</td>
<td>Indicates the maximum transmission power for transmitting V2X sidelink communication on the corresponding frequency.</td>
</tr>
<tr>
<td>additionalSpectrumEmissionV2X</td>
<td>Indicates the <code>additionalSpectrumEmission</code> value defined in TS 36.101 [42, 6.2.4] for V2X sidelink communication.</td>
</tr>
<tr>
<td>v2x-FreqSelectionConfigList</td>
<td>Indicates the configuration information for the carrier selection for V2X sidelink communication transmission. The configuration applies to the carrier frequency identified by <code>v2x-CommCarrierFreq</code> (i.e. carrier specific configuration).</td>
</tr>
<tr>
<td>v2x-SchedulingPool</td>
<td>Indicates the resource pool for inter-carrier scheduled resource allocation. This field is configured in RRC dedicated signalling only when <code>scheduled</code> is configured in IE <code>SL-V2X-ConfigDedicated</code>.</td>
</tr>
<tr>
<td>v2x-UE-ConfigList</td>
<td>Indicates the inter-carrier resource configuration. If there is only one entry in the list without <code>physCellId</code> configured, the configuration is applied to the frequency identified by <code>v2x-CommCarrierFreq</code> (i.e. carrier specific configuration); if the entry of this field includes <code>physCellIdList</code>, the configuration is applied to the cell(s) identified by <code>physCellIdList</code> (i.e. cell specific configuration).</td>
</tr>
</tbody>
</table>

---

### SL-V2X-UE-ConfigList

The IE `SL-V2X-UE-ConfigList` indicates inter-frequency resource configuration per-carrier or per-cell.

### SL-V2X-UE-ConfigList information element

```plaintext
-- ASN1START

SL-V2X-UE-ConfigList-r14 ::= SEQUENCE (SIZE (1.. maxCellIntra)) OF SL-V2X-InterFreqUE-Config-r14

SL-V2X-InterFreqUE-Config-r14 ::= SEQUENCE { physCellIdList-r14 PhysCellIdList-r13 OPTIONAL, -- Need OR typeTxSync-r14 SL-TypeTxSync-r14 OPTIONAL, -- Need OR v2x-SyncConfig-r14 SL-SyncConfigListNFreqV2X-r14 OPTIONAL, -- Need OR v2x-CommRxPool-r14 SL-CommRxPoolListV2X-r14 OPTIONAL, -- Need OR v2x-CommTxPoolNormal-r14 SL-CommTxPoolListV2X-r14 OPTIONAL, -- Need OR v2x-CommTxPoolExceptional-r14 SL-CommResourcePoolV2X-r14 OPTIONAL, -- Need OR v2x-ResourceSelectionConfig-r14 SL-CommTxPoolSensingConfig-r14 OPTIONAL, -- Need OR zoneConfig-r14 SL-ZoneConfig-r14 OPTIONAL, -- Need OR offsetDFN-r14 INTEGER (0..1000) OPTIONAL, -- Need OR ... }

-- ASN1STOP
```
---

### SL-V2X-UE-ConfigList field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>offsetDFN</code></td>
<td>Indicates the timing offset for the UE to determine DFN timing when GNSS is used for timing reference. Value 0 corresponds to 0 milliseconds, value 1 corresponds to 0.001 milliseconds, value 2 corresponds to 0.002 milliseconds, and so on.</td>
</tr>
<tr>
<td><code>p2x-CommTxPoolNormal</code></td>
<td>Indicates the resources on a carrier frequency by which the UE may transmit P2X related V2X sidelink communication.</td>
</tr>
<tr>
<td><code>physCellIdList</code></td>
<td>If configured, the resource configuration is applicable for the cell(s) identified by this field. Otherwise, the resource configuration is for a given carrier frequency.</td>
</tr>
<tr>
<td><code>typeTxSync</code></td>
<td>Indicates the prioritized synchronization type (i.e. eNB or GNSS) for performing V2X sidelink communication on a carrier frequency.</td>
</tr>
<tr>
<td><code>v2x-CommRxPool</code></td>
<td>Indicates the resources on a carrier frequency by which the UE may receive V2X sidelink communication. This field is absent within <code>v2x-InterFreqInfoList</code> included in <code>RRCConnectionReconfiguration</code> except if received with MobilityControlInfo or MobilityControlInfoV2X.</td>
</tr>
<tr>
<td><code>v2x-CommTxPoolExceptional</code></td>
<td>Indicates the resources on a carrier frequency by which the UE may transmit V2X sidelink communication in exceptional conditions, as specified in 5.10.13.</td>
</tr>
<tr>
<td><code>v2x-CommTxPoolNormal</code></td>
<td>Indicates the resources on a carrier frequency by which the UE may transmit V2X sidelink communication.</td>
</tr>
<tr>
<td><code>v2x-SyncConfig</code></td>
<td>Indicates the synchronization configuration used for transmission/reception of SLSS on the given frequency.</td>
</tr>
</tbody>
</table>

---

### SL-OffsetIndicator

The IE `SL-OffsetIndicator` indicates the offset of the pool of resources relative to SFN 0 of the cell from which it was obtained or, when out of coverage, relative to DFN 0.

#### SL-OffsetIndicator information element

```asn1
-- ASN1START
SL-OffsetIndicator-r12 ::= CHOICE {
  small-r12        INTEGER (0..319),
  large-r12        INTEGER (0..10239)
}
SL-OffsetIndicatorSync-r12 ::= INTEGER (0..39)
SL-OffsetIndicatorSync-v1430 ::= INTEGER (40..159)
SL-OffsetIndicatorSync-r14 ::= INTEGER (0..159)
-- ASN1STOP
```

---

### SL-OffsetIndicator field descriptions

#### SL-OffsetIndicator

In `sc-TF-ResourceConfig`, it indicates the offset of the first period of pool of resources within a SFN cycle. For `data-TF-ResourceConfig`, it corresponds to the `offsetIndicator` as defined in TS 36.213 [23, 14.1.3].

#### SL-OffsetIndicatorSync

For sidelink discovery and sidelink communication, synchronisation resources are present in those SFN and subframes which satisfy the relation: 
(SFN*10+ Subframe Number) mod 40 = SL-OffsetIndicatorSync. For V2X sidelink communication, synchronisation resources are present in those SFN and subframes which satisfy the relation: 
(SFN*10+ Subframe Number) mod 160 = SL-OffsetIndicatorSync.

---

### SL-P2X-ResourceSelectionConfig

The IE `SL-P2X-ResourceSelectionConfig` includes the configuration of resource selection for P2X related V2X sidelink communication. E-UTRAN configures at least one resource selection mechanism.

#### SL-P2X-ResourceSelectionConfig information element

```asn1
-- ASN1START
```
SL-P2X-ResourceSelectionConfig-r14 ::= SEQUENCE {
  partialSensing-r14 ENUMERATED {true} OPTIONAL, -- Need OR
  randomSelection-r14 ENUMERATED {true} OPTIONAL -- Need OR
}
-- ASN1STOP

**SL-P2X-ResourceSelectionConfig field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>partialSensing</td>
<td>Indicates that partial sensing is allowed for UE autonomous resource selection in a resource pool.</td>
</tr>
<tr>
<td>randomSelection</td>
<td>Indicates that random selection is allowed for UE autonomous resource selection in a resource pool.</td>
</tr>
</tbody>
</table>

---

**SL-PeriodComm**

The IE *SL-PeriodComm* indicates the period over which resources allocated in a cell for sidelink communication.

**SL-PeriodComm information element**

```plaintext
-- ASN1START
SL-PeriodComm-r12 ::= ENUMERATED {sf40, sf60, sf70, sf80, sf120, sf140,
  sf160, sf240, sf280, sf320, spare6, spare5,
  spare4, spare3, spare2, spare}
-- ASN1STOP
```

---

**SL-Priority**

The IE *SL-Priority* indicates the one or more priorities of resource pool used for sidelink communication, or of a logical channel group used in case of scheduled sidelink communication resources, see TS 36.321 [6].

**SL-Priority information element**

```plaintext
-- ASN1START
SL-PriorityList-r13 ::= SEQUENCE (SIZE (1..maxSL-Prio-r13)) OF SL-Priority-r13
SL-Priority-r13 ::= INTEGER (1..8)
-- ASN1STOP
```

---

**SL-PSSCH-TxConfigList**

The IE *SL-PSSCH-TxConfigList* indicates PSSCH transmission parameters. When lower layers select parameters from the range indicated in IE *SL-PSSCH-TxConfigList*, the UE considers both configurations in IE *SL-PSSCH-TxConfigList* and the CBR-dependent configurations represented in IE *SL-CBR-PPPP-TxConfigList*. Only one IE *SL-PSSCH-TxConfig* is provided per *typeTxSync*.

**SL-PSSCH-TxConfigList information element**

```plaintext
-- ASN1START
SL-PSSCH-TxConfigList-r14 ::= SEQUENCE (SIZE (1..maxPSSCH-TxConfig-r14)) OF SL-PSSCH-TxConfig-r14
SL-PSSCH-TxConfig-r14 ::= SEQUENCE {
  typeTxSync-r14 SL-TypeTxSync-r14 OPTIONAL, -- Need OR
  thresUE-Speed-r14 ENUMERATED {kmph60, kmph80, kmph100, kmph120,
    kmph140, kmph160, kmph180, kmph200},
  parametersAboveThres-r14 SL-PSSCH-TxParameters-r14,
  parametersBelowThres-r14 SL-PSSCH-TxParameters-r14,
  ...
  [ parametersAboveThres-v1530 SL-PSSCH-TxParameters-v1530 OPTIONAL, -- Need OR
    parametersBelowThres-v1530 SL-PSSCH-TxParameters-v1530 OPTIONAL -- Need OR
  ]
}
```


---

**SL-PSSCH-TxParameters-r14** ::= SEQUENCE {
  minMCS-PSSCH-r14 INTEGER (0..31),
  maxMCS-PSSCH-r14 INTEGER (0..31),
  minSubChannel-NumberPSSCH-r14 INTEGER (1..20),
  maxSubchannel-NumberPSSCH-r14 INTEGER (1..20),
  allowedRetxNumberPSSCH-r14 ENUMERATED (n0, n1, both, spare),
  maxTxPower-r14 SL-TxPower-r14 OPTIONAL -- Cond CBR
}

**SL-PSSCH-TxParameters-v1530** ::= SEQUENCE {
  minMCS-PSSCH-r15 INTEGER (0..31),
  maxMCS-PSSCH-r15 INTEGER (0..31)
}

---

**SL-PSSCH-TxConfigList** field descriptions

**allowedRetxNumberPSSCH**
Indicates the allowed retransmission number for transmissions on PSSCH (see TS 36.213 [23]). The value n0 indicates no retransmission for a transport block allowed; the value n1 indicates that the UE shall perform one retransmission for a transport block; and the value both indicates that the UE may autonomously select no retransmission or one retransmission for a transport block.

**maxTxPower**
Indicates the maximum transmission power for transmission on PSSCH and PSCCH (see TS 36.213 [23]).

**minMCS-PSSCH, maxMCS-PSSCH**
Indicates the minimum and maximum MCS values used for transmissions on PSSCH (see TS 36.213 [23]). If included, minMCS-PSSCH-r15 and maxMCS-PSSCH-r15 correspond to both the MCS table in Table 8.6.1-1 in TS 36.213 [23] and the MCS table supporting 64QAM in Table 14.1.1-2 in TS 36.213 [23] used for transmission on PSSCH.

**minSubchannel-NumberPSSCH, maxSubchannel-NumberPSSCH**
Indicates the minimum and maximum number of sub-channels which may be used for transmissions on PSSCH (see TS 36.213 [23]).

**thresUE-Speed**
Indicates a UE speed threshold.

**typeTxSync**
Indicates the synchronization reference type (see TS 36.213 [23]). For configurations by the eNB, only gnss and enb can be configured; and for pre-configuration, only gnss and ue can be configured. If the field is absent, the configuration is applicable for all synchronization reference types.

**parametersAboveThres**
Indicates TX parameters for the UE speed above thresUE-Speed.

**parametersBelowThres**
Indicates TX parameters for the UE speed below thresUE-Speed.

---

**Conditional presence**

<table>
<thead>
<tr>
<th>CBR</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The field is optionally present, need OR, in IE SL-CBR-CommonTxConfigList-r14, or in IE SL-CBR-PreconfigTxConfigList-r14. Otherwise the field is not present. Need OR.</td>
</tr>
</tbody>
</table>

---

**SL-Reliability**

The IE **SL-Reliability** indicates one or more reliabilities of a logical channel group used in case of scheduled sidelink communication resources or traffic reliability(ies) associated with the reported traffic pattern for V2X sidelink communication; see TS 36.321 [6].

**SL-Reliability information element**

---

**-- ASN1START**

SL-ReliabilityList-r15 ::= SEQUENCE (SIZE (1..maxSL-Reliability-r15)) OF SL-Reliability-r15

SL-Reliability-r15 ::= INTEGER (1..8)

**-- ASN1STOP**
— **SL-RestrictResourceReservationPeriodList**

The IE **SL-RestrictResourceReservationPeriodList** indicates which values are allowed for the signaling of the resource reservation period in PSCCH for V2X sidelink communication, see TS 36.321 [6].

**SL-RestrictResourceReservationPeriodList information element**

```asn1
SL-RestrictResourceReservationPeriodList-r14 ::= SEQUENCE (SIZE (1..maxReservationPeriod-r14)) OF
  SL-RestrictResourceReservationPeriod-r14
SL-RestrictResourceReservationPeriod-r14 ::= ENUMERATED {v0dot2, v0dot5, v1, v2, v3, v4, v5,
  v6, v7, v8, v9, v10, spare4, spare3, spare2, spare1}
```

**SL-RestrictResourceReservationPeriodList field descriptions**

**SL-RestrictResourceReservationPeriod**

Value v0dot2 means **SL-RestrictResourceReservationPeriod** is set to 0.2, value v0dot5 means **SL-RestrictResourceReservationPeriod** is set to 0.5, value v1 means **SL-RestrictResourceReservationPeriod** is set to 1, and so on. Value v0dot2 and value v0dot5 are configured in a pool-specific manner only. E-UTRAN should not set value v0dot2 and v0dot5 for transmission pool for P2X related V2X sidelink communication.

— **SLSSID**

The IE **SLSSID** identifies a cell and is used by the receiving UE to detect asynchronous neighbouring cells, and by transmitting UEs to extend the synchronisation signals beyond the cell’s coverage area.

**SLSSID information element**

```asn1
SLSSID-r12 ::= INTEGER (0..167)
```

— **SL-SyncAllowed**

The IE **SL-SyncAllowed** indicates the allowed the synchronization references for a transmission resource pool for V2X sidelink communication.

**SL-SyncAllowed information element**

```asn1
SL-SyncAllowed-r14 ::= SEQUENCE {
  gnss-Sync-r14      ENUMERATED {true}    OPTIONAL, -- Need OR
  enb-Sync-r14      ENUMERATED {true}    OPTIONAL, -- Need OR
  ue-Sync-r14       ENUMERATED {true}    OPTIONAL -- Need OR}
```

**SL-SyncAllowed field descriptions**

**enb-Sync**

If configured, the (pre-) configured resources can be used if the UE is directly or indirectly synchronized to eNB (i.e., synchronized to a reference UE which is directly synchronized to eNB).

**gnss-Sync**

If configured, the (pre-) configured resources can be used if the UE is directly or indirectly synchronized to GNSS (i.e., synchronized to a reference UE which is directly synchronized to GNSS).

**ue-Sync**

If configured, the (pre-) configured resources can be used if the UE is synchronized to a reference UE which is synchronized to neither GNSS nor eNB directly or indirectly.
The IE SL-SyncConfig specifies the configuration information concerning reception of synchronisation signals from neighbouring cells as well as concerning the transmission of synchronisation signals for sidelink communication and sidelink discovery.

**SL-SyncConfig information element**

```plaintext
-- ASN1START
SL-SyncConfigList-r12 ::= SEQUENCE (SIZE (1..maxSL-SyncConfig-r12)) OF SL-SyncConfig-r12
SL-SyncConfigListV2X-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-SyncConfig-r14)) OF SL-SyncConfig-r12
SL-SyncConfig-r12 ::= SEQUENCE {
  syncCP-Len-r12      SL-CP-Len-r12,
  syncOffsetIndicator-r12    SL-OffsetIndicatorSync-r12,
  slssid-r12        SLSSID-r12,
  txParameters-r12     SEQUENCE {
    syncTxParameters-r12    SL-TxParameters-r12,
    syncTxThreshIC-r12     RSRP-RangeSL-r12,
    syncInfoReserved-r12     BIT STRING (SIZE (19)) OPTIONAL, -- Need OR
  } OPTIONAL, -- Need OR
  rxParamsNCell1-r12     SEQUENCE {
    physCellId-r12       PhysCellId,
    discSyncWindow-r12    ENUMERATED {w1, w2}
  } OPTIONAL, -- Need OR
  ...,
  [][ syncTxPeriodic-r13     ENUMERATED {true} OPTIONAL -- Need OR
  ],
  [][ syncOffsetIndicator-v1430  SL-OffsetIndicatorSync-v1430 OPTIONAL, -- Need OR
  ],
  [][ syncOffsetIndicator2-r14  SL-OffsetIndicatorSync-r14 OPTIONAL, -- Need OR
  syncOffsetIndicator3-r14  SL-OffsetIndicatorSync-r14 OPTIONAL -- Need OR
  ],
  [][ slss-TxDisabled-r15    ENUMERATED {true} OPTIONAL -- Need OR
  ]
}
SL-SyncConfigListNFreq-r13 ::= SEQUENCE (SIZE (1..maxSL-SyncConfig-r12)) OF SL-SyncConfigNFreq-r13
SL-SyncConfigListNFreqV2X-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-SyncConfig-r14)) OF SL-SyncConfigNFreq-r13
SL-SyncConfigNFreq-r13 ::=   SEQUENCE {
  asyncParameters-r13     SEQUENCE {
    syncCP-Len-r13      SL-CP-Len-r12,
    syncOffsetIndicator-r13    SL-OffsetIndicatorSync-r12,
    slssid-r13       SLSSID-r12
  } OPTIONAL, -- Need OR
  txParameters-r13     SEQUENCE {
    syncTxParameters-r13    SL-TxParameters-r12,
    syncTxThreshIC-r13     RSRP-RangeSL-r12,
    syncInfoReserved-r13     BIT STRING (SIZE (19)) OPTIONAL, -- Need OR
    syncTxPeriodic-r13     ENUMERATED {true} OPTIONAL -- Need OR
  } OPTIONAL, -- Need OR
  rxParameters-r13     SEQUENCE {
    discSyncWindow-r13    ENUMERATED {w1, w2}
  } OPTIONAL, -- Need OR
  ...,
  [][ syncOffsetIndicator-v1430  SL-OffsetIndicatorSync-v1430 OPTIONAL, -- Need OR
  ],
  [][ syncOffsetIndicator2-r14  SL-OffsetIndicatorSync-r14 OPTIONAL, -- Need OR
  syncOffsetIndicator3-r14  SL-OffsetIndicatorSync-r14 OPTIONAL -- Need OR
  ],
  [][ slss-TxDisabled-r15    ENUMERATED {true} OPTIONAL -- Need OR
  ]
}
-- ASN1STOP
```
SL-SyncConfig field descriptions

**discSyncWindow**
Indicates the synchronization window over which the UE expects that SLSS or discovery resources indicated by the pool configuration (see TS 36.213 [23, 14.4]). The value w1 denotes 5 milliseconds. The value w2 denotes the length corresponding to normal cyclic prefix divided by 2.

**gnss-Sync**
If configured, the synchronization configuration is used for SLSS transmission/reception when the UE is synchronized to GNSS, by using slssid=0 and ignoring slssid-r12 configured. If not configured, the synchronization configuration is used for SLSS transmission/reception when the UE is synchronized to eNB, by using the configured slssid-r12.

**slss-TxDisabled**
Value TRUE indicates that the carrier, even though equipped with synchronisation resources, cannot be used as a synchronisation carrier frequency to transmit SLSS or PSBCH.

**syncCP-Len**
In case of V2X sidelink communications this field is always configured to normal.

**syncInfoReserved**
Reserved for future use.

**syncOffsetIndicator**
E-UTRAN should ensure syncOffsetIndicator is set to the same value as syncOffsetIndicator1 or syncOffsetIndicator2 in preconfigSync within SL-Preconfiguration, if configured. If syncOffsetIndicator-v1430 is configured, the UE shall ignore the field syncOffsetIndicator-r12. E-UTRAN should ensure syncOffsetIndicator is set to the same value as syncOffsetIndicator1 in v2x-CommPreconfigSync within SL-V2X-Preconfiguration, if configured. E-UTRAN should ensure syncOffsetIndicator2 is set to the same value as syncOffsetIndicator2 in v2x-CommPreconfigSync within SL-V2X-Preconfiguration, if configured. E-UTRAN should ensure all values in syncOffsetIndicator are same across all carrier frequencies configured for UEs performing V2X sidelink communication on multiple carrier frequencies. For SL-V2X-Preconfiguration, all values in syncOffsetIndicator should be same across all carrier frequencies configured for UEs performing V2X sidelink communication on multiple carrier frequencies.

**syncTxPeriodic**
Indicates whether in each discovery period in which UE transmits discovery, the UE transmits SLSS once or periodically (i.e. every 40ms). In the latter case (periodic) the UE also transmits the MasterInformationBlock-SL message alongside. E-UTRAN configures this field only for synchronisation configurations applicable for PS discovery.

**syncTxThresholdIC**
Indicates the threshold used while in coverage. In case the RSRP measurement of the cell chosen for transmission of sidelink communication/ discovery announcements/ V2X sidelink communication, or of the cell used as reference for DL measurements and synchronization, is below the level indicated by this field, the UE may transmit SLSS (i.e. become synchronisation reference) when performing the corresponding sidelink transmission..

**txParameters**
Includes parameters relevant only for transmission. E-UTRAN includes the field in one entry per list, as included in commSyncConfig or discSyncConfig.

---

**SL-TF-ResourceConfig**
The IE SL-TF-ResourceConfig specifies a set of time/ frequency resources used for sidelink.

**SL-TF-ResourceConfig information element**

```asn1
 SL-TF-ResourceConfig-r12 ::= SEQUENCE {
 prb-Num-r12 INTEGER (1..100),
 prb-Start-r12 INTEGER (0..99),
 prb-End-r12 INTEGER (0..99),
 offsetIndicator-r12 SL-OffsetIndicator-r12,
 subframeBitmap-r12 SubframeBitmapSL-r12
 }
 SubframeBitmapSL-r12 ::= CHOICE {
 bs4-r12 BIT STRING (SIZE (4)),
 bs8-r12 BIT STRING (SIZE (8)),
 bs12-r12 BIT STRING (SIZE (12)),
 bs16-r12 BIT STRING (SIZE (16)),
 bs30-r12 BIT STRING (SIZE (30)),
 bs40-r12 BIT STRING (SIZE (40)),
 bs42-r12 BIT STRING (SIZE (42))
 }
 SubframeBitmapSL-r14 ::= CHOICE {
 bs10-r14 BIT STRING (SIZE (10)),
```
### SL-TF-ResourceConfig field descriptions

**prb-Start, prb-End, prb-Num**

Sidelink transmissions on a sub-frame can occur on PRB with index greater than or equal to `prb-Start` and less than `prb-Start + prb-Num`, and on PRB with index greater than `prb-End - prb-Num` and less than or equal to `prb-End`. Even for neighbouring cells, `prb-Start` and `prb-End` are relative to PRB #0 of the cell from which it was obtained. See TS 36.213 [23, 14.1.3, 14.2.3, 14.3.3].

**subframeBitmap**

Indicates the subframe bitmap indicating resources used for sidelink. For sidelink communication, E-UTRAN configures value `bs40` for FDD and the following values for TDD: value `bs42` for configuration0, value `bs16` for configuration1, value `bs8` for configuration2, value `bs12` for configuration3, value `bs8` for configuration4, value `bs4` for configuration5 and value `bs30` for configuration6. For V2X sidelink communication, E-UTRAN configures value `bs16`, `bs20` or `bs100` for FDD or Frame Structure Type 1 as defined in 3GPP TS 36.211 [21], and the following values for TDD or Frame Structure Type 2 as defined in 3GPP TS 36.211 [21]: value `bs60` for configuration0, value `bs40` for configuration1, value `bs20` for configuration2, value `bs30` for configuration3, value `bs20` for configuration4, value `bs10` for configuration5 and value `bs50` for configuration6.

---

**SL-TxPower**

The IE `SL-TxPower` is used to limit the UE's sidelink transmission power on a carrier frequency. The unit is dBm. Value `minusinfinity` corresponds to –infinity.

**SL-TxPower information element**

```asn1
SL-TxPower-r14 ::=  CHOICE {
  minusinfinity-r14    NULL,
  txPower-r14      INTEGER (-41..31)
}
```

---

**SL-TypeTxSync**

The IE `SL-TypeTxSync` indicates the synchronization reference type.

**SL-TypeTxSync information element**

```asn1
SL-TypeTxSync-r14 ::=  ENUMERATED {gnss, enb, ue}
```

---

**SL-ThresPSSCH-RSRP-List**

IE `SL-ThresPSSCH-RSRP-List` indicates a threshold used for sensing based UE autonomous resource selection (see TS 36.213 [23]). A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above the threshold defined by IE `SL-ThresPSSCH-RSRP-List`.

**SL-ThresPSSCH-RSRP-List information element**

```asn1
SL-ThresPSSCH-RSRP-List-r14 ::= SEQUENCE (SIZE (64)) OF SL-ThresPSSCH-RSRP-r14
```
**SL-ThresPSSCH-RSRP**

Value 0 corresponds to minus infinity dBm, value 1 corresponds to -128dBm, value 2 corresponds to -126dBm, value n corresponds to (-128 + (n-1)*2) dBm and so on, value 66 corresponds to infinity dBm.

---

**SL-TxParameters**

The IE `SL-TxParameters` identifies a set of parameters configured for sidelink transmission, used for communication, discovery and synchronisation.

**SL-TxParameters information element**

---

**SL-TxPoolIdentity**

The IE `SL-TxPoolIdentity` identifies an individual pool entry configured for sidelink transmission, used for communication and discovery.

**SL-TxPoolIdentity information element**

---

**SL-TxPoolToReleaseList**

The IE `SL-TxPoolToReleaseList` is used to release one or more individual pool entries used for sidelink transmission, for communication and discovery.

**SL-TxPoolToReleaseList information element**

---
-- ASN1STOP

-- ASN1START

SL-TxPoolToReleaseListExt-r13 ::= SEQUENCE (SIZE (1..maxSL-TxPool-v1310)) OF SL-TxPoolIdentity-v1310

-- ASN1STOP

--- SL-V2X-ConfigDedicated

The IE SL-V2X-ConfigDedicated specifies the dedicated configuration information for V2X sidelink communication.

**SL-V2X-ConfigDedicated information element**

```asn1
-- ASN1START

SL-V2X-ConfigDedicated-r14 ::= SEQUENCE {
  commTxResources-r14  CHOICE {
    release             NULL,
    setup               CHOICE {
      scheduled-r14      SEQUENCE {
        sl-V-RNTI-r14      C-RNTI,
        mac-MainConfig-r14 MAC-MainConfigSL-r12,
        v2x-SchedulingPool-r14 SL-CommResourcePoolV2X-r14 OPTIONAL, -- Need ON
        mcs-r14            INTEGER (0..31) OPTIONAL, -- Need OR
        logicalChGroupInfoList-r14 LogicalChGroupInfoList-r13
      },
      ue-Selected-r14     SEQUENCE {
        -- Pool for normal usage
        v2x-CommTxPoolNormalDedicated-r14 SEQUENCE {
          sl-TxPoolReleaseList-v1310 SL-TxPoolReleaseListV2X-r14 OPTIONAL, -- Need ON
          sl-TxPoolToAddModList-r14  SL-TxPoolToAddModListV2X-r14 OPTIONAL, -- Need ON
        }
      }
    }
  }
}

v2x-InterFreqInfoList-r14   SL-InterFreqInfoListV2X-r14 OPTIONAL, -- Need ON
thresSL-TxPrioritization-r14 SL-Priority-r13 OPTIONAL, -- Need OR
typeTxSync-r14              SL-InterFreqInfoListV2X-r14 OPTIONAL, -- Need ON
cbr-DedicatedTxConfigList-r14 SL-CBR-CommonTxConfigList-r14 OPTIONAL, -- Need OR

...[
  \[ commTxResources-v1530  CHOICE {
    release             NULL,
    setup               CHOICE {
      scheduled-v1530    SEQUENCE {
        logicalChGroupInfoList-v1530 LogicalChGroupInfoList-v1530 OPTIONAL, -- Need OR
      },
      ue-Selected-v1530     SEQUENCE {
        v2x-FreqSelectionConfigList-r15 SL-V2X-FreqSelectionConfigList-r15 OPTIONAL -- Need OR
      }
    }
  }
]

}]

LogicalChGroupInfoList-v1530 ::= SEQUENCE (SIZE (1..maxLCG-r13)) OF SL-ReliabilityList-r15

SL-TxPoolToAddModListV2X-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-TxPool-r14)) OF SL-TxPoolToAddMod-v1310

--- END OF ASN1
**SL-V2X-ConfigDedicated field descriptions**

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cbr-DedicatedTxConfigList</td>
<td>Indicates the dedicated list of CBR range division and the list of PSCCH TX configurations available to configure congestion control to the UE for V2X sidelink communication.</td>
</tr>
<tr>
<td>logicalChGroupInfoList</td>
<td>Indicates for each logical channel group the list of associated priorities and reliabilities, used as specified in TS 36.321 [6], in order of increasing logical channel group identity. If E-UTRAN includes <code>logicalChGroupInfoList-v1530</code>, it includes the same number of entries, and listed in the same order, as in <code>logicalChGroupInfoList-r14</code>, and a logical channel group identity of the same entry in <code>logicalChGroupInfoList-r14</code> and in <code>logicalChGroupInfoList-v1530</code> is associated with both the priorities (as in <code>logicalChGroupInfoList-r14</code>) and reliabilities (as in <code>logicalChGroupInfoList-v1520</code>) of that entry. If <code>logicalChGroupInfoList-v1530</code> is not included, this field indicates for each logical channel group the list of associated priorities.</td>
</tr>
<tr>
<td>mcs</td>
<td>Indicates the MCS as defined in TS 36.213 [23, 14.2.1]. If not configured, the selection of MCS is up to UE implementation. If included, <code>mcs-r15</code> corresponds to both the MCS table in Table 8.6.1-1 in TS 36.213 [23] and the MCS table supporting 64QAM in Table 14.1.1-2 in TS 36.213 [23] used for transmission on PSSCH.</td>
</tr>
<tr>
<td>scheduled</td>
<td>Indicates the configuration for the case E-UTRAN schedules the transmission resources based on sidelink specific BSR from the UE.</td>
</tr>
<tr>
<td>sl-V-RNTI</td>
<td>Indicates the RNTI used for DCI dynamically scheduling sidelink resources for V2X sidelink communication.</td>
</tr>
<tr>
<td>thresSL-TxPrioritization</td>
<td>Indicates the threshold used to determine whether SL V2X transmission is prioritized over uplink transmission if they overlap in time (see TS 36.321 [6]). This value shall overwrite <code>thresSL-TxPrioritization</code> configured in SIB21 or <code>SL-V2X-Preconfiguration</code> if any.</td>
</tr>
<tr>
<td>typeTxSync</td>
<td>Indicates the prioritized synchronization type (i.e. eNB or GNSS) for performing V2X sidelink communication on PCell.</td>
</tr>
<tr>
<td>ue-Selected</td>
<td>Indicates the configuration for the case the UE selects the transmission resources from a pool of resources configured by E-UTRAN.</td>
</tr>
<tr>
<td>v2x-InterFreqInfoList</td>
<td>Indicates synchronization and resource allocation configurations of other carrier frequencies than the serving carrier frequency for V2X sidelink communication. For inter-carrier scheduled resource allocation, CIF=1 in DCI-5A corresponds to the first entry in this frequency list, CIF=2 corresponds to the second entry, and so on (see TS 36.213 [23]). CIF=0 in DCI-5A corresponds to the frequency where the DCI is received.</td>
</tr>
<tr>
<td>v2x-SchedulingPool</td>
<td>Indicates a pool of resources when E-UTRAN schedules Tx resources for V2X sidelink communications.</td>
</tr>
</tbody>
</table>

---

**SL-V2X-FreqSelectionConfigList**

The IE `SL-V2X-FreqSelectionConfigList` specifies the configuration information for carrier selection for V2X sidelink communication transmission using UE autonomous resource selection.

**SL-V2X-FreqSelectionConfigList information element**

```plaintext
-- ASN1START
SL-V2X-FreqSelectionConfigList-r15 ::= SEQUENCE (SIZE (1..8)) OF SL-V2X-FreqSelectionConfig-r15

SL-V2X-FreqSelectionConfig-r15 ::= SEQUENCE {
    priorityList-r15     SL-PriorityList-r13,
    threshCBR-FreqReselection-r15  SL-CBR-r14   OPTIONAL, -- Need OR
    threshCBR-FreqKeeping-r15    SL-CBR-r14   OPTIONAL, -- Need OR
}
-- ASN1STOP
```
### SL-V2X-FreqSelectionConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>priorityList</strong></td>
<td>Indicates the list of PPPP(s) which is associated with the configurations in <code>threshCBR-FreqReselection</code> and in <code>threshCBR-FreqKeeping</code>.</td>
</tr>
<tr>
<td><strong>threshCBR-FreqReselection</strong></td>
<td>Indicates the CBR threshold to determine whether the carrier frequency can be (re)selected for the transmission of V2X sidelink communication. See TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>threshCBR-FreqKeeping</strong></td>
<td>Indicates the CBR threshold to determine whether the UE can keep using the carrier which was selected for the transmission of V2X sidelink communication. See TS 36.321 [6].</td>
</tr>
</tbody>
</table>

---

### SL-V2X-PacketDuplicationConfig

The IE `SL-V2X-PacketDuplicationConfig` specifies the configuration information for sidelink packet duplication for V2X sidelink communication transmission.

**SL-V2X-PacketDuplicationConfig information element**

```
-- ASN1START
SL-V2X-PacketDuplicationConfig-r15 ::= SEQUENCE {
  allowedCarrierFreqConfig-r15  SL-PPPR-Dest-CarrierFreqList-r15  OPTIONAL, -- Need OR
  ...}

-- ASN1STOP
```

---

### SL-V2X-SyncFreqList

The IE `SL-V2X-SyncFreqList` specifies the list of candidate synchronisation carrier frequencies used for V2X sidelink communication.

**SL-V2X-SyncFreqList information element**

```
-- ASN1START
SL-V2X-SyncFreqList-r15 ::= SEQUENCE (SIZE (1..maxFreqV2X-r14)) OF ARFCN-ValueEUTRA-r9
-- ASN1STOP
```
---

**SL-ZoneConfig**

The IE **SL-ZoneConfig** indicates zone configurations used for V2X sidelink communication.

### SL-ZoneConfig information element

```
-- ASN1START

SL-ZoneConfig-r14 ::= SEQUENCE {
  zoneLength-r14 ENUMERATED { m5, m10, m20, m50, m100, m200, m500, spare1 },
  zoneWidth-r14 ENUMERATED { m5, m10, m20, m50, m100, m200, m500, spare1 },
  zoneIdLongiMod-r14 INTEGER (1..4),
  zoneIdLatiMod-r14 INTEGER (1..4)
}

-- ASN1STOP
```

---

**SL-ZoneConfig field descriptions**

- **zoneLength**
  Indicates the length of each geographic zone. Value m5 corresponds to 5 meters, m10 corresponds to 10 meters and so on.

- **zoneWidth**
  Indicates the width of each geographic zone. Value m5 corresponds to 5 meters, m10 corresponds to 10 meters and so on.

- **zoneIdLongiMod**
  Indicates the total number of zones that is configured with respect to longitude.

- **zoneIdLatiMod**
  Indicates the total number of zones that is configured with respect to latitude.

---

### 6.4 RRC multiplicity and type constraint values

#### Multiplicity and type constraint definitions

```
-- ASN1START

maxAccessCat-1-r15 INTEGER ::= 63 -- Maximum number of Access Categories - 1
maxACDC-Cat-r13 INTEGER ::= 16 -- Maximum number of ACDC categories (per PLMN)
maxAvailNarrowBands-r13 INTEGER ::= 16 -- Maximum number of narrowbands
maxBandComb-r10 INTEGER ::= 128 -- Maximum number of band combinations.
maxBandComb-r11 INTEGER ::= 256 -- Maximum number of additional band combinations.
maxBandComb-r13 INTEGER ::= 384 -- Maximum number of band combinations in Rel-13
maxBands INTEGER ::= 1024 -- Maximum number of bands listed in EUTRA UE caps
maxBandwidthClass-r10 INTEGER ::= 16 -- Maximum number of supported CA BW classes per band
maxBandwidthCombSet-r10 INTEGER ::= 32 -- Maximum number of bandwidth combination sets per supported band combination
maxBarrinfoInfoSet-r15 INTEGER ::= 8 -- Maximum number of UAC barrning information sets
maxBT-IdReport-r15 INTEGER ::= 32 -- Maximum number of Bluetooth IDs to report
maxBT-Name-r15 INTEGER ::= 4 -- Maximum number of Bluetooth name
maxCBER-Level-r14 INTEGER ::= 16 -- Maximum number of CBR levels
maxCBER-Level-1-r14 INTEGER ::= 15
maxCBER-Report-r14 INTEGER ::= 72 -- Maximum number of CBR results in a report
maxCDMA-BandClass INTEGER ::= 32 -- Maximum value of the CDMA band classes
maxCE-Level-r13 INTEGER ::= 4 -- Maximum number of CE levels
maxCellBlack INTEGER ::= 16 -- Maximum number of blacklisted physical cell identity
maxCellHistory-r12 INTEGER ::= 8 -- Maximum number of neighbouring inter-frequency cells per carrier measured in IDLE mode
maxCellInfoGERAN-r9 INTEGER ::= 32 -- Maximum number of GERAN cells for which system information can be provided as redirection assistance
maxCellInfoUTRA-r9 INTEGER ::= 16 -- Maximum number of UTRA cells for which system information can be provided as redirection assistance
maxCellMeasIdle-r15 INTEGER ::= 8 -- Maximum number of MR-DC combinations
maxComIDC-r11 INTEGER ::= 128 -- Maximum number of reported UL CA or MR-DC combinations
maxCSI-IM-r11 INTEGER ::= 3 -- Maximum number of CSI-IM configurations (per carrier frequency)
maxCSI-IM-r12 INTEGER ::= 4 -- Maximum number of CSI-IM configurations (per carrier frequency)

-- ASN1STOP
```
minCSI-IM-r13 INTEGER ::= 5  -- Minimum number of CSI IM configurations from which
-- REL-13 extension is used
maxCSI-IM-r13 INTEGER ::= 24  -- Maximum number of CSI-IM configurations
-- (per carrier frequency)
maxCSI-IM-v1310 INTEGER ::= 20  -- Maximum number of additional CSI-IM configurations
-- (per carrier frequency)
maxCSI-Proc-r11 INTEGER ::= 4  -- Maximum number of CSI processes (per carrier
-- frequency)
maxCSI-RS-NZP-r11 INTEGER ::= 3  -- Maximum number of CSI RS resource
-- configurations using non-zero Tx power
-- (per carrier frequency)
minCSI-RS-NZP-r13 INTEGER ::= 4  -- Minimum number of CSI RS resource from which
-- REL-13 extension is used
maxCSI-RS-NZP-r13 INTEGER ::= 24  -- Maximum number of CSI RS resource
-- configurations using non-zero Tx power
-- (per carrier frequency)
maxCSI-RS-NZP-v1310 INTEGER ::= 21  -- Maximum number of additional CSI RS resource
-- configurations using non-zero Tx power
-- (per carrier frequency)
maxCSI-RS-ZP-r11 INTEGER ::= 4  -- Maximum number of CSI RS resource
-- configurations using zero Tx power (per carrier
-- frequency)
maxCQI-ProcExt-r11 INTEGER ::= 3  -- Maximum number of additional periodic CQI
-- configurations (per carrier frequency)
maxFreqUTRA-TDD-r10 INTEGER ::= 6  -- Maximum number of UTRA TDD carrier frequencies for
-- which system information can be provided as
-- redirection assistance
maxCellInter INTEGER ::= 16  -- Maximum number of neighbouring inter-frequency
-- cells listed in SIB type 4
maxCellIntra INTEGER ::= 16  -- Maximum number of neighbouring intra-frequency
-- cells listed in SIB type 4
maxCellList:GERAN INTEGER ::= 3  -- Maximum number of lists of GERAN cells
maxCellMeas INTEGER ::= 32  -- Maximum number of entries in each of the
-- cell lists in a measurement object
maxCellReport INTEGER ::= 8  -- Maximum number of reported cells/CSI-RS resources
maxCellSFTD INTEGER ::= 3  -- Maximum number of cells for SFTD reporting
maxConfigSPS-r14 INTEGER ::= 8  -- Maximum number of simultaneous SPS configurations
maxConfigSPS-r15 INTEGER ::= 6  -- Maximum number of simultaneous SPS configurations
-- configured with SPS C-RNTI
maxCSI-RS-Meas-r12 INTEGER ::= 96  -- Maximum number of entries in the CSI-RS list
-- in a measurement object
maxDRB INTEGER ::= 11  -- Maximum number of Data Radio Bearers
maxDRBExt-r15 INTEGER ::= 4  -- Maximum number of additional DRBs
maxFreqUTRA-TDD-r11 INTEGER ::= 15  -- Highest value of extended maximum number of DRBs
maxDS-Duration-r12 INTEGER ::= 5  -- Maximum number of subframes in a discovery signals
-- occasion
maxDS-ZTP-CSI-RS-r12 INTEGER ::= 5  -- Maximum number of zero transmission power CSI-RS for
-- a serving cell concerning discovery signals
maxEAPFCN INTEGER ::= 65535  -- Maximum value of EUTRA carrier frequency
maxEAPFCN-Plus1 INTEGER ::= 65536  -- Lowest value extended EAPFCN range
maxEAPFCNZ INTEGER ::= 262143  -- Highest value extended EAPFCN range
maxEPDCCH-Set-r11 INTEGER ::= 2  -- Maximum number of EPDCCH sets
maxFBI INTEGER ::= 64  -- Maximum value of frequency band indicator
maxFBI-NR-r15 INTEGER ::= 1024  -- Highest value FBI range for NR.
maxFBI-Plus1 INTEGER ::= 65  -- Lowest value extended FBI range
maxFBI2 INTEGER ::= 256  -- Highest value extended FBI range
maxFeatureSets-r15 INTEGER ::= 256  -- Total number of feature sets (size of pool)
maxPerCC-FeatureSets-r15 INTEGER ::= 32  -- Total number of CC-specific feature sets
-- (size of the pool)
maxFreq INTEGER ::= 8  -- Maximum number of carrier frequencies
maxFreqIDC-r11 INTEGER ::= 32  -- Maximum number of carrier frequencies that are
-- affected by the IDC problems
maxFreqIdle-r15 INTEGER ::= 8  -- Maximum number of carrier frequencies for
-- IDLE mode measurements configured by eNB
maxFreqMBMS-r11 INTEGER ::= 5  -- Maximum number of carrier frequencies for which an
-- MBMS capable UE may indicate an interest
-- which a UE may provide measurement results upon
-- NR SCG failure and for which network can provide
-- cell reselection priorities upon release
maxFreqNR-r15 INTEGER ::= 5  -- Maximum number of NR carrier frequencies for
-- which a UE may provide measurement results upon
-- NR SCG failure and for which network can provide
-- cell reselection priorities upon release
maxFreqV2X-r14 INTEGER ::= 8  -- Maximum number of carrier frequencies for which V2X
-- sidelink communication can be configured
maxFreqV2X-1-r14 INTEGER ::= 7  -- Highest index of frequencies
maxGERAN-SI INTEGER ::= 10  -- Maximum number of GERAN SI blocks that can be
-- provided as part of NACC information
maxGNFG INTEGER ::= 16  -- Maximum number of GERAN neighbour freq groups
maxIdleMeasCarriers-r15 INTEGER ::= 3  -- Maximum number of neighbouring inter-
-- frequency carriers measured in IDLE mode
maxLCG-r13 INTEGER ::= 4 -- Maximum number of logical channel groups
maxLogMeasReport-r10 INTEGER ::= 520 -- Maximum number of logged measurement entries
-- that can be reported by the UE in one message
maxMBSFN-Allocations INTEGER ::= 8 -- Maximum number of MBSFN frame allocations with
-- different offset
maxMBSFN-Area INTEGER ::= 8
maxMBSFN-Area-1 INTEGER ::= 7
maxMBMS-ServiceListPerUE-r13 INTEGER ::= 15 -- Maximum number of services which the UE can
-- include in the MBMS interest indication
maxMeasId INTEGER ::= 32
maxMeasId-Plus1 INTEGER ::= 33
maxMeasId-r12 INTEGER ::= 64
maxMulti Bands INTEGER ::= 8 -- Maximum number of additional frequency bands
-- that a cell belongs to
maxMulti BandsNR-r15 INTEGER ::= 32 -- Maximum number of additional NR frequency bands
-- that a cell belongs to
maxNS-Pmax-r10 INTEGER ::= 8 -- Maximum number of NS and P-Max values per band
maxNAICS-Entries-r12 INTEGER ::= 8 -- Maximum number of supported NAICS combination(s)
maxNeighCell-r12 INTEGER ::= 8 -- Maximum number of neighbouring cells in NAICS
-- configuration (per carrier frequency)
maxNeighCell-SCPTM-r13 INTEGER ::= 8 -- Maximum number of SCPTM neighbour cells
maxNrofNSSAI-r15 INTEGER ::= 8 -- Maximum number of S-NSSAI
maxObjectID INTEGER ::= 32
maxObjectID-Plus1-r13 INTEGER ::= 33
maxObjectID-r13 INTEGER ::= 64
maxP-a-PerNeighCell-r12 INTEGER ::= 3 -- Maximum number of power offsets for a neighbour cell
-- in NAICS configuration
maxPageRec INTEGER ::= 16 --
maxPhysCellIdRange-r9 INTEGER ::= 4 -- Maximum number of physical cell identity ranges
maxPLMN-r11 INTEGER ::= 6 -- Maximum number of PLMNs
maxPLMN-1-r14 INTEGER ::= 5 -- Maximum number of PLMNs minus one
maxPLMN-r15 INTEGER ::= 8 -- Maximum number of PLMNs for RNA configuration
maxPLMN-NR-r15 INTEGER ::= 12 -- Maximum number of NR PLMNs
maxPNOffset INTEGER ::= 511 -- Maximum number of CDMA2000 PN offsets
maxPMCH-PerMBSFN INTEGER ::= 15
maxPSSCH-TxConfig-r14 INTEGER ::= 16 -- Maximum number of PSSCH TX configurations
maxQuantSetsNR-r15 INTEGER ::= 2 -- Maximum number of NR quantity configuration sets
maxQCIF-r13 INTEGER ::= 6 -- Maximum number of QCIs
maxRAT-Capabilities INTEGER ::= 8 -- Maximum number of interworking RATs (incl EUTRA)
maxRSTD-Freq-r10 INTEGER ::= 3 -- Maximum number of frequency layers for RSTD
-- measurement
maxSAI-MBMS-r11 INTEGER ::= 64 -- Maximum number of MBMS service area identities
-- broadcast per carrier frequency
maxSCELL-r10 INTEGER ::= 4 -- Maximum number of SCells
maxSCELL-r13 INTEGER ::= 31 -- Highest value of extended number range of SCells
maxSCELLGroups-r15 INTEGER ::= 4 -- Maximum number of SCell common parameter groups
maxSC-MTCH-r13 INTEGER ::= 1023 -- Maximum number of SC-MTCs in one cell
maxSC-MTCH-BR-r14 INTEGER ::= 128 -- Maximum number of SC-MTCs in one cell for feMTC
maxSLCommRxPoolINFreq-r13 INTEGER ::= 32 -- Maximum number of individual sidelink communication
-- Rx resource pools on neighbouring freq
maxSLCommRxPoolPreconf-v1310 INTEGER ::= 12 -- Maximum number of additional preconfigured
-- sidelink communication Rx resource pool entries
maxSL-TxPool-r12Plus1-r13 INTEGER ::= 5 -- First additional individual sidelink
-- Tx resource pool
maxSL-TxPool-v1310 INTEGER ::= 4 -- Maximum number of additional sidelink
-- Tx resource pool entries
maxSL-TxPool-r13 INTEGER ::= 8 -- Maximum number of individual sidelink
-- Tx resource pools
maxSLCommTxPoolPreconf-v1310 INTEGER ::= 7 -- Maximum number of additional preconfigured
-- sidelink Tx resource pool entries
maxSL-Dest-r12 INTEGER ::= 16 -- Maximum number of sidelink destinations
maxSL-DiscCells-r13 INTEGER ::= 16 -- Maximum number of cells with similar sidelink
-- configurations
maxSL-DiscPowerClass-r12 INTEGER ::= 3 -- Maximum number of sidelink power classes
maxSL-DiscRxPoolPreconf-r13 INTEGER ::= 16 -- Maximum number of preconfigured sidelink
-- discovery Rx resource pool entries
maxSL-DiscSysInfoReportFreq-r13 INTEGER ::= 8 -- Maximum number of frequencies to include in a
maxSL-DiscTxPoolPreconf-r13 INTEGER ::= 4 -- Maximum number of preconfigured sidelink discovery Tx resource pools entries
maxSL-GP-r13 INTEGER ::= 8 -- Maximum number of gap patterns that can be requested for a frequency or assigned
maxSL-PoolToMeasure-r14 INTEGER ::= 72 -- Maximum number of TX resource pools for CBR measurement and report
maxSL-Prio-r13 INTEGER ::= 8 -- Maximum number of entries in sidelink priority list pools
maxSL-Reliability-r15 INTEGER ::= 8 -- Maximum number of entries in sidelink reliability list
maxSL-SyncConfig-r12 INTEGER ::= 16 -- Maximum number of sidelink Sync configurations
maxSL-TF-IndexPair-r12 INTEGER ::= 64 -- Maximum number of sidelink Time Freq resource index pairs
maxSL-TxPool-r12 INTEGER ::= 4 -- Maximum number of individual sidelink Tx resource pools
maxSL-V2X-RxPool-r14 INTEGER ::= 16 -- Maximum number of RX resource pools for V2X sidelink communication
maxSL-V2X-RxPoolPreconf-r14 INTEGER ::= 16 -- Maximum number of RX resource pools for V2X sidelink communication
maxSL-V2X-TxPool-r14 INTEGER ::= 8 -- Maximum number of TX resource pools for V2X sidelink communication
maxSL-V2X-TxPoolPreconf-r14 INTEGER ::= 8 -- Maximum number of TX resource pools for V2X sidelink communication
maxSL-V2X-SyncConfig-r14 INTEGER ::= 16 -- Maximum number of sidelink Sync configurations for V2X sidelink communication
maxSL-V2X-CBRConfig-r14 INTEGER ::= 4 -- Maximum number of CBR range configurations for V2X sidelink communication congestion control
maxSL-V2X-CBRConfig1-r14 INTEGER ::= 3
maxSL-V2X-TxConfig-r14 INTEGER ::= 64 -- Maximum number of TX parameter configurations for V2X sidelink communication congestion control
maxSL-V2X-CBRConfig2-r14 INTEGER ::= 8 -- Maximum number of CBR range configurations in pre-configuration for V2X sidelink communication congestion control
maxSL-V2X-CBRConfig2-1-r14 INTEGER ::= 7
maxSL-V2X-TxConfig2-r14 INTEGER ::= 128 -- Maximum number of TX parameter configurations in pre-configuration for V2X sidelink communication congestion control
maxSL-V2X-TxConfig2-1-r14 INTEGER ::= 127
maxSTAG-r11 INTEGER ::= 3 -- Maximum number of STAGs
maxServCell-r10 INTEGER ::= 5 -- Maximum number of Serving cells
maxServCell-r13 INTEGER ::= 32 -- Highest value of extended number range of Serving cells
maxServCellNR-r15 INTEGER ::= 16 -- Maximum number of NR serving cells
maxServiceCount INTEGER ::= 16 -- Maximum number of MBMS services that can be included in an MBMS counting request and response
maxServiceCount-1 INTEGER ::= 15
maxSessionPerPMCH INTEGER ::= 29
maxSessionPerPMCH-1 INTEGER ::= 28
maxSIB INTEGER ::= 32 -- Maximum number of SIBs
maxSIB-1 INTEGER ::= 31
maxSI-Message INTEGER ::= 32 -- Maximum number of SI messages
maxSimultaneousBands-r10 INTEGER ::= 64 -- Maximum number of simultaneously aggregated bands
maxSubframePatternIDC-r11 INTEGER ::= 8 -- Maximum number of subframe reservation patterns that the UE can simultaneously recommend to the E-UTRAN for use.
maxTrafficPattern-r14 INTEGER ::= 8 -- Maximum number of periodical traffic patterns that the UE can simultaneously report to the E-UTRAN.
maxUTRA-FDD-Carrier INTEGER ::= 16 -- Maximum number of UTRA FDD carrier frequencies
maxUTRA-TDD-Carrier INTEGER ::= 16 -- Maximum number of UTRA TDD carrier frequencies
maxWayPoint-r15 INTEGER ::= 20 -- Maximum number of flight path information waypoints
maxWLAN-Id-r12 INTEGER ::= 16 -- Maximum number of WLAN identifiers
maxWLAN-Bands-r13 INTEGER ::= 8 -- Maximum number of WLAN bands
maxWLAN-Id-r13 INTEGER ::= 32 -- Maximum number of WLAN identifiers
maxWLAN-Channels-r13 INTEGER ::= 32 -- Maximum number of WLAN channels used in WLAN-CarrierInfo
maxWLAN-CarrierInfo-r13 INTEGER ::= 8 -- Maximum number of WLAN Carrier Information
maxWLAN-Id-Report-r14 INTEGER ::= 32 -- Maximum number of WLAN IDs to report
maxWLAN-Name-r15 INTEGER ::= 4 -- Maximum number of WLAN name

NOTE: The value of maxDRB aligns with SA2.
6.5 PC5 RRC messages

NOTE: The messages included in this section reflect the current status of the discussions. Additional messages may be included at a later stage.

6.5.1 General message structure

This ASN.1 segment is the start of the PC5 RRC PDU definitions.

```
-- ASNISTART
PC5-RRC-Definitions DEFINITIONS AUTOMATIC TAGS ::= BEGIN
IMPORTS
  TDD-ConfigSL-r12
FROM EUTRA-RRC-Definitions;
-- ASNISTOP

SBCCH-SL-BCH-Message

The SBCCH-SL-BCH-Message class is the set of RRC messages that may be sent from the UE to the UE via SL-BCH on the SBCCH logical channel.

```

```
-- ASNISTART
SBCCH-SL-BCH-Message ::= SEQUENCE {
  message SBCCH-SL-BCH-MessageType
}
SBCCH-SL-BCH-MessageType ::= MasterInformationBlock-SL
-- ASNISTOP

SBCCH-SL-BCH-Message-V2X

The SBCCH-SL-BCH-Message-V2X class is the set of RRC messages that may be sent from the UE to the UE via SL-BCH on the SBCCH logical channel for V2X sidelink communication.

```

```
-- ASNISTART
SBCCH-SL-BCH-Message-V2X-r14 ::= SEQUENCE {
  message SBCCH-SL-BCH-MessageType-V2X-r14
}
SBCCH-SL-BCH-MessageType-V2X-r14 ::= MasterInformationBlock-SL-V2X-r14
-- ASNISTOP
```
6.5.2 Message definitions

– MasterInformationBlock-SL

The MasterInformationBlock-SL includes the information transmitted by a UE transmitting SLSS, i.e. acting as synchronisation reference, via SL-BCH.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: SBCCH

Direction: UE to UE

---

MasterInformationBlock-SL

---

DirectFrameNumber

Indicates the frame number in which SLSS and SL-BCH are transmitted. The subframe in the frame corresponding to DirectFrameNumber is indicated by DirectSubframeNumber.

InCoverage

Value TRUE indicates that the UE transmitting the MasterInformationBlock-SL is in E-UTRAN coverage.

Sl-Bandwidth

Parameter: transmission bandwidth configuration. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.

---

MasterInformationBlock-SL-V2X

The MasterInformationBlock-SL-V2X includes the information transmitted by a UE transmitting SLSS, i.e. acting as synchronisation reference, via SL-BCH for V2X sidelink communication.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: SBCCH

Direction: UE to UE

---

MasterInformationBlock-SL-V2X

---
**MasterInformationBlock-SL-V2X field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>directFrameNumber</td>
<td>Indicates the frame number in which SLSS and SL-BCH for V2X sidelink communication are transmitted. The subframe in the frame corresponding to directFrameNumber is indicated by directSubframeNumber.</td>
</tr>
<tr>
<td>inCoverage</td>
<td>Value TRUE indicates that the UE transmitting the MasterInformationBlock-SL-V2X for V2X sidelink communication is in E-UTRAN coverage.</td>
</tr>
<tr>
<td>si-Bandwidth</td>
<td>Parameter: transmission bandwidth configuration. n6 corresponds to 6 resource blocks, n15 to 15 resource blocks and so on.</td>
</tr>
</tbody>
</table>

---

**End of PC5-RRC-Definitions**

---

### 6.6 Direct Indication Information

Direct Indication information is transmitted on MPDCCH using P-RNTI but without associated Paging message. Table 6.6-1 defines the Direct Indication information, see TS 36.212 [22, 5.3.3.1.14].

When bit n is set to 1, UE shall behave as if the corresponding field is set in the Paging message, see 5.3.2.3. Bit 1 is the least significant bit.

**Table 6.6-1: Direct Indication information**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Direct Indication information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>systemInfoModification</td>
</tr>
<tr>
<td>2</td>
<td>etws-Indication</td>
</tr>
<tr>
<td>3</td>
<td>cmas-Indication</td>
</tr>
<tr>
<td>4</td>
<td>eab-ParamModification</td>
</tr>
<tr>
<td>5</td>
<td>systemInfoModification-eDRX</td>
</tr>
<tr>
<td>6, 7, 8</td>
<td>Not used, and shall be ignored by UE if received.</td>
</tr>
</tbody>
</table>

---

### 6.6a Direct Indication FeMBMS

On MBMS-dedicated cell and on FeMBMS/Unicast-mixed cell, a Direct Indication FeMBMS is transmitted on PDCCH together with 8-bit MCCH change notification using M-RNTI, see TS 36.212 [22, 5.3.3.1.4]. Table 6.6a-1 defines the Direct Indication FeMBMS.

When the first bit is set to 1, UE shall behave as if systemInfoModification field is set in the Paging message and when the second bit is set to 1, UE shall behave as if both etws-Indication and cmas-Indication are set in the Paging message, see 5.3.2.3. Bit 1 is the least significant bit.

**Table 6.6a-1: Direct Indication FeMBMS**

<table>
<thead>
<tr>
<th>Bit</th>
<th>Direct Indication FeMBMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>systemInfoModification</td>
</tr>
<tr>
<td>2</td>
<td>etws-Indication and cmas-Indication</td>
</tr>
</tbody>
</table>
6.7 NB-IoT RRC messages

6.7.1 General NB-IoT message structure

```asn1
-- ASN1START

NB-IOT-RRC-Definitions DEFINITIONS AUTOMATIC TAGS ::==
BEGIN
IMPORTS
    RRCConnectionReestablishmentReject,
    SecurityModeCommand,
    SecurityModeComplete,
    SecurityModeFailure,
    AdditionalSpectrumEmission,
    ARFCN-ValueEUTRA-r9,
    CellIdentity,
    C-RNTI,
    DedicatedInfoNAS,
    DRB-Identity,
    InitialUE-Identity,
    IntraFreqBlackCellList,
    IntraFreqNeighCellList,
    maxBands,
    maxCellBlack,
    maxCellInter,
    maxCellIntra,
    maxFBi2,
    maxFreq,
    maxMultiBands,
    maxPageRec,
    maxPLMN-r11,
    maxSAI-MBMS-r11,
    maxSIB,
    maxSIB-1,
    MBMS-SAI-r11,
    MBMS-List-r11,
    MBMSsessionInfo-r13,
    NextHopChainingCount,
    PagingUE-Identity,
    P-Max,
    PowerRampingParameters,
    PreambleTransMax,
    PhysCellId,
    Q-OffsetRange,
    Q-QualMin-r9,
    Q-RxLevMin,
    ReestabUE-Identity,
    RegisteredMME,
    ReselectionThreshold,
    ResumeIdentity-r13,
    RRC-TransactionIdentifier,
    RSRP-Range,
    ShortMAC-I,
    S-TMSI,
    SystemInformationBlockType16-r11,
    SystemInfoValueTagSI-r13,
    T-Reordering,
    TimeAlignmentTimer,
    TMGI-r9,
    TrackingAreaCode,
    DataInactivityTimer-r14
FROM EUTRA-RRC-Definitions;

-- ASN1STOP
```
The **BCCH-BCH-Message-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the UE via BCH on the BCCH logical channel in FDD.

```asn1
BCCH-BCH-Message-NB ::= SEQUENCE {
  message     BCCH-BCH-MessageType-NB
}
BCCH-BCH-MessageType-NB ::= MasterInformationBlock-NB
```

The **BCCH-BCH-Message-TDD-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the UE via BCH on the BCCH logical channel in TDD.

```asn1
BCCH-BCH-Message-TDD-NB ::= SEQUENCE {
  message     BCCH-BCH-MessageType-TDD-NB-r15
}
BCCH-BCH-MessageType-TDD-NB-r15 ::= MasterInformationBlock-TDD-NB-r15
```

The **BCCH-DL-SCH-Message-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the UE via DL-SCH on the BCCH logical channel.

```asn1
BCCH-DL-SCH-Message-NB ::= SEQUENCE {
  message     BCCH-DL-SCH-MessageType-NB
}
BCCH-DL-SCH-MessageType-NB ::= CHOICE {
  c1      CHOICE {
    systemInformation-r13    SystemInformation-NB,
    systemInformationBlockType1-r13  SystemInformationBlockType1-NB
  },
  messageClassExtension SEQUENCE {}
}
```

The **PCCH-Message-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the PCCH logical channel.

```asn1
PCCH-Message-NB ::= SEQUENCE {
  message     PCCH-MessageType-NB
}
PCCH-MessageType-NB ::= CHOICE {
  c1      CHOICE {
    paging-r13       Paging-NB
  },
  messageClassExtension SEQUENCE {}
}
-- ASN1START

**DL-CCCH-Message-NB**

The **DL-CCCH-Message-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink CCCH logical channel.

```asn1
-- ASN1START

DL-CCCH-Message-NB ::= SEQUENCE {
  message     DL-CCCH-MessageType-NB
}

DL-CCCH-MessageType-NB ::= CHOICE {
  c1      CHOICE {
    rrcConnectionReestablishment-r13  RRCConnectionReestablishment-NB,
    rrcConnectionReestablishmentReject-r13 RRCConnectionReestablishmentReject,
    rrcConnectionReject-r13     RRCConnectionReject-NB,
    rrcConnectionSetup-r13     RRCConnectionSetup-NB,
    rrcEarlyDataComplete-r15    RRCEarlyDataComplete-NB-r15,
    spare3 NULL, spare2 NULL, spare1 NULL
  },
  messageClassExtension SEQUENCE {}
}

-- ASN1STOP
```

-- ASN1START

**DL-DCCH-Message-NB**

The **DL-DCCH-Message-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the UE on the downlink DCCH logical channel.

```asn1
-- ASN1START

DL-DCCH-Message-NB ::= SEQUENCE {
  message     DL-DCCH-MessageType-NB
}

DL-DCCH-MessageType-NB ::= CHOICE {
  c1      CHOICE {
    dlInformationTransfer-r13    DLInformationTransfer-NB,
    rrcConnectionReconfiguration-r13  RRCConnectionReconfiguration-NB,
    rrcConnectionRelease-r13    RRCConnectionRelease-NB,
    securityModeCommand-r13     SecurityModeCommand,
    ueCapabilityEnquiry-r13     UECapabilityEnquiry-NB,
    rrcConnectionResume-r13     RRCConnectionResume-NB,
    spare2 NULL, spare1 NULL
  },
  messageClassExtension SEQUENCE {}
}

-- ASN1STOP
```

-- ASN1START

**UL-CCCH-Message-NB**

The **UL-CCCH-Message-NB** class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink CCCH logical channel.

```asn1
-- ASN1START

UL-CCCH-Message-NB ::= SEQUENCE {
  message     UL-CCCH-MessageType-NB
}

UL-CCCH-MessageType-NB ::= CHOICE {
  c1      CHOICE {
    rrcConnectionReestablishmentRequest-r13 RRCConnectionReestablishmentRequest-NB,
    rrcConnectionRequest-r13     RRCConnectionRequest-NB,
  }
}

-- ASN1STOP
```
---

### SC-MCCH-Message-NB

The **SC-MCCH-Message-NB** class is the set of RRC messages that may be sent from the E-UTRAN to the NB-IoT UE on the SC-MCCH logical channel.

```asn1
SC-MCCH-Message-NB ::= SEQUENCE {
  message     SC-MCCH-MessageType-NB
}

SC-MCCH-MessageType-NB ::= CHOICE {
  c1          CHOICE {
    scptmConfiguration-r14      SCPTMConfiguration-NB-r14
  },
  messageClassExtension SEQUENCE {}
}

---

### UL-DCCH-Message-NB

The **UL-DCCH-Message-NB** class is the set of RRC messages that may be sent from the UE to the E-UTRAN on the uplink DCCH logical channel.

```asn1
UL-DCCH-Message-NB ::= SEQUENCE {
  message     UL-DCCH-MessageType-NB
}

UL-DCCH-MessageType-NB ::= CHOICE {
  c1          CHOICE {
    rrcConnectionReconfigurationComplete-r13 RRCConnectionReconfigurationComplete-NB,
    rrcConnectionReestablishmentComplete-r13 RRCConnectionReestablishmentComplete-NB,
    rrcConnectionSetupComplete-r13    RRCConnectionSetupComplete-NB,
    securityModeComplete-r13     SecurityModeComplete,
    securityModeFailure-r13      SecurityModeFailure,
    ueCapabilityInformation-r13     UECapabilityInformation-NB,
    ulInformationTransfer-r13     ULInformationTransfer-NB,
    rrcConnectionResumeComplete-r13    RRCConnectionResumeComplete-NB,
    spare8 NULL, spare7 NULL,
    spare6 NULL, spare5 NULL, spare4 NULL,
    spare3 NULL, spare2 NULL, spare1 NULL
  },
  messageClassExtension SEQUENCE {}
}

---

### 6.7.2 NB-IoT Message definitions

--

**DLInformationTransfer-NB**

The **DLInformationTransfer-NB** message is used for the downlink transfer of NAS dedicated information.

- Signalling radio bearer: SRB1 or SRB1bis

---
---

**DLInformationTransfer-NB message**

---

**MasterInformationBlock-NB**

The *MasterInformationBlock-NB* includes the system information transmitted on BCH in FDD.

---

**MasterInformationBlock-NB**
MasterInformationBlock-NB field descriptions

**ab-Enabled**
Value TRUE indicates that access barring is enabled and that the UE shall acquire SystemInformationBlockType14-NB before initiating RRC connection establishment or resume.

**additionalTransmissionSIB1**
Value TRUE indicates that additional SIB1-NB transmissions are present. See TS 36.211 [21] and TS 36.213 [23]. E-UTRAN only configures additionalTransmissionSIB1 to TRUE if schedulingInfoSIB1 indicates that the number of NPDSCH repetitions is 16, see TS 36.213 [23], Table 16.4.1.3-3.

**eutra-CRS-SequenceInfo**
Information of the carrier containing NPSS/NSSS/NPBCH. Each value is associated with an E-UTRA PRB index as an offset from the middle of the LTE system sorted out by channel raster offset. See TS 36.211[21] and TS 36.213 [23].

**eutra-NumCRS-Ports**
Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23].

**hyperSFN-LSB**
Indicates the 2 least significant bits of hyper SFN. The remaining bits are present in SystemInformationBlockType1-NB.

**operationModeInfo**
Deployment scenario (in-band/guard-band/standalone) and related information. See TS 36.211 [21] and TS 36.213 [23].

**Inband-SamePCI** indicates an in-band deployment and that the NB-IoT and LTE cell share the same physical cell id and have the same number of NRS and CRS ports.

**Inband-DifferentPCI** indicates an in-band deployment and that the NB-IoT and LTE cell have different physical cell id.

**guardband** indicates a guard-band deployment.

**standalone** indicates a standalone deployment.

**schedulingInfoSIB1**
This field contains an index to a table specified in TS 36.213 [23, Table 16.4.1.3-3] that defines SystemInformationBlockType1-NB scheduling information.

**systemFrameNumber-MSB**
Defines the 4 most significant bits of the SFN. As indicated in TS 36.211 [21], the 6 least significant bits of the SFN are acquired implicitly by decoding the NPBCH.

**systemInfoValueTag**
Common for all SIBs other than MIB-NB, SIB14-NB and SIB16-NB.

---

MasterInformationBlock-TDD-NB

The MasterInformationBlock-TDD-NB includes the system information transmitted on BCH in TDD.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E-UTRAN to UE

---

ETSI
GuardbandTDD-NB-r15 ::= SEQUENCE {
  rasterOffset-r15     ChannelRasterOffset-NB-r13,
  sib-GuardbandInfo-r15    CHOICE {
    sib-GuardbandAnchor-r15    SIB-GuardbandAnchorTDD-NB-r15,
    sib-GuardbandGuardband-r15   SIB-GuardbandGuardbandTDD-NB-r15,
    sib-GuardbandInbandSamePCI-r15  SIB-GuardbandInbandSamePCI-TDD-NB-r15,
    sib-GuardbandInbandDiffPCI-r15  SIB-GuardbandInbandDiffPCI-TDD-NB-r15
  },
  eutra-Bandwidth-r15     ENUMERATED {bw5or10, bw15or20}
}

Inband-SamePCI-TDD-NB-r15 ::= SEQUENCE {
  eutra-CRS-SequenceInfo-r15   INTEGER (0..31),
  sib-InbandLocation-r15 ENumerated {lower, higher}
}

Inband-DifferentPCI-TDD-NB-r15 ::= SEQUENCE {
  eutra-NumCRS-Ports-r15     ENUMERATED {same, four},
  rasterOffset-r15      ChannelRasterOffset-NB-r13,
  sib-InbandLocation-r15     ENUMERATED {lower, higher},
  spare         BIT STRING (SIZE (2))
}

StandaloneTDD-NB-r15 ::= SEQUENCE {
  sib-StandaloneLocation-r15    ENUMERATED {lower, higher},
  spare         BIT STRING (SIZE (5))
}

SIB-GuardbandAnchorTDD-NB-r15 ::= SEQUENCE {
  spare         BIT STRING (SIZE (1))
}

SIB-GuardbandGuardbandTDD-NB-r15 ::= SEQUENCE {
  sib-GuardbandGuardbandLocation-r15 ENumerated {same, opposite}
}

SIB-GuardbandInbandSamePCI-TDD-NB-r15 ::= SEQUENCE {
  spare         BIT STRING (SIZE (1))
}

SIB-GuardbandInbandDiffPCI-TDD-NB-r15 ::= SEQUENCE {
  sib-EUTRA-NumCRS-Ports-r15    ENUMERATED {same, four}
}

-- ASN1STOP
**MasterInformationBlock-TDD-NB field descriptions**

**ab-Enabled**
Value TRUE indicates that access barring is enabled and that the UE shall acquire SystemInformationBlockType14-NB before initiating RRC connection establishment or resume.

**eutra-Bandwidth**
EUTRA system bandwidth. Value bw5or10 corresponds to bandwidth 5 or 10 MHz, value bw15or20 corresponds to bandwidth 15 or 20 MHz.
If the value of eutra-Bandwidth is bw5or10 and rasterOffset is set to khz7dot5 or khz-7dot5, the E-UTRA system bandwidth is 5 MHz.
If the value of eutra-Bandwidth is bw5or10 and rasterOffset is set to khz2dot5 or khz-2dot5, the E-UTRA system bandwidth is 10 MHz.
If the value of eutra-Bandwidth is bw15or20 and rasterOffset is set to khz7dot5 or khz-7dot5, the E-UTRA system bandwidth is 15 MHz.
If the value of eutra-Bandwidth is bw15or20 and rasterOffset is set to khz2dot5 or khz-2dot5, the E-UTRA system bandwidth is 20 MHz.
When the E-UTRA system bandwidth is 5 MHz or 10 MHz, if the value of sib-GuardbandInfo is sib-GuardbandInbandSamePCI or sib-GuardbandInbandDiffPCI, the offset between the anchor carrier and the non-anchor carrier used for SIB1 and/or SI transmission is 45 kHz.

**eutra-CRS-SequenceInfo**
Information of the carrier containing NPSS/NSSS/NPBCH.
Each value is associated with an E-UTRA PRB index as an offset from the middle of the LTE system sorted out by channel raster offset. See TS 36.211[21] and TS 36.213 [23].

**eutra-NumCRS-Ports, sib-eutra-NumCRS-Ports**
Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23].

**hyperSFN-LSB**
Indicates the 2 least significant bits of hyper SFN. The remaining bits are present in SystemInformationBlockType1-NB.

**operationModeInfo**
Deployment scenario (in-band/guard-band/standalone) and related information. See TS 36.211 [21] and TS 36.213 [23].
Inband-SamePCI indicates an in-band deployment and that the NB-IoT and LTE cell share the same physical cell id and have the same number of NRS and CRS ports.
Inband-DifferentPCI indicates an in-band deployment and that the NB-IoT and LTE cell have different physical cell id.
standalone indicates a standalone deployment.
When operationmodeInfo is set to guardband, if rasterOffset is set to khz7dot5 or khz-7dot5, the guardband anchor carrier is at the higher edge of the LTE carrier. If rasterOffset is set to khz2dot5 or khz-2dot5, the guardband anchor carrier is at the lower edge of the LTE carrier.

**schedulingInfoSIB1**
This field contains an index to a table specified in TS 36.213 [23], Table 16.4.1.3-3 that defines SystemInformationBlockType1-NB scheduling information.
If sib1-CarrierInfo is set to non-anchor, E-UTRAN configures a value between 0 and 7.

**sib-GuardbandGuardbandLocation**
Location of the non-anchor carrier used for SIB1 and/or SI transmission when operationmodeInfo is set to guardband and the non-anchor carrier is in guardband. See TS 36.213 [23].
Value same corresponds to the carrier adjacent to the anchor carrier on the outer side of the guardband, value opposite corresponds to the carrier closest to the edge of the LTE carrier in the opposite guardband.

**sib-GuardbandInfo**
Information of the carrier used for SIB1 and/or SI transmission when operationmodeInfo is set to guardband. See TS 36.213 [23].
sib-GuardbandAnchor indicates the anchor carrier.
sib-GuardbandGuard indicates a non-anchor carrier in guardband mode.
sib-GuardbandInbandSamePCI indicates a non-anchor carrier in inband mode, and at the edge of the LTE carrier and on the same side as the anchor carrier.

**sib-InbandLocation**
Location of the non-anchor carrier used for SIB1 and/or SI transmission when operationmodeInfo is set to inband-SamePCI or inband-DifferentPCI, and sib1-CarrierInfo and/or tdd-SI-CarrierInfo in SIB1-NB is set to non-anchor. See TS 36.213 [23].
Value lower corresponds to the lower adjacent carrier relative to the anchor carrier and value higher corresponds to the higher adjacent carrier relative to the anchor carrier.
If both sib1-CarrierInfo value and tdd-SI-CarrierInfo value in SIB1-NB are set to anchor, the UE ignores sib-InbandLocation.
### MasterInformationBlock-TDD-NB field descriptions

**sib-StandaloneLocation**
Location of the non-anchor carrier used for SIB1 and/or SI transmission when `operationModeInfo` is set to `standalone`, and `sib1-CarrierInfo` value and/or `tdd-SI-CarrierInfo` in SIB1-NB is set to `non-anchor`. See TS 36.213 [23]. Value `lower` corresponds to the lower adjacent carrier relative to the anchor carrier and value `higher` corresponds to the higher adjacent carrier relative to the anchor carrier. If both `sib1-CarrierInfo` value and `tdd-SI-CarrierInfo` value in SIB1-NB are set to `anchor`, the UE ignores `sib-StandaloneLocation`.

**sib1-CarrierInfo**
Carrier used for SIB1 transmission. See TS 36.213 [23], section 16.4.1.3. Value `anchor` corresponds to anchor carrier, value `non-anchor` cooresponds to non-anchor carrier.

**systemFrameNumber-MSB**
Defines the 4 most significant bits of the SFN. As indicated in TS 36.211 [21], the 6 least significant bits of the SFN are acquired implicitly by decoding the NPBCH.

**systemInfoValueTag**
Common for all SIBs other than MIB-NB, SIB14-NB and SIB16-NB.

---

**Paging-NB**

The **Paging-NB** message is used for the notification of one or more UEs.

- **Signalling radio bearer:** N/A
- **RLC-SAP:** TM
- **Logical channel:** PCCH
- **Direction:** E-UTRAN to UE

#### Paging-NB message

```asn1
-- ASN1START
Paging-NB ::= SEQUENCE {  pagingRecordList-r13 PagingRecordList-NB-r13 OPTIONAL, -- Need ON  systemInfoModification-r13 ENUMERATED {true} OPTIONAL, -- Need ON  systemInfoModification-eDRX-r13 ENUMERATED {true} OPTIONAL, -- Need ON  nonCriticalExtension SEQUENCE {} OPTIONAL }
PagingRecordList-NB-r13 ::= SEQUENCE {  pagingRecord-r13 PagingRecord-NB-r13 }
PagingRecord-NB-r13 ::= SEQUENCE {  ue-Identity-r13 PagingUE-Identity,  ... } -- ASN1STOP
```

#### Paging-NB field descriptions

**systemInfoModification**
If present: indication of a BCCH modification other than for `SystemInformationBlockType14-NB` (SIB14-NB) and `SystemInformationBlockType16-NB` (SIB16-NB). This indication does not apply to UEs using eDRX cycle longer than the BCCH modification period.

**systemInfoModification-eDRX**
If present: indication of a BCCH modification other than for `SystemInformationBlockType14-NB` (SIB14-NB) and `SystemInformationBlockType16-NB` (SIB16-NB). This indication applies only to UEs using eDRX cycle longer than the BCCH modification period.

**ue-Identity**
Provides the NAS identity of the UE that is being paged.

---

**RRCConnectionReconfiguration-NB**

The **RRCConnectionReconfiguration-NB** message is the command to modify an RRC connection. It may convey information for resource configuration (including RBs, MAC main configuration and physical channel configuration) including any associated dedicated NAS information.
Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**RRConnectionReconfiguration-NB message**

```asn1
RRConnectionReconfiguration-NB ::= SEQUENCE {
    rrc-TransactionIdentifier    RRC-TransactionIdentifier,
    criticalExtensions      CHOICE {
        c1          CHOICE{
            rrcConnectionReconfiguration-r13  RRCConnectionReconfiguration-NB-r13-IEs,
        },
        criticalExtensionsFuture   SEQUENCE {} }
}
```

**RRConnectionReconfiguration-NB-r13-IEs**

```asn1
RRCConnectionReconfiguration-NB-r13-IEs ::= SEQUENCE {
    dedicatedInfoNASList-r13   SEQUENCE (SIZE(1..maxDRB-NB-r13)) OF
        DedicatedInfoNAS OPTIONAL, -- Need ON
    radioResourceConfigDedicated-r13  RadioResourceConfigDedicated-NB-r13 OPTIONAL, -- Need ON
    fullConfig-r13      ENUMERATED {true}     OPTIONAL, -- Cond
    Reestab
    lateNonCriticalExtension  OCTET STRING      OPTIONAL,
    nonCriticalExtension    SEQUENCE {} OPTIONAL
}
```

**RRConnectionReconfiguration-NB field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dedicatedInfoNASList</td>
<td>This field is used to transfer UE specific NAS layer information between the network and the UE. The RRC layer is transparent for each PDU in the list.</td>
</tr>
<tr>
<td>fullConfig</td>
<td>Indicates the full configuration option is applicable for the RRC Connection Reconfiguration message.</td>
</tr>
</tbody>
</table>

**Conditional presence**

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reestab</td>
<td>This field is optionally present, need ON upon the first reconfiguration after RRC connection re-establishment; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

**RRConnectionReconfigurationComplete-NB**

The **RRConnectionReconfigurationComplete-NB** message is used to confirm the successful completion of an RRC connection reconfiguration.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**RRConnectionReconfigurationComplete-NB message**

```asn1
RRConnectionReconfigurationComplete-NB ::= SEQUENCE {
    rrc-TransactionIdentifier    RRC-TransactionIdentifier,
    criticalExtensions      CHOICE {
        rrcConnectionReconfigurationComplete-r13  RRCConnectionReconfigurationComplete-NB-r13-IEs,
        criticalExtensionsFuture   SEQUENCE {}
    }
}
```
---

**RRCConnectionReestablishment-NB**

The **RRCConnectionReestablishment-NB** message is used to re-establish SRB1.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: E-UTRAN to UE

---

**RRCConnectionReestablishment-NB message**

```asn1
RRCConnectionReestablishment-NB ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1                  CHOICE{
      rrcConnectionReestablishment-r13 RRCConnectionReestablishment-NB-r13-IEs,
      spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}  
  }
}
```

```asn1
RRCConnectionReestablishment-NB-r13-IEs ::= SEQUENCE {
  radioResourceConfigDedicated-r13   RadioResourceConfigDedicated-NB-r13,
  nextHopChainingCount-r13     OCTETChainingCount,
  lateNonCriticalExtension     OCTET STRING      OPTIONAL,
  nonCriticalExtension      RRCConnectionReestablishment-NB-v1430-IEs OPTIONAL
}
```

```asn1
RRCConnectionReestablishment-NB-v1430-IEs ::= SEQUENCE {
  dl-NAS-MAC       BIT STRING (SIZE (16)) OPTIONAL, -- Cond Reestablish-CP
  nonCriticalExtension    SEQUENCE {}    OPTIONAL
}
```

---

**RRCConnectionReestablishment-NB field descriptions**

- **dl-NAS-MAC**
  - Downlink authentication token, see TS 33.401 [32]. If this field is present, the UE shall ignore the field **nextHopChainingCount**.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reestablish-CP</strong></td>
<td>This field is mandatory present for NB-IoT UE using the Control Plane CIoT EPS optimisation; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionReestablishmentComplete-NB**

The **RRCConnectionReestablishmentComplete-NB** message is used to confirm the successful completion of an RRC connection re-establishment.
Signalling radio bearer: SRB1 or SRB1bis  
RLC-SAP: AM  
Logical channel: DCCH  
Direction: UE to E-UTRAN

**RRCConnectionReestablishmentComplete-NB message**

```
-- ASN1START
RRCConnectionReestablishmentComplete-NB ::= SEQUENCE {
  rrc-TransactionIdentifier    RRC-TransactionIdentifier,  
criticalExtensions      CHOICE {  
    rrcConnectionReestablishmentComplete-r13 RRCConnectionReestablishmentComplete-NB-r13-IEs,  
criticalExtensionsFuture SEQUENCE { }  
  }
}
RRCConnectionReestablishmentComplete-NB-r13-IEs ::= SEQUENCE {  
  lateNonCriticalExtension OCTET STRING  OPTIONAL,  
  nonCriticalExtension RRCConnectionReestablishmentComplete-NB-v1470-IEs  OPTIONAL  
}
RRCConnectionReestablishmentComplete-NB-v1470-IEs ::= SEQUENCE {  
  measResultServCell-r14 MeasResultServCell-NB-r14  OPTIONAL,  
  nonCriticalExtension SEQUENCE {}  OPTIONAL  
}
-- ASN1STOP
```

**RRCConnectionReestablishmentComplete-NB field descriptions**

**measResultServCell**  
This field refers to the last idle mode measurement results taken of the serving cell.

---

**RRCConnectionReestablishmentRequest-NB**  
The **RRCConnectionReestablishmentRequest-NB** message is used to request the reestablishment of an RRC connection.  

Signalling radio bearer: SRB0  
RLC-SAP: TM  
Logical channel: CCCH  
Direction: UE to E-UTRAN

**RRCConnectionReestablishmentRequest-NB message**

```
-- ASN1START
RRCConnectionReestablishmentRequest-NB ::= SEQUENCE {  
  criticalExtensions     CHOICE {  
    rrcConnectionReestablishmentRequest-r13 RRCConnectionReestablishmentRequest-NB-r13-IEs,  
    later        CHOICE {  
      rrcConnectionReestablishmentRequest-r14 RRCConnectionReestablishmentRequest-NB-r14-IEs,  
      criticalExtensionsFuture SEQUENCE {}  
    }  
  }  
}
RRCConnectionReestablishmentRequest-NB-r13-IEs ::= SEQUENCE {  
  ue-Identity-r13 ReestabUE-Identity,  
  reestablishmentCause-r13 ReestablishmentCause-NB-r13,  
  cqi-NPDCCH-r14 CQI-NPDCCH-NB-r14,  
  earlyContentionResolution-r14 BOOLEAN,  
  spare BIT STRING (SIZE (20))  
}
-- ASN1STOP
```
**RRCConnectionReestablishmentRequest-NB**

The `RRCConnectionReestablishmentRequest-NB` message is used to re-establish a RRC connection. It can be sent when the current RRC connection is in an error state and needs to be re-established.

**signalling radio bearer:** SRB0

**RLC-SAP:** TM

**Logical channel:** CCCH

**Direction:** E-UTRAN to UE

---

**RRCConnectionReestablishmentRequest-NB field descriptions**

- **cqi-NPDCCH**: This field indicates the measured DL channel quality of the serving cell as specified in TS 36.133 [16].
- **earlyContentionResolution**: Value `true` indicates UE supports MAC PDU containing the UE contention resolution identity MAC control element without RRC response message. This field is always set to `true` in this version of the specification.
- **reestablishmentCause**: Indicates the failure cause that triggered the re-establishment procedure. eNB is not expected to reject a RRCConnectionReestablishmentRequest due to unknown cause value being used by the UE.
- **ue-Identity**: UE identity included to retrieve UE context and to facilitate contention resolution by lower layers.
- **ul-NAS-Count**: For description of this field see TS 33.401 [32].
- **ul-NAS-MAC**: For description of this field see TS 33.401 [32].

---

**RRCConnectionReject-NB**

The `RRCConnectionReject-NB` message is used to reject the RRC connection establishment or RRC connection resume.

**signalling radio bearer:** SRB0

**RLC-SAP:** TM

**Logical channel:** CCCH

**Direction:** E-UTRAN to UE

---

**RRCConnectionReject-NB message**

```asn1
RRCConnectionReject-NB ::= SEQUENCE {
    criticalExtensions CHOICE {
        c1 CHOICE {
            rrcConnectionReject-r13 RRCConnectionReject-NB-r13-IEs,
            spare1 NULL
        },
        criticalExtensionsFuture SEQUENCE {}
    }
}

RRCConnectionReject-NB-r13-IEs ::= SEQUENCE {
    extendedWaitTime-r13 INTEGER (1..1800),
    rrc-SuspendIndication-r13 ENUMERATED {true} OPTIONAL, -- Need ON
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension SEQUENCE {}
}
```

---

*ETSI*
### RRCConnectionReject-NB field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>extendedWaitTime</td>
<td>Value in seconds.</td>
</tr>
<tr>
<td>rrc-SuspendIndication</td>
<td>If present, this field indicates that the UE should remain suspended and not release its stored context.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionRelease-NB**

The **RRCConnectionRelease-NB** message is used to command the release of an RRC connection, or to complete an UP-EDT procedure.

- Signalling radio bearer: SRB1 or SRB1bis
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

#### RRCConnectionRelease-NB message

```plaintext
-- ASN1START

RRCConnectionRelease-NB ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,  
  criticalExtensions     CHOICE {
    c1         CHOICE {
      rrcConnectionRelease-r13   RRCConnectionRelease-NB-r13-IEs, 
      spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  },
  extendedWaitTime           INTEGER (1..1800)    OPTIONAL, -- Need ON
  redirectedCarrierInfo-r13   RedirectedCarrierInfo-NB-r13 OPTIONAL, -- Need ON
  lateNonCriticalExtension   OCTET STRING     OPTIONAL,
  nonCriticalExtension    RRCConnectionRelease-NB-v1430-IEs  OPTIONAL
}

RRCConnectionRelease-NB-r13-IEs ::= SEQUENCE {
  releaseCause-r13     ReleaseCause-NB-r13,  
  resumeIdentity-r13     ResumeIdentity-r13    OPTIONAL, -- Need OR
  extendedWaitTime-r13   INTEGER (1..1800)    OPTIONAL, -- Need ON
  redirectedCarrierInfo-r13   RedirectedCarrierInfo-NB-r13 OPTIONAL, -- Need ON
  latestNonCriticalExtension   OCTET STRING     OPTIONAL,
  nonCriticalExtension    RRCConnectionRelease-NB-v1430-IEs  OPTIONAL
}

RRCConnectionRelease-NB-v1430-IEs ::= SEQUENCE {
  redirectedCarrierInfo-v1430   RedirectedCarrierInfo-NB-v1430 OPTIONAL, -- Cond
  extendedWaitTime-CPdata-r14   INTEGER (1..1800) OPTIONAL, -- Cond NoExtendedWaitTime
  nonCriticalExtension    RRCConnectionRelease-NB-v1530-IEs  OPTIONAL
}

RRCConnectionRelease-NB-v1530-IEs ::= SEQUENCE {
  drb-ContinueROHC-r15    ENUMERATED {true}   OPTIONAL, -- Cond UP-EDT
  nextHopChainingCount-r15 NextHopChainingCount OPTIONAL, -- Cond UP-EDT
  nonCriticalExtension    SEQUENCE {}      OPTIONAL
}

ReleaseCause-NB-r13 ::= ENUMERATED {loadBalancingTAUrequired, other, 
  rrc-Suspend, spare1}

RedirectedCarrierInfo-NB-r13::=

RedirectedCarrierInfo-NB-v1430 ::= SEQUENCE {
  redirectedCarrierOffsetDedicated-r14  
    OCTET STRING     
    OPTIONAL,
  t322-r14    ENUMERATED{
    dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, 
    dB12, (dB14, dB16, dB18, dB20, dB22, dB24, dB26),
    min5, min10, min20, min30, min60, min120, min180, 
    spare1}
}

-- ASN1STOP
```
**RRCConnectionRelease-NB field descriptions**

**drb-ContinueROHC**
This field indicates whether to continue or reset the header compression protocol context for the DRBs configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues when UE initiates UP-EDT in the same cell, while absence indicates that the header compression protocol context is reset.

**extendedWaitTime**
Value in seconds.

**extendedWaitTime-CPdata**
Wait time for data transfer using the Control Plane CIoT EPS optimisation. Value in seconds. See TS 24.301 [35].

**redirectedCarrierInfo**
The redirectedCarrierInfo indicates a carrier frequency (downlink for FDD) and is used to redirect the UE to a NB-IoT carrier frequency, by means of the cell selection upon leaving RRC_CONNECTED as specified in TS 36.304 [4].

**redirectedCarrierOffsetDedicated**
Parameter "Qoffsetdedicatedfrequency" in TS 36.304 [4]. For NB-IoT carrier frequencies, a UE that supports multi-band cells considers the redirectedCarrierOffsetDedicated to be common for all overlapping bands (i.e. regardless of the EARFCN that is used).

**releaseCause**
The releaseCause is used to indicate the reason for releasing the RRC Connection. E-UTRAN should not set the releaseCause to loadBalancingTAURequired if the extendedWaitTime is present.

**t322**
Timer T322 as described in section 7.3. Value minN corresponds to N minutes.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NoExtendedWaitTime</td>
<td>The field is optionally present, Need ON, if the extendedWaitTime is not included; otherwise the field is not present.</td>
</tr>
<tr>
<td>Redirection</td>
<td>The field is optionally present, Need ON, if redirectedCarrierInfo is included; otherwise the field is not present.</td>
</tr>
<tr>
<td>UP-EDT</td>
<td>The field is optionally present, Need ON, if the UE supports UP-EDT and releaseCause is set to rrc-Suspend; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionRequest-NB**

The RRCConnectionRequest-NB message is used to request the establishment of an RRC connection.

Signalling radio bearer: SRB0

RLC-SAP: TM

Logical channel: CCCH

Direction: UE to E-UTRAN

**RRCConnectionRequest-NB message**

```asn1
RRCConnectionRequest-NB ::= SEQUENCE {
    criticalExtensions CHOICE {
        rrcConnectionRequest-r13   RRCConnectionRequest-NB-r13-IEs,
        criticalExtensionsFuture   SEQUENCE {}
    }
}

RRCConnectionRequest-NB-r13-IEs ::= SEQUENCE {
    ue-Identity-r13       InitialUE-Identity,
    establishmentCause-r13 EstablishmentCause-NB-r13,
    multiToneSupport-r13  ENUMERATED {true}    OPTIONAL,
    multiCarrierSupport-r13 ENUMERATED {true}    OPTIONAL,
    earlyContentionResolution-r14 BOOLEAN,
    cqi-NPDCCH-r14        CQI-NPDCCH-NB-r14,
    spare         BIT STRING (SIZE (17))
}
```

---

**NOTES**

- ETSI TS 136 331 V15.3.0 (2018-10)
**RRCConnectionRequest-NB field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cqi-NPDCCH</strong></td>
<td>This field indicates the measured DL channel quality of the serving cell as specified in TS 36.133 [16].</td>
</tr>
<tr>
<td><strong>earlyContentionResolution</strong></td>
<td>Value TRUE indicates UE supports MAC PDU containing the UE contention resolution identity MAC control element without RRC response message. This field is always set to TRUE in this version of the specification.</td>
</tr>
<tr>
<td><strong>establishmentCause</strong></td>
<td>Provides the establishment cause for the RRC connection request as provided by the upper layers. eNB is not expected to reject a RRCConnectionRequest due to unknown cause value being used by the UE.</td>
</tr>
<tr>
<td><strong>multiCarrierSupport</strong></td>
<td>If present, this field indicates that the UE supports multi-carrier operation in the mode, FDD or TDD, used for access.</td>
</tr>
<tr>
<td><strong>multiToneSupport</strong></td>
<td>If present, this field indicates that the UE supports UL multi-tone transmissions on NPUSCH in the mode, FDD or TDD, used for access.</td>
</tr>
<tr>
<td><strong>ue-Identity</strong></td>
<td>UE identity included to facilitate contention resolution by lower layers.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionResume-NB**

The RRCConnectionResume-NB message is used to resume the suspended RRC connection.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: E-UTRAN to UE

**RRCConnectionResume-NB message**

```asn1
RRCConnectionResume-NB ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      rrcConnectionResume-r13    RRCConnectionResume-NB-r13-IEs,
      spare1        NULL
    },
    criticalExtensionsFuture   SEQUENCE {} 
  }
}
```

**RRCConnectionResume-NB field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>drb-ContinueROHC</strong></td>
<td>This field indicates whether to continue or reset the header compression protocol context for the DRBs configured with the header compression protocol. Presence of the field indicates that the header compression protocol context continues while absence indicates that the header compression protocol context is reset.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionResumeComplete-NB**

The RRCConnectionResumeComplete-NB message is used to confirm the successful completion of an RRC connection resumption.
Signalling radio bearer: SRB1
RLC-SAP: AM
Logical channel: DCCH
Direction: UE to E-UTRAN

**RRConnectionResumeComplete-NB message**

```asn1
RRConnectionResumeComplete-NB ::= SEQUENCE {
  rrc-TransactionIdentifier    RRC-TransactionIdentifier,
  criticalExtensions       CHOICE {
    rrcConnectionResumeComplete-r13    RRCConnectionResumeComplete-NB-r13-IEs,
    criticalExtensionsFuture     SEQUENCE {}}
}
```

```asn1
RRCConnectionResumeComplete-NB-r13-IEs ::= SEQUENCE {
  selectedPLMN-Identity-r13     INTEGER (1..maxPLMN-r11) OPTIONAL,
  dedicatedInfoNAS-r13         DedicatedInfoNAS OPTIONAL,
  lateNonCriticalExtension     OCTET STRING     OPTIONAL,
  nonCriticalExtension      RRCConnectionResumeComplete-NB-v1470-IEs OPTIONAL
}
```

```asn1
RRCConnectionResumeComplete-NB-v1470-IEs ::= SEQUENCE {
  measResultServCell-r14      MeasResultServCell-NB-r14 OPTIONAL,
  nonCriticalExtension      SEQUENCE {}     OPTIONAL
}
```

**RRConnectionResumeComplete-NB field descriptions**

**measResultServCell**
This field refers to the last idle mode measurement results taken of the serving cell.

**selectedPLMN-Identity**
Index of the PLMN selected by the UE from the `plmn-IdentityList` included in `SystemInformationBlockType1-NB`. 1 if the 1st PLMN is selected from the `plmn-IdentityList` included in SIB1-NB, 2 if the 2nd PLMN is selected from the `plmn-IdentityList` included in SIB1-NB and so on.

---

**RRConnectionResumeRequest-NB**

The **RRConnectionResumeRequest-NB** message is used to request the resumption of a suspended RRC connection or to perform UP-EDT.

Signalling radio bearer: SRB0
RLC-SAP: TM
Logical channel: CCCH
Direction: UE to E-UTRAN

**RRConnectionResumeRequest-NB message**

```asn1
RRConnectionResumeRequest-NB ::= SEQUENCE {
  criticalExtensions       CHOICE {
    rrcConnectionResumeRequest-r13   RRCConnectionResumeRequest-NB-r13-IEs,
    criticalExtensionsFuture    SEQUENCE {}}
}
```

```asn1
RRCConnectionResumeRequest-NB-r13-IEs ::= SEQUENCE {
  resumeID-r13        ResumeIdentity-r13,
  shortResumeMAC-I-r13      ShortMAC-I,
  resumeCause-r13        EstablishmentCause-NB-r13,
  earlyContentionResolution-r14    BOOLEAN,
  nonCriticalExtension      SEQUENCE {}     OPTIONAL
}
```
cqi-NPDCCH-r14 CQI-NPDCCH-NB-r14,
spare BIT STRING (SIZE (4))

-- ASN1STOP

### RRCConnectionResumeRequest-NB field descriptions

**cqi-NPDCCH**
This field indicates the measured DL channel quality of the serving cell as specified in TS 36.133 [16].

**earlyContentionResolution**
Value TRUE indicates UE supports MAC PDU containing the UE contention resolution identity MAC control element without RRC response message. This field is always set to TRUE in this version of the specification.

**resumeCause**
Provides the resume cause for the RRC connection resume request as provided by the upper layers. eNB is not expected to reject a RRCConnectionResumeRequest due to unknown cause value being used by the UE.

**resumeID**
UE identity to facilitate UE context retrieval at eNB.

**shortResumeMAC-I**
Authentication token to facilitate UE authentication at eNB.

---

### RRCConnectionSetup-NB

The **RRCConnectionSetup-NB** message is used to establish SRB1 and SRB1bis.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: E-UTRAN to UE

#### RRCConnectionSetup-NB message

```asn1
RRCConnectionSetup-NB ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      rrcConnectionSetup-r13    RRCConnectionSetup-NB-r13-IEs,
      spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}       OPTIONAL
  }
}
RRCConnectionSetup-NB-r13-IEs ::=  SEQUENCE {
  radioResourceConfigDedicated-r13 RadioResourceConfigDedicated-NB-r13,
  lateNonCriticalExtension     OCTET STRING      OPTIONAL,
  nonCriticalExtension     SEQUENCE {}       OPTIONAL
}
```

---

### RRCConnectionSetupComplete-NB

The **RRCConnectionSetupComplete-NB** message is used to confirm the successful completion of an RRC connection establishment.
Signalling radio bearer: SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**RRCConnectionSetupComplete-NB message**

```asn1
RRCConnectionSetupComplete-NB ::= SEQUENCE {
  rrcTransactionIdentifier    RRC-TransactionIdentifier,
  criticalExtensions      CHOICE{
    rrcConnectionSetupComplete-r13  RRCConnectionSetupComplete-NB-r13-IEs,
    criticalExtensionsFuture   SEQUENCE {}}
}

RRCConnectionSetupComplete-NB-r13-IEs ::= SEQUENCE {
  selectedPLMN-Identity-r13    INTEGER (1..maxPLMN-r11),
  s-TMSI-r13        S-TMSI       OPTIONAL,
  registeredMME-r13      RegisteredMME     OPTIONAL,
  dedicatedInfoNAS-r13    DedicatedInfoNAS,
  attachWithoutPDN-Connectivity-r13  ENUMERATED {true}    OPTIONAL,
  up-CIoT-EPS-Optimisation-r13   ENUMERATED {true}    OPTIONAL,
  lateNonCriticalExtension    OCTET STRING     OPTIONAL,
  nonCriticalExtension     RRCConnectionSetupComplete-NB-v1430-IEs OPTIONAL
}

RRCConnectionSetupComplete-NB-v1430-IEs ::= SEQUENCE {
  gummei-Type-r14       ENUMERATED { mapped} OPTIONAL,
  dcn-ID-r14        INTEGER (0..65535)   OPTIONAL,
  nonCriticalExtension     RRCConnectionSetupComplete-NB-v1470-IEs OPTIONAL
}

RRCConnectionSetupComplete-NB-v1470-IEs ::= SEQUENCE {
  measResultServCell-r14      MeasResultServCell-NB-r14 OPTIONAL,
  nonCriticalExtension      SEQUENCE {}     OPTIONAL
}
```

**RRCConnectionSetupComplete-NB field descriptions**

- **attachWithoutPDN-Connectivity**
  This field is used to indicate that the UE performs an Attach without PDN connectivity procedure, as indicated by the upper layers. TS 24.301 [35].

- **dcn-ID**
  The Dedicated Core Network Identity, see TS 23.401 [41].

- **gummei-Type**
  This field is used to indicate that the GUMMEI included is mapped (from 2G/3G identifiers) as indicated by the upper layers, TS 24.301 [35].

- **measResultServCell**
  This field refers to the last idle mode measurement results taken of the serving cell.

- **registeredMME**
  This field is used to transfer the GUMMEI of the MME where the UE is registered, as provided by upper layers.

- **selectedPLMN-Identity**
  Index of the PLMN selected by the UE from the plmn-IdentityList included in SystemInformationBlockType1-NB. 1 if the 1st PLMN is selected from the plmn-IdentityList included in SIB1, 2 if the 2nd PLMN is selected from the plmn-IdentityList included in SIB1 and so on.

- **up-CIoT-EPS-Optimisation**
  This field is included when the UE supports S1-U data transfer or the User plane CIoT EPS Optimisation, as indicated by the upper layers, see TS 24.301 [35].

---

**RRCEarlyDataComplete-NB**

The **RRCEarlyDataComplete-NB** message is used to confirm the successful completion of the CP-EDT procedure.
Signalling radio bearer: SRB0
RLC-SAP: TM
Logical channel: CCCH
Direction: E-UTRAN to UE

**RRCEarlyDataComplete-NB message**

```asn1
RRCEarlyDataComplete-NB-r15 ::= SEQUENCE {
    criticalExtensions CHOICE {
        rrcEarlyDataComplete-r15         RRCEarlyDataComplete-NB-r15-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCEarlyDataComplete-NB-r15-IEs ::= SEQUENCE {
    dedicatedInfoNAS-r15    DedicatedInfoNAS    OPTIONAL, -- Need ON
    extendedWaitTime-r15    INTEGER (1..1800)    OPTIONAL, -- Need ON
    redirectedCarrierInfo-r15     RedirectedCarrierInfo-NB-r13 OPTIONAL,  -- Need ON
    redirectedCarrierInfoExt-r15  RedirectedCarrierInfo-NB-v1430 OPTIONAL, -- Cond
    nonCriticalExtension    SEQUENCE {}     OPTIONAL
}
```

**RRCEarlyDataComplete-NB field descriptions**

<table>
<thead>
<tr>
<th><strong>extendedWaitTime</strong></th>
<th>Value in seconds.</th>
</tr>
</thead>
</table>

**Conditional presence**

| **Redirection** | The field is optionally present, Need ON, if redirectedCarrierInfo is included; otherwise the field is not present. |

---

**RRCEarlyDataRequest-NB**

The **RRCEarlyDataRequest-NB** message is used to initiate CP-EDT.

Signalling radio bearer: SRB0
RLC-SAP: TM
Logical channel: CCCH
Direction: UE to E-UTRAN

**RRCEarlyDataRequest-NB message**

```asn1
RRCEarlyDataRequest-NB-r15 ::= SEQUENCE {
    criticalExtensions CHOICE {
        rrcEarlyDataRequest-r15         RRCEarlyDataRequest-NB-r15-IEs,
        criticalExtensionsFuture        SEQUENCE {}
    }
}

RRCEarlyDataRequest-NB-r15-IEs ::= SEQUENCE {
    s-TMSI-r15       S-TMSI,
    establishmentCause-r15    ENUMERATED {mo-Data-r15, mo-ExceptionData-r15, delayTolerantAccess-r15, spare1},
    cqi-NPDCCH-r15     CQI-NPDCCH-NB-r14 OPTIONAL,
    dedicatedInfoNAS-r15    DedicatedInfoNAS, nonCriticalExtension    SEQUENCE {}     OPTIONAL
}
```

---
SCPTMConfiguration-NB

The **SCPTMConfiguration-NB** message contains the control information applicable for MBMS services transmitted via SC-MRB.

- Signalling radio bearer: N/A
- RLC-SAP: UM
- Logical channel: SC-MCCH
- Direction: E-UTRAN to UE

---

**SCPTMConfiguration-NB message**

```asn1
SCPTMConfiguration-NB-r14 ::= SEQUENCE {
  sc-mtch-InfoList-r14  SC-MTCH-InfoList-NB-r14,
  scptm-NeighbourCellList-r14  SCPTM-NeighbourCellList-NB-r14  OPTIONAL, -- Need OP
  lateNonCriticalExtension  OCTET STRING      OPTIONAL,
  nonCriticalExtension   SEQUENCE ()       OPTIONAL
}
```

---

**SCPTMConfiguration-NB field descriptions**

- **sc-mtch-InfoList**
  Provides the configuration of each SC-MTCH in the current cell.

- **scptm-NeighbourCellList**
  List of neighbour cells providing MBMS services via SC-MRB. When absent, the UE shall assume that MBMS services listed in the **SCPTMConfiguration-NB** message are not provided via SC-MRB in any neighbour cell.

---

SystemInformation-NB

The **SystemInformation-NB** message is used to convey one or more System Information Blocks. All the SIBs included are transmitted with the same periodicity.

- Signalling radio bearer: N/A
- RLC-SAP: TM
- Logical channel: BCCH
- Direction: E-UTRAN to UE

---

**SystemInformation-NB message**

```asn1
SystemInformation-NB ::=  SEQUENCE {
  criticalExtensions     CHOICE {
    systemInformation-r13    SystemInformation-NB-r13-IEs,
    criticalExtensionsFuture   SEQUENCE {}      -- Need OP
  },
}

SystemInformation-NB-r13-IEs ::= SEQUENCE {
  sib-TypeAndInfo-r13     SEQUENCE (SIZE (1..maxSIB)) OF CHOICE {
    sib2-r13       SystemInformationBlockType2-NB-r13,
    sib3-r13       SystemInformationBlockType3-NB-r13,
    sib4-r13       SystemInformationBlockType4-NB-r13,
    sib5-r13       SystemInformationBlockType5-NB-r13,
    sib6-r13       SystemInformationBlockType6-NB-r13,
    sib14-r13      SystemInformationBlockType14-NB-r13,
    sib15-r13      SystemInformationBlockType15-NB-r13,
    ...,
    sib15-v1430    SystemInformationBlockType15-NB-r14,
  }
}
```
-- SystemInformationBlockType1-NB

The SystemInformationBlockType1-NB message contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information.

Signalling radio bearer: N/A

RLC-SAP: TM

Logical channel: BCCH

Direction: E-UTRAN to UE

SystemInformationBlockType1-NB message

```asn1
SystemInformationBlockType1-NB ::= SEQUENCE {
  hyperSFN-MSB-r13            BIT STRING (SIZE (8)),
  cellAccessRelatedInfo-r13   SEQUENCE {
    plmn-IdentityList-r13    PLMN-IdentityList-NB-r13,
    trackingAreaCode-r13     TrackingAreaCode,
    cellIdentity-r13         CellIdentity,
    cellBarred-r13           ENUMERATED {barred, notBarred},
    intraFreqReselection-r13 ENUMERATED {allowed, notAllowed}
  },
  cellSelectionInfo-r13       SEQUENCE {
    q-RxLevMin-r13           Q-RxLevMin,
    q-QualMin-r13            Q-QualMin-r9
  },
  p-Max-r13                  P-Max OPTIONAL, -- Need OP
  freqBandIndicator-r13      FreqBandIndicator-NB-r13,
  freqBandInfo-r13           NS-PmaxList-NB-r13 OPTIONAL, -- Need OR
  multiBandInfoList-r13      MultiBandInfoList-NB-r13 OPTIONAL, -- Need OR
  downlinkBitmap-r13         DL-Bitmap-NB-r13 OPTIONAL, -- Cond SIB1
  eutraControlRegionSize-r13 ENUMERATED {n1, n2, n3} OPTIONAL, -- Cond inband
  nrs-CRS-PowerOffset-r13    ENUMERATED {dB-6, dB-4dot77, dB-3, dB-1dot77, dB0, dB1, dB1dot23, dB2, dB3, dB4, dB4dot23, dB5, dB6, dB7, dB8, dB9} OPTIONAL, -- Cond inband-SamePCI
  schedulingInfoList-r13     SchedulingInfoList-NB-r13,
  si-WindowLength-r13        ENUMERATED {ms160, ms320, ms480, ms640, ms960, ms1280, ms1600, spare1},
  si-RadioFrameOffset-r13    INTEGER (1..15) OPTIONAL, -- Need OP
  systemInfoValueTagList-r13 SystemInfoValueTagList-NB-r13 OPTIONAL, -- Need OR
  nonCriticalExtension       OCTET STRING OPTIONAL,
} -- ASN1STOP
```

```
SystemInformationBlockType1-NB-v1350 ::= SEQUENCE {
  cellSelectionInfo-v1350    CellSelectionInfo-NB-v1350 OPTIONAL, -- Cond Qrxlevmin
  nonCriticalExtension      SystemInformationBlockType1-NB-v1430 OPTIONAL
} -- ASN1STOP
```

```
SystemInformationBlockType1-NB-v1430 ::= SEQUENCE {
  cellSelectionInfo-v1430    CellSelectionInfo-NB-v1430 OPTIONAL, -- Need OR
  nonCriticalExtension      SystemInformationBlockType1-NB-v1450 OPTIONAL
} -- ASN1STOP
```

```
SystemInformationBlockType1-NB-v1450 ::= SEQUENCE {
  nrs-CRS-PowerOffset-v1450  ENUMERATED {dB-6, dB-4dot77, dB-3, dB1dot77, dB0, dB1}
} -- ASN1STOP
```
749

PLMN-IdentityList-NB-r13 ::= SEQUENCE (SIZE (1..maxPLMN-r11)) OF PLMN-IdentityInfo-NB-r13

PLMN-IdentityInfo-NB-r13 ::= SEQUENCE {
  plmn-Identity-r13      PLMN-Identity,
  cellReservedForOperatorUse-r13   ENUMERATED {reserved, notReserved},
  attachWithoutPDN-Connectivity-r13  ENUMERATED {true} OPTIONAL -- Need OP
}

SchedulingInfoList-NB-r13 ::= SEQUENCE (SIZE (1..maxSI-Message-NB-r13)) OF SchedulingInfo-NB-r13

SchedulingInfo-NB-r13 ::= SEQUENCE {
  si-Periodicity-r13    ENUMERATED {rf64, rf128, rf256, rf512, rf1024, rf2048, rf4096, spare},
  si-RepetitionPattern-r13  ENUMERATED {every2ndRF, every4thRF, every8thRF, every16thRF},
  sib-MappingInfo-r13    SIB-MappingInfo-NB-r13,
  si-TB-r13      ENUMERATED {b56, b120, b208, b256, b328, b440, b552, b680}
}

SchedulingInfo-NB-v1530 ::= SEQUENCE {
  sib-MappingInfo-v1530    SIB-MappingInfo-NB-v1530 OPTIONAL -- Need OP
}

SystemInfoValueTagList-NB-r13 ::= SEQUENCE (SIZE (1.. maxSI-Message-NB-r13)) OF SystemInfoValueTagSI-r13

SIB-MappingInfo-NB-r13 ::= SEQUENCE {
  sib-MappingInfo-NB-r13   SIB-MappingInfo-NB-r13
}

SIB-MappingInfo-NB-v1530 ::= SEQUENCE {
  sib-MappingInfo-v1530    SIB-MappingInfo-NB-v1530
}

SIB-Type-NB-r13 ::= ENUMERATED {
  sibType3-NB-r13, sibType4-NB-r13, sibType5-NB-r13, sibType14-NB-r13, sibType15-NB-r13, sibType16-NB-r13, sibType17-NB-r13
}

SIB-Type-NB-v1530 ::= ENUMERATED {
  sibType23-NB-r15, spare7, spare6, spare5, spare4, spare3, spare2, spare1
}

CellSelectionInfo-NB-v1350 ::= SEQUENCE {
  delta-RxLevMin-v1350    INTEGER (--8..-1)
}

CellSelectionInfo-NB-v1430 ::= SEQUENCE {
  powerClass14dBm-Offset-r14  ENUMERATED {db-6, db-3, db3, db6, db9, db12} OPTIONAL, -- Need OP
  ce-authorisationOffset-r14 ENUMERATED {db5, db10, db15, db20, db25, db30, db35} OPTIONAL -- Need OP
}

-- ASN1STOP
### SystemInformationBlockType1-NB field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>attachWithoutPDN-Connectivity</strong></td>
</tr>
<tr>
<td>If present, the field indicates that attach without PDN connectivity as specified in TS 24.301 [35] is supported for this PLMN.</td>
</tr>
<tr>
<td><strong>ce-authorisationOffset</strong></td>
</tr>
<tr>
<td>Parameter &quot;Qoffsetauthorization&quot; in TS 36.304 [4]. Value in dB. Value dB5 corresponds to 5 dB, dB10 corresponds to 10 dB and so on. If the field is absent, the value of 0 dB shall be used for &quot;Qoffsetauthorization&quot;.</td>
</tr>
<tr>
<td><strong>cellBarred</strong></td>
</tr>
<tr>
<td>Barred means the cell is barred, as defined in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>cellIdentity</strong></td>
</tr>
<tr>
<td>Indicates the cell identity.</td>
</tr>
<tr>
<td><strong>cellReservedForOperatorUse</strong></td>
</tr>
<tr>
<td>As defined in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>cellSelectionInfo</strong></td>
</tr>
<tr>
<td>Cell selection information as specified in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>downlinkBitmap</strong></td>
</tr>
<tr>
<td>For FDD, NB-IoT downlink subframe configuration for downlink transmission as specified in TS 36.213 [23], section 16.4. For TDD, NB-IoT downlink, uplink and special subframes configuration for transmission on the anchor carrier as specified in TS 36.213 [23], section 16.4. If the bitmap is not present, the UE shall assume that all subframes are valid (except for subframes carrying NPSS/ NSSS/NPBCH/SIB1-NB) as specified in TS 36.213 [23, 16.4].</td>
</tr>
<tr>
<td><strong>eutraControlRegionSize</strong></td>
</tr>
<tr>
<td>Indicates the control region size of the E-UTRA cell for the in-band operation mode, see TS 36.213 [23]. Unit is in number of OFDM symbols.</td>
</tr>
<tr>
<td><strong>freqBandInfo</strong></td>
</tr>
<tr>
<td>A list of additionalPmax and additionalSpectrumEmission values as defined in TS 36.101 [42, 6.2.4F] for the frequency band in freqBandIndicator.</td>
</tr>
<tr>
<td><strong>hyperSFN-MSB</strong></td>
</tr>
<tr>
<td>Indicates the 8 most significant bits of hyper-SFN. Together with hyperSFN-LSB in MIB-NB, the complete hyper-SFN is built up. hyper-SFN is incremented by one when the SFN wraps around.</td>
</tr>
<tr>
<td><strong>intraFreqReselection</strong></td>
</tr>
<tr>
<td>Used to control cell reselection to intra-frequency cells when the highest ranked cell is barred, or treated as barred by the UE, as specified in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>multiBandInfoList</strong></td>
</tr>
<tr>
<td>A list of additional frequency band indicators, additionalPmax and additionalSpectrumEmission values, as defined in TS 36.101 [42, table 5.5-1]. If the UE supports the frequency band in the freqBandIndicator IE it shall apply that frequency band. Otherwise, the UE shall apply the first listed band which it supports in the multiBandInfoList IE.</td>
</tr>
<tr>
<td><strong>nrs-CRS-PowerOffset</strong></td>
</tr>
<tr>
<td>NRS power offset between NRS and E-UTRA CRS, see TS 36.213 [23, 16.2.2]. Unit in dB. Default value of 0.</td>
</tr>
<tr>
<td><strong>plmn-IdentityList</strong></td>
</tr>
<tr>
<td>List of PLMN identities. The first listed PLMN-Identity is the primary PLMN.</td>
</tr>
<tr>
<td><strong>powerClass14dBm-Offset</strong></td>
</tr>
<tr>
<td>Parameter &quot;Poffset&quot; in TS 36.304 [4]. Only applicable for UE supporting powerClassNB-14dBm. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the field is absent, the UE applies the (default) value of 0 dB for &quot;Poffset&quot; in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>p-Max</strong></td>
</tr>
<tr>
<td>Value applicable for the cell. If absent the UE applies the maximum power according to the UE capability.</td>
</tr>
<tr>
<td><strong>q-QualMin</strong></td>
</tr>
<tr>
<td>Parameter &quot;Qqualmin&quot; in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>q-RxLevMin, delta-RxLevMin</strong></td>
</tr>
<tr>
<td>Parameter Q_{rxlevmin} in TS 36.304 [4]. If delta-RxLevMin is not included, actual value Q_{rxlevmin} = q-RxLevMin * 2 [dBm]. If delta-RxLevMin is included, actual value Q_{rxlevmin} = (q-RxLevMin + delta-RxLevMin) * 2 [dBm].</td>
</tr>
<tr>
<td><strong>schedulingInfoList</strong></td>
</tr>
<tr>
<td>Indicates additional scheduling information of SI messages.</td>
</tr>
<tr>
<td><strong>si-Periodicity</strong></td>
</tr>
<tr>
<td>Periodicity of the SI-message in radio frames, such that rf256 denotes 256 radio frames, rf512 denotes 512 radio frames, and so on.</td>
</tr>
<tr>
<td><strong>si-RadioFrameOffset</strong></td>
</tr>
<tr>
<td>Offset in number of radio frames to calculate the start of the SI window. If the field is absent, no offset is applied.</td>
</tr>
<tr>
<td><strong>si-RepetitionPattern</strong></td>
</tr>
<tr>
<td>Indicates the starting radio frames within the SI window used for SI message transmission. Value every2ndRF corresponds to every 2 radio frames, value every4thRF corresponds to every 4 radio frames and so on. The first transmission of the SI message is transmitted from the first radio frame of the SI window.</td>
</tr>
</tbody>
</table>
**SystemInformationBlockType1-NB field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>si-TB</td>
<td>This field indicates the transport block size in number of bits and the corresponding number of consecutive NB-IoT downlink subframes that are used to broadcast the SI message. Value b56 corresponds to 56 bits, b120 corresponds to 120 bits and so on. TBS of 56 bits and 120 bits are transmitted over 2 sub-frames, other TBS are transmitted over 8 sub-frames, see TS 36.213 [23, Table 16.4.1.5.1-1].</td>
</tr>
<tr>
<td>si-WindowLength</td>
<td>Common SI scheduling window for all SIs. Unit in milliseconds, where ms160 denotes 160 milliseconds, ms320 denotes 320 milliseconds and so on.</td>
</tr>
<tr>
<td>sib-MappingInfo</td>
<td>List of the SIBs mapped to this SystemInformation message. There is no mapping information of SIB2-NB; it is always present in the first SystemInformation message listed in the schedulingInfoList list.</td>
</tr>
<tr>
<td>sib-MappingInfo</td>
<td>List of the SIBs mapped to this SystemInformation message. There is no mapping information of SIB2-NB; it is always present in the first SystemInformation message listed in the schedulingInfoList list.</td>
</tr>
<tr>
<td>systemInfoValueTagList</td>
<td>Indicates SI message specific value tags. It includes the same number of entries, and listed in the same order, as in SchedulingInfoList.</td>
</tr>
<tr>
<td>systemInfoValueTagSI</td>
<td>SI message specific value tag as specified in Clause 5.2.1.3. Common for all SIBs within the SI message other than SIB14-NB.</td>
</tr>
<tr>
<td>tdd-Config</td>
<td>Indicates the TDD specific physical channel configuration.</td>
</tr>
<tr>
<td>tdd-SI-CarrierInfo</td>
<td>Carrier used for SI message transmission. Value anchor corresponds to anchor carrier, value non-anchor corresponds to non-anchor carrier. See TS 36.213 [23]. When tdd-SI-CarrierInfo is set to value non-anchor then sib-GuardbandInfo in MIB-TDD-NB (in case of operationModelInfo is set to guardband) or sib-InbandLocation in MIB-TDD-NB (in case of operationModelInfo is set to inband-SamePCI or inband-DifferentPCI) or sib-StandaloneLocation in MIB-TDD-NB (in case of operationModelInfo is set to standalone) defines which non-anchor carrier is used (see MIB-NB-TDD).</td>
</tr>
<tr>
<td>tdd-SI-SubframesBitmap</td>
<td>NB-IoT downlink, uplink and special subframes configuration for transmission on the carrier carrying the SI message as specified in TS 36.213 [23], section 16.4.</td>
</tr>
<tr>
<td>trackingAreaCode</td>
<td>A trackingAreaCode that is common for all the PLMNs listed.</td>
</tr>
</tbody>
</table>

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>inband</td>
<td>In FDD: The field is mandatory present if IE operationModelInfo in MIB-NB is set to inband-SamePCI or inband-DifferentPCI. Otherwise the field is not present. In TDD: The field is mandatory present if:</td>
</tr>
<tr>
<td></td>
<td>- IE operationModelInfo in MIB-TDD-NB is set to inband-SamePCI or inband-DifferentPCI or</td>
</tr>
<tr>
<td></td>
<td>- IE operationModelInfo in MIB-TDD-NB is set to guardband and IE sib-GuardbandInfo in MIB-TDD-NB is set to sib-GuardbandInbandSamePCI or sib-GuardbandInbandDiffPCI and IE tdd-SI-CarrierInfo is set to non-anchor</td>
</tr>
<tr>
<td>inband-SamePCI</td>
<td>The field is mandatory present, if IE operationModelInfo in MIB-NB is set to inband-SamePCI. Otherwise the field is not present.</td>
</tr>
<tr>
<td>inband-DifferentPCI</td>
<td>The field is optionally present if IE operationModelInfo in MIB-NB is set to a value other than inband-SamePCI, and at least one non-anchor carrier is inband carrier and uses the same PCI as the E-UTRA carrier. Otherwise the field is not present.</td>
</tr>
<tr>
<td>Qrxlevmin</td>
<td>This field is optionally present, Need OR, if q-RxLevMin is set to the minimum value. Otherwise the field is not present.</td>
</tr>
<tr>
<td>SIB1</td>
<td>The field is mandatory present if IE additionalTransmissionSIB1 in MIB-NB is set to TRUE. Otherwise the field is optionally present, Need OP.</td>
</tr>
<tr>
<td>TDD</td>
<td>The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDD-SI-NonAnchor</td>
<td>The field is mandatory present for TDD if si-CarrierInfo is set to non-anchor; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

**UECapabilityEnquiry-NB**

The **UECapabilityEnquiry-NB** message is used to request the transfer of UE radio access capabilities for NB-IoT.
UECapabilityEnquiry-NB message

-- ASN1START

UECapabilityEnquiry-NB ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    criticalExtensionsFuture   SEQUENCE { }
  },
  ueCapabilityEnquiry-r13    UECapabilityEnquiry-NB-r13-IEs,
  spare1        NULL
}

-- ASN1STOP

-- ASN1START

UECapabilityEnquiry-NB-r13-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension     SEQUENCE {}       OPTIONAL
}

-- ASN1STOP

-- ASN1START

UECapabilityInformation-NB

The UECapabilityInformation-NB message is used to transfer of UE radio access capabilities requested by the E-UTRAN.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

UECapabilityInformation-NB message

-- ASN1START

UECapabilityInformation-NB ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    ueCapabilityInformation-r13  UECapabilityInformation-NB-r13-IEs,
    criticalExtensionsFuture  SEQUENCE { }
  },
  ueCapability-ContainerExt-r14   OCTET STRING (CONTAINING UECapabilityInformation-NB-Ext-r14-IEs),
  nonCriticalExtension     SEQUENCE {}       OPTIONAL
}

-- ASN1STOP
**UECapabilityInformation-NB field descriptions**

This field contains UE capability information used for paging.

---

**ULInformationTransfer-NB**

The *ULInformationTransfer-NB* message is used for the uplink transfer of NAS information.

Signalling radio bearer: SRB1 or SRB1bis

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

**ULInformationTransfer-NB message**

```plaintext
-- ASN1START
ULInformationTransfer-NB ::= SEQUENCE {
  criticalExtensions CHOICE {
    ulInformationTransfer-r13  ULInformationTransfer-NB-r13-IEs,
    criticalExtensionsFuture  SEQUENCE { }
  }
}
ULInformationTransfer-NB-r13-IEs ::= SEQUENCE {
  dedicatedInfoNAS-r13 DedicatedInfoNAS,
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension SEQUENCE { }
}
-- ASN1STOP
```

6.7.3 NB-IoT information elements

6.7.3.1 NB-IoT System information blocks

---

**SystemInformationBlockType2-NB**

The IE *SystemInformationBlockType2-NB* contains radio resource configuration information that is common for all UEs.

NOTE: UE timers and constants related to functionality for which parameters are provided in another SIB are included in the corresponding SIB.

**SystemInformationBlockType2-NB information element**

```plaintext
-- ASN1START
SystemInformationBlockType2-NB-r13 ::= SEQUENCE {
  radioResourceConfigCommon-r13 RadioResourceConfigCommonSIB-NB-r13,
  ue-TimersAndConstants-r13  UE-TimersAndConstants-NB-r13,
  freqInfo-r13              SEQUENCE {
    ul-CarrierFreq-r13 CarrierFreq-NB-r13 OPTIONAL, -- Need OP
    additionalSpectrumEmission-r13 AdditionalSpectrumEmission
  },
  timeAlignmentTimerCommon-r13 TimeAlignmentTimer,
  multiBandInfoList-r13     SEQUENCE (SIZE (1..maxMultiBands)) OF AdditionalSpectrumEmission OPTIONAL, -- Need OR
  ..., OCTET STRING OPTIONAL, -- Need OR
  [[ cp-Reestablishment-r14 ENUMERATED {true} OPTIONAL -- Need
    OP
  }],
  [[ servingCellMeasInfo-r14 ENUMERATED {true} OPTIONAL, -- Need OR
    cqi-Reporting-r14 ENUMERATED {true} OPTIONAL, -- Need OR
    ];
}
```
SystemInformationBlockType2-NB field descriptions

additionalSpectrumEmission
The UE requirements related to IE AdditionalSpectrumEmission are defined in TS 36.101 [42, 6.2.4F].

cp-EDT
This field indicates whether the UE is allowed to initiate CP-EDT, see 5.3.3.1b.

cp-Reestablishment
This field indicates if the NB-IoT UE is allowed to trigger RRC connection re-establishment when AS security has not been activated.

cqi-Reporting
This field indicates if downlink channel quality reporting in RRCConnectionReestablishmentRequest-NB, RRCConnectionRequest-NB and RRCConnectionResumeRequest-NB message is allowed.

enhancedPHR
This field indicates if the NB-IoT UE is allowed to report enhanced PHR in MSG3 as specified in TS 36.321 [6].

multiBandInfoList
A list of additionalSpectrumEmission i.e. one for each additional frequency band included in multiBandInfoList in SystemInformationBlockType1-NB, listed in the same order.

servingCellMeasInfo
This field indicates if serving cell idle mode measurement reporting in RRCConnectionReestablishmentComplete-NB, RRCConnectionResumeComplete-NB and RRCConnectionSetupComplete-NB is allowed.

tdd-UL-DL-AlignmentOffset
Indicates the offset between the UL carrier frequency center with respect to DL carrier frequency center for the anchor carrier, see TS 36.211 [21].

ul-CarrierFreq
For FDD: Uplink carrier frequency as defined in TS 36.101 [42, 5.7.3F]. If operationModeInfo in the MIB-NB is set to standalone and the field is absent, the value of the carrier frequency is determined by the TX-RX frequency separation defined in TS 36.101 [42, table 5.7.4-1] and the value of the carrier frequency offset is 0. If operationModeInfo in the MIB-NB is not set to standalone, the field is mandatory present.

For TDD: This field is absent and the uplink carrier frequency is same as the downlink frequency.

up-EDT
This field indicates whether the UE is allowed to initiate UP-EDT, see 5.3.3.1b.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

SystemInformationBlockType3-NB

The IE SystemInformationBlockType3-NB contains cell re-selection information common for intra-frequency, and inter-frequency cell re-selection as well as intra-frequency cell re-selection information other than neighbouring cell related.

SystemInformationBlockType3-NB information element

-- ASN1START

SystemInformationBlockType3-NB-r13 ::= SEQUENCE {
  cellReselectionInfoCommon-r13  SEQUENCE {
    q-Hyst-r13        ENUMERATED {
      dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10,
      dB12, dB14, dB16, dB18, dB20, dB22, dB24
    }
  },
  cellReselectionServingFreqInfo-r13  SEQUENCE {
    s-NonIntraSearch-r13     ReselectionThreshold
  },
  intraFreqCellReselectionInfo-r13  SEQUENCE {
    q-RxLevMin-r13       Q-RxLevMin
  }
}
IntraFreqCellReselectionInfo-NB-v1350 ::= SEQUENCE {
  delta-RxLevMin-v1350 INTEGER {-8..-1}
}

IntraFreqCellReselectionInfo-NB-v1360 ::= SEQUENCE {
  s-IntraSearchP-v1360 ReselectionThreshold-NB-v1360
}

IntraFreqCellReselectionInfo-NB-v1430 ::= SEQUENCE {
  powerClass14dBm-Offset-r14 ENUMERATED {-6, -3, 3, 6, 9, 12} OPTIONAL, -- Need OP
  ce-AuthorisationOffset-r14 ENUMERATED {0..35} OPTIONAL -- Need OP
}

CellReselectionInfoCommon-NB-v1450 ::= SEQUENCE {
  s-SearchDeltaP-r14 ENUMERATED {6, 9, 12, 15}
}

-- ASN1STOP
### SystemInformationBlockType3-NB field descriptions

**ce-AuthorisationOffset**
Parameter "Qoffsetauthorization" in TS 36.304 [4]. Value in dB. Value dB5 corresponds to 5 dB, dB10 corresponds to 10 dB and so on. If the field is absent, the UE applies the value of ce-authorisationOffset in SystemInformationBlockType1-NB.

**multiBandInfoList**
A list of additionalPmax and additionalSpectrumEmission values as defined in TS 36.101 [42, 6.2.4F] applicable for the intra-frequency neighbouring NB-IoT cells if the UE selects the frequency band from freqBandIndicator in SystemInformationBlockType1-NB.

**npbch-RRM-Config**
Configuration for NPBCB-based RRM measurements. See TS 36.214 [24].

**nsss-RRM-Config**
Configuration for NSSS-based RRM measurements for the serving cell.

**powerClass14dBm-Offset**
Parameter "Poffset" in TS 36.304 [4], only applicable for UE supporting powerClassNB-14dBm. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the field is absent, the UE applies the (default) value of 0 dB for "Poffset" in TS 36.304 [4].

**p-Max**
Value applicable for the intra-frequency neighbouring E-UTRA cells. If absent the UE applies the maximum power according to the UE capability.

**q-Hyst**
Parameter Qhyst in TS 36.304 [4], Value in dB. Value dB1 corresponds to 1 dB, dB2 corresponds to 2 dB and so on.

**q-QualMin**
Parameter "Qqualmin" in TS 36.304 [4], applicable for intra-frequency neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin.

**q-RxLevMin, delta-RxLevMin**
Parameter "Qrxlevmin" in TS 36.304 [4], applicable for intra-frequency neighbour cells. If delta-RxLevMin is not included, actual value Qrxlevmin = q-RxLevMin * 2 [dBm]. If delta-RxLevMin is included, actual value Qrxlevmin = (q-RxLevMin + delta-RxLevMin) * 2 [dBm].

**s-IntraSearchP**
Parameter "SIntraSearchP" in TS 36.304 [4]. In case s-IntraSearchP-v1360 is included, the UE shall ignore s-IntraSearchP (i.e. without suffix).

**s-NonIntraSearch**
Parameter "SnonIntraSearch" in TS 36.304 [4].

**s-SearchDeltaP**
Parameter "SSearchDeltaP" in TS 36.304 [4]. This parameter is only applicable for UEs supporting relaxed monitoring as specified in TS 36.306 [5]. Value dB6 corresponds to 6 dB, dB9 corresponds to 9 dB and so on.

**t-Reselection**
Parameter "TreselectionNB-IoT" in TS 36.304 [4].

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qrxlevmin</td>
<td>This field is optionally present, Need OR, if q-RxLevMin is set to the minimum value. Otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

### SystemInformationBlockType4-NB

The IE SystemInformationBlockType4-NB contains neighbouring cell related information relevant only for intra-frequency cell re-selection. The IE includes cells with specific re-selection parameters.

#### SystemInformationBlockType4-NB information element

```plaintext
-- ASN1START
SystemInformationBlockType4-NB-r13 ::= SEQUENCE {
  intraFreqNeighborCellList-r13   IntraFreqNeighborCellList OPTIONAL, -- Need OR
  intraFreqBlackCellList-r13     IntraFreqBlackCellList OPTIONAL, -- Need OR
  lateNonCriticalExtension       OCTET STRING OPTIONAL,
  ...,
  [ nsss-RRM-Config-r15          NSSS-RRM-Config-NB-r15 OPTIONAL, -- Need OR
    intraFreqNeighborCellList-v1530 IntraFreqNeighborCellList-NB-v1530 OPTIONAL -- Need OR
  ]
}
IntraFreqNeighborCellList-NB-v1530 ::= SEQUENCE (SIZE (1..maxCellIntra)) OF IntraFreqNeighborCellInfo-NB-v1530
-- ASN1END
```
### SystemInformationBlockType4-NB field descriptions

**intraFreqBlackCellList**
List of blacklisted intra-frequency neighbouring cells.

**intraFreqNeighCellList**
List of intra-frequency neighbouring cells with specific cell re-selection parameters.

**nsss-RRM-Config**
Configuration for NSSS-based RRM measurements.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NSSS-RRM</strong></td>
<td>This field is optionally present, Need OR, when nsss-RRM-Config is present in SystemInformationBlockType4NB. Otherwise, the field is not present, and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

### SystemInformationBlockType5-NB

The IE SystemInformationBlockType5-NB contains information relevant only for inter-frequency cell re-selection i.e. information about other NB-IoT frequencies and inter-frequency neighbouring cells relevant for cell re-selection. The IE includes cell re-selection parameters common for a frequency as well as cell specific re-selection parameters.

### SystemInformationBlockType5-NB information element

---

---

---
**SystemInformationBlockType5-NB field descriptions**

**ce-AuthorisationOffset**
Parameter "Qoffsetauthorization" in TS 36.304 [4]. Value in dB. Value dB5 corresponds to 5 dB, dB10 corresponds to 10 dB and so on. If the field is absent, the UE applies the value of ce-authorisationOffset in SystemInformationBlockType1-NB.

**p-Max**
Value applicable for the neighbouring NB-IoT cells on this carrier frequency. If absent the UE applies the maximum power according to the UE capability.

**InterFreqBlackCellList**
List of blacklisted inter-frequency neighbouring cells. E-UTRAN includes InterFreqNeighCellList-NB-v1530 for cells with cell specific NSSS-based measurement configuration.

**InterFreqCarrierFreqList**
List of neighbouring inter-frequencies. E-UTRAN does not configure more than one entry for the same physical frequency regardless of the E-ARFCN used to indicate this.

**InterFreqNeighCellList**
List of inter-frequency neighbouring cells.

**multiBandInfoList**
Indicates the list of frequency bands, with the associated additionalPmax and additionalSpectrumEmission values as defined in TS 36.101 [42, 6.2.4], in addition to the band represented by dl-CarrierFreq for which cell reselection parameters are common.

**nsss-RRM-Config**
Configuration for NSSS-based RRM measurements.

**powerClass14dBm-Offset**
Parameter "Poffset" in TS 36.304 [4], only applicable for UE supporting powerClassNB-14dBm. Value in dB. Value dB-6 corresponds to -6 dB, dB-3 corresponds to -3 dB and so on. If the field is absent, the UE applies the (default) value of 0 dB for "Poffset" in TS 36.304 [4].

**q-OffsetFreq**
Parameter "Qoffsetfrequency" in TS 36.304 [4].

**q-QualMin**
Parameter "Qqualmin" in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin.

**q-RxLevMin, delta-RxLevMin**
Parameter "QRxLevmin" in TS 36.304 [4]. If delta-RxLevMin is not included, actual value Qrxlevmin = q-RxLevMin * 2 [dBm]. If delta-RxLevMin is included, actual value Qrxlevmin = (q-RxLevMin + delta-RxLevMin) * 2 [dBm].

**scptm-FreqOffset**
Parameter QoffsetSCPTM in TS 36.304 [4]. Actual value QoffsetSCPTM = field value * 2 [dB]. If the field is absent, the UE uses infinite dBs for the SC-PTM frequency offset with cell ranking as specified in TS 36.304 [4].

**t-Reselection**
Parameter "TreselectionNB-IoT_Inter" in TS 36.304 [4].

---

**SystemInformationBlockType14-NB**

The IE SystemInformationBlockType14-NB contains the AB parameters.

---

**SystemInformationBlockType14-NB information element**
ab-Common-r13  AB-Config-NB-r13,
   ab-PerPLMN-List-r13  SEQUENCE (SIZE (1..maxPLMN-r11)) OF AB-ConfigPLMN-NB-r13
 } optional, -- Need OR
lateNonCriticalExtension  OCTET STRING  optional,
...,
[[ ab-PerNRSRP-r15  ENUMERATED (thresh1, thresh2) OPTIONAL  -- Need OR
]]
}

AB-ConfigPLMN-NB-r13 ::= SEQUENCE {
   ab-Config-r13  AB-Config-NB-r13  OPTIONAL  -- Need OR
 }

AB-Config-NB-r13 ::= SEQUENCE {
   ab-Category-r13  ENUMERATED {a, b, c},
   ab-BarringBitmap-r13  BIT STRING (SIZE(10)),
   ab-BarringForExceptionData-r13 ENUMERATED {true}  OPTIONAL  -- Need OR
   ab-BarringForSpecialAC-r13  BIT STRING (SIZE(5))
 }

-- ASN1STOP

SystemInformationBlockType14-NB field descriptions

ab-BarringBitmap
Access class barring for AC 0-9. The first/ leftmost bit is for AC 0, the second bit is for AC 1, and so on.

ab-BarringForExceptionData
Indicates whether ExceptionData is subject to access barring.

ab-BarringForSpecialAC
Access class barring for AC 11-15. The first/ leftmost bit is for AC 11, the second bit is for AC 12, and so on.

ab-Category
Indicates the category of UEs for which AB applies. Value a corresponds to all UEs, value b corresponds to the UEs that are neither in their HPLMN nor in a PLMN that is equivalent to it, and value c corresponds to the UEs that are not in the PLMN listed as most preferred PLMN of the country where the UEs are roaming in the operator-defined PLMN selector list on the USIM, nor in their HPLMN nor in a PLMN that is equivalent to their HPLMN, see TS 22.011 [10].

ab-Common
The AB parameters applicable for all PLMN(s).

ab-PerNRSRP
Access barring per NRSRP. Value thresh1 corresponds to the first entry configured in rsrp-ThresholdsPrachInfoList, value thresh2 corresponds to the second entry configured in rsrp-ThresholdsPrachInfoList.

ab-PerPLMN-List
The AB parameters per PLMN, listed in the same order as the PLMN(s) occur in plmn-IdentityList in SystemInformationBlockType1-NB.

-- SystemInformationBlockType14-NB

SystemInformationBlockType15-NB

The IE SystemInformationBlockType15-NB contains the MBMS Service Area Identities (SAI) of the current and/ or neighbouring carrier frequencies.

SystemInformationBlockType15-NB information element

-- ASN1START

SystemInformationBlockType15-NB-r14 ::= SEQUENCE {
   mbms-SAI-IntraFreq-r14  MBMS-SAI-List-r11  OPTIONAL, -- Need OR
   mbms-SAI-InterFreqList-r14  MBMS-SAI-InterFreqList-NB-r14  OPTIONAL, -- Need OR
lateNonCriticalExtension  OCTET STRING  OPTIONAL,
...,
}

MBMS-SAI-InterFreqList-NB-r14 ::= SEQUENCE (SIZE (1..maxFreq)) OF MBMS-SAI-InterFreq-r14

MBMS-SAI-InterFreq-r14 ::= SEQUENCE {
   dl-CarrierFreq-r14  CarrierFreq-NB-r13,
   mbms-SAI-List-r14  MBMS-SAI-List-r11,
   multiBandInfoList-r14  AdditionalBandInfoList-NB-r14  OPTIONAL  -- Need OR
 }

-- ASN1STOP
SystemInformationBlockType15-NB field descriptions

**mbms-SAI-InterFreqList**
Contains a list of neighboring frequencies including additional frequency bands, if any, that provide MBMS services and the corresponding MBMS SAIs.

**mbms-SAI-IntraFreq**
Contains the list of MBMS SAIs for the current frequency. A duplicate MBMS SAI indicates that this and all following SAIs are not offered by this cell but only by neighbour cells on the current frequency. For MBMS service continuity, the UE shall use all MBMS SAIs listed in **mbms-SAI-IntraFreq** to derive the MBMS frequencies of interest.

**mbms-SAI-List**
Contains a list of MBMS SAIs for a specific frequency.

**multiBandInfoList**
A list of additional frequency bands applicable for the cells participating in the SC-PTM transmission.

---

**SystemInformationBlockType16-NB**
The IE **SystemInformationBlockType16-NB** contains information related to GPS time and Coordinated Universal Time (UTC). The UE may use the parameters provided in this system information block to obtain the UTC, the GPS and the local time.

```asn1
SystemInformationBlockType16-NB-r13 ::= SystemInformationBlockType16-r11
```

---

**SystemInformationBlockType20-NB**
The IE **SystemInformationBlockType20-NB** contains the information required to acquire the control information associated with transmission of MBMS using SC-PTM.

**SystemInformationBlockType20-NB information element**

```asn1
SystemInformationBlockType20-NB-r14 ::= SEQUENCE {
    npdcch-SC-MCCH-Config-r14    \[NPDCCH-SC-MCCH-Config-NB-r14, \]
    sc-mcch-CarrierConfig-r14    \[CHOICE { \]
        d1-CarrierConfig-r14    \[DI-CarrierConfigCommon-NB-r14, \]
        d1-CarrierIndex-r14    \} \]
    sc-mcch-RepetitionPeriod-r14  \[\text{ENUMERATED} \{ rf32, rf128, rf512, rf1024, rf2048, rf4096, rf8192, rf16384 \}],
    sc-mcch-ModificationPeriod-r14 \[\text{ENUMERATED} \{ \text{rf32}, \text{rf128}, \text{rf256}, \text{rf512}, \text{rf1024}, \text{rf2048}, \text{rf4096}, \text{rf8192}, \text{rf16384}, \text{rf32768}, \text{rf65536}, \text{rf131072}, \text{rf262144}, \text{rf524288}, \text{rf1048576}, \text{spare} \}],
    sc-mcch-SchedulingInfo-r14    \[\text{SC-MCCH-SchedulingInfo-NB-r14} \text{ OPTIONAL,} \text{ -- Need} \]
    lateNonCriticalExtension    OCTET STRING \text{ OPTIONAL,} \text{ -- Need} \}
```

**NPDCCH-SC-MCCH-Config-NB-r14**

```asn1
NPDCCH-SC-MCCH-Config-NB-r14 ::= SEQUENCE {
    npdcch-NumRepetitions-SC-MCCH-r14    \[\text{ENUMERATED} \{ r1, r2, r4, r8, r16, r32, r64, r128, r256, r512, r1024, r2048 \}],
    npdcch-StartSF-SC-MCCH-r14    \[\text{ENUMERATED} \{ v1dot5, v2, v4, v8, v16, v32, v48, v64 \}],
    npdcch-Offset-SC-MCCH-r14    \[\text{ENUMERATED} \{ \text{zero}, \text{oneEighth}, \text{oneQuarter}, \text{threeEighth}, \text{oneHalf}, \text{fiveEighth}, \text{threeQuarter}, \text{sevenEighth} \} \}
```

**SC-MCCH-SchedulingInfo-NB-r14**

```asn1
SC-MCCH-SchedulingInfo-NB-r14 ::= SEQUENCE {
    onDurationTimerSCPTM-r14    \[\text{ENUMERATED} \{ \text{pp1}, \text{pp2}, \text{pp3}, \text{pp4}, \text{pp8}, \text{pp16}, \text{pp32}, \text{spare} \}],
    drx-InactivityTimerSCPTM-r14    \[\text{ENUMERATED} \{ \text{pp0}, \text{pp1}, \text{pp2}, \text{pp3}, \text{pp4}, \text{pp8}, \text{pp16}, \text{pp32} \}],
```
### SystemInformationBlockType20-NB field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dl-CarrierConfig</strong></td>
<td>Downlink carrier used for SC-MCCH. E-UTRAN cannot configure a downlink carrier operating in mixed operation mode.</td>
</tr>
<tr>
<td><strong>dl-CarrierIndex</strong></td>
<td>Index to a downlink carrier signalled in system information. Value '0' corresponds to the anchor carrier, value '1' corresponds to the first entry in <strong>dl-ConfigList</strong> in SystemInformationBlockType22-NB, value '2' corresponds to the second entry in <strong>dl-ConfigList</strong> and so on.</td>
</tr>
<tr>
<td><strong>drx-InactivityTimerSCPTM</strong></td>
<td>Timer for SC-MCCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on.</td>
</tr>
<tr>
<td><strong>npdcch-NumRepetitions-SC-MCCH</strong></td>
<td>The maximum number of NPDCCH repetitions the UE needs to monitor for SC-MCCH multicast search space, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>npdcch-Offset-SC-MCCH</strong></td>
<td>Fractional period offset of starting subframe for NPDCCH multicast search space for SC-MCCH, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>npdcch-StartSF-SC-MCCH</strong></td>
<td>Starting subframes configuration of the NPDCCH multicast search space for SC-MCCH, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>onDurationTimerSCPTM</strong></td>
<td>Timer for SC-MCCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on.</td>
</tr>
<tr>
<td><strong>schedulingPeriodStartOffsetSCPTM-r14</strong></td>
<td>SCPTM-SchedulingCycle and SCPTM-SchedulingOffset in TS 36.321 [6]. The value of <strong>SCPTM-SchedulingCycle</strong> is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of <strong>SCPTM-SchedulingOffset</strong> is in number of sub-frames.</td>
</tr>
<tr>
<td><strong>sc-mcch-CarrierConfig</strong></td>
<td>Downlink carrier that is used for SC-MCCH.</td>
</tr>
<tr>
<td><strong>sc-mcch-ModificationPeriod</strong></td>
<td>Defines periodically appearing boundaries, i.e. radio frames for which (H-SFN * 1024 +SFN) mod <strong>sc-mcch-ModificationPeriod</strong> = 0. The contents of different transmissions of SC-MCCH information can only be different if there is at least one such boundary in-between them. Value rf32 corresponds to 32 radio frames, value rf128 corresponds to 128 radio frames and so on.</td>
</tr>
<tr>
<td><strong>sc-mcch-Offset</strong></td>
<td>Indicates, together with the sc-mcch-RepetitionPeriod, the boundary of the repetition period: (H-SFN * 1024 +SFN) mod <strong>sc-mcch-RepetitionPeriod</strong> = <strong>sc-mcch-Offset</strong>.</td>
</tr>
<tr>
<td><strong>sc-mcch-RepetitionPeriod</strong></td>
<td>Defines the interval between transmissions of SC-MCCH information, in radio frames. Value rf32 corresponds to 32 radio frames, rf128 corresponds to 128 radio frames and so on.</td>
</tr>
<tr>
<td><strong>sc-mcch-SchedulingInfo</strong></td>
<td>DRX information for the SC-MCCH. If the field is absent, DRX is not used for SC-MCCH reception.</td>
</tr>
</tbody>
</table>

---

The IE SystemInformationBlockType22-NB contains radio resource configuration for paging and random access procedure on non-anchor carriers.
SystemInformationBlockType22-NB information element

-- ASN1START

SystemInformationBlockType22-NB-r14 ::= SEQUENCE {
  dl-ConfigList-r14   DL-ConfigCommonList-NB-r14 OPTIONAL, -- Need OR
  ul-ConfigList-r14   UL-ConfigCommonList-NB-r14 OPTIONAL, -- Need OR
  pagingWeightAnchor-r14 PagingWeight-NB-r14 OPTIONAL, -- Cond pcch-config
  nprrach-ProbabilityAnchorList-r14 NRACH-ProbabilityAnchorList-NB-r14 OPTIONAL, -- Cond
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  [[ mixedOperationModeConfig-r15 SEQUENCE {
    dl-ConfigListMixed-r15   DL-ConfigCommonList-NB-r14 OPTIONAL, -- Need OR
    ul-ConfigListMixed-r15   UL-ConfigCommonList-NB-r14 OPTIONAL, -- Need OR
    pagingDistribution-r15   ENUMERATED {true} OPTIONAL, -- Need OR
    nprrach-Distribution-r15 ENUMERATED {true} OPTIONAL -- Need OR
  }]] OPTIONAL, -- Cond pcch-config
  ul-ConfigList-r15    UL-ConfigCommonListTDD-NB-r15 OPTIONAL -- Cond TDD
}

DL-ConfigCommonList-NB-r14 ::=  SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF
  DL-ConfigCommon-NB-r14

UL-ConfigCommonList-NB-r14 ::=  SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF
  UL-ConfigCommon-NB-r14

UL-ConfigCommonListTDD-NB-r15 ::= SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF
  UL-ConfigCommonTDD-NB-r15

DL-ConfigCommon-NB-r14 ::=   SEQUENCE {
  dl-CarrierConfig-r14    DL-CarrierConfigCommon-NB-r14,
  pcch-Config-r14      PCCH-Config-NB-r14   OPTIONAL, -- Need OR
  ...,
  [[ wus-Config-r15     WUS-ConfigPerCarrier-NB-r15  OPTIONAL -- Cond WUS
   ]]
}

PCCH-Config-NB-r14 ::=    SEQUENCE {
  npdcch-NumRepetitionPaging-r14  ENUMERATED {
    r1, r2, r4, r8, r16, r32, r64, r128,
    r256, r512, r1024, r2048,
    spare4, spare3, spare2, spare1} OPTIONAL, -- Need OP
  pagingWeight-r14      PagingWeight-NB-r14 DEFAULT w1,
  ...
}

PagingWeight-NB-r14 ::=  ENUMERATED {w1, w2, w3, w4, w5, w6, w7, w8,
  w9, w10, w11, w12, w13, w14, w15, w16}

UL-ConfigCommon-NB-r14 ::=  SEQUENCE {
  ul-CarrierFreq-r14     CarrierFreq-NB-r13,
  nprrach-ParametersList-r14    NRACH-ParametersList-NB-r14 OPTIONAL, -- Need OR
  ...
  [[ nprrach-ParametersListEDT-r15 NRACH-ParametersList-NB-r14 OPTIONAL -- Cond EDT
     ]]
}

UL-ConfigCommonTDD-NB-r15 ::=  SEQUENCE {
  tdd-UL-DL-AlignmentOffset-r15  TDD-UL-DL-AlignmentOffset-NB-r15,
  nprrach-ParametersListTDD-r15   NRACH-ParametersListTDD-NB-r15 OPTIONAL, -- Need OR
  ...
}

NRACH-ParametersList-NB-r14 ::=  SEQUENCE (SIZE (1.. maxNRACH-Resources-NB-r13)) OF
  NRACH-Parameters-NB-r14

NRACH-Parameters-NB-r14 ::=  SEQUENCE {
  nprrach-Parameters-r14     NRACH-Parameters-r14
  nprrach-Periodicity-r14     ENUMERATED {ms40, ms80, ms160, ms240,
    ms320, ms640, ms1280, ms2560} OPTIONAL, -- Need OP
  nprrach-StartTime-r14     ENUMERATED {ms8, ms16, ms32, ms64,
    ms128, ms256, ms512, ms1024} OPTIONAL, -- Need OP
  nprrach-SubcarrierOffset-r14 ENUMERATED {n0, n12, n24, n36, n2, n18, n34, spare1}
OPTIONAL, -- NEED OP
nprach-NumSubcarriers-r14 ENUMERATED {n12, n24, n36, n48}
OPTIONAL, -- NEED OP
nprach-SubcarrierMSG3-RangeStart-r14 ENUMERATED {zero, oneThird, twoThird, one}
OPTIONAL, -- NEED OP
npdcch-NumRepetitions-RA-r14 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256, r512, r1024, r2048, spare4, spare3, spare2, spare1}
OPTIONAL, -- NEED OP
nprach-NumCBRA-StartSubcarriers-r14 ENUMERATED {n8, n10, n11, n12, n20, n22, n23, n24, n32, n34, n35, n36, n40, n44, n46, n48}
OPTIONAL, -- NEED OP
npdcch-CarrierIndex-r14 INTEGER (1..maxNonAnchorCarriers-NB-r14)
OPTIONAL, -- Need OP
...
} OPTIONAL -- Need OR

NPRACH-ProbabilityAnchorList-NB-r14 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF
NPRACH-ProbabilityAnchor-NB-r14

NPRACH-ProbabilityAnchor-NB-r14 ::= SEQUENCE {
  nprach-ProbabilityAnchor-r14 ENUMERATED {
    zero, oneSixteenth, oneFifteenth, oneFourteenth, oneThirteenth, oneTwelfth, oneEleventh, oneTenth, oneNinth, oneEighth, oneSeventh, oneSixth, oneFifth, oneFourth, oneThird, oneHalf
  }
  OPTIONAL -- Need OP
}

-- ASN1STOP
**SystemInformationBlockType2-NB field descriptions**

### dl-CarrierConfig
For FDD: Provides the configuration of the DL non-anchor carrier.
For TDD: Provides the configuration of the non-anchor carrier.

### dl-ConfigList, dl-ConfigListMixed
For FDD: List of DL non-anchor carriers and associated configuration that can be used for paging and/or random access. E-UTRAN configures DL non-anchor carriers operating in mixed operation mode only in dl-ConfigListMixed and only a UE that supports mixed operation mode uses the carriers in dl-ConfigListMixed. A given carrier is either signalled in the dl-ConfigList or in dl-ConfigListMixed.
If pagingDistribution is present, the UE supporting mixed operation mode creates the list of DL carriers for paging by concatenating the entries in dl-ConfigList and dl-ConfigListMixed while maintaining the order among them; the total number of signalled DL non-anchor carriers cannot be more than maxNonAnchorCarriers-NB-r14.
If pagingDistribution is absent, the UE supporting mixed operation mode uses the list of DL carriers for paging provided in dl-ConfigListMixed.
For TDD: List of non-anchor carriers and associated configuration that can be used for paging and/or random access.

### mixedOperationModeConfig
For FDD: Provides the configuration of DL and UL non-anchor carriers that can be used for paging and random access by a UE that supports mixed operation mode.
For TDD: This parameter is absent.

### npdcch-CarrierIndex
For FDD: Index of the carrier in the list of DL non anchor carriers. The first entry in the list has index '1', the second entry has index '2' and so on.
If the field is absent in the entry in nprach-ParametersListEDT, the value of npdcch-CarrierIndex in the corresponding entry of nprach-ParametersList applies, if present. If the field is absent in the entry in nprach-ParametersList, the DL anchor carrier is used.
For TDD: This parameter is absent.

### npdcch-NumRepetitionPaging
Maximum number of repetitions for NPDCCH common search space (CSS) for paging, see TS 36.213 [23, 16.6]. If the field is absent, the value of npdcch-NumRepetitionPaging configured in SystemInformationBlockType2-NB in IE pcch-Config applies.

### npdcch-NumRepetitions-RA
Maximum number of repetitions for NPDCCH common search space (CSS) for RAR, Msg3 retransmission and Msg4, see TS 36.213 [23, 16.6]. NOTE 1.

### npdcch-Offset-RA
Fractional period offset of starting subframe for NPDCCH common search space (CSS Type 2), see TS 36.213 [23, 16.6]. NOTE 1.

### npdcch-StartSF-CSS-RA
Starting subframe configuration for NPDCCH common search space (CSS), including RAR, Msg3 retransmission, and Msg4, see TS 36.213 [23, 16.6]. NOTE 1.

### nprach-Distribution
Indicates which UL carriers a UE supporting mixed operation mode uses for random access.
If the field is present, the UE considers nprach-ProbabiliyAnchor being set to zero for each NPRACH resource, i.e. the anchor carrier is not used.

### nprach-NumCBRA-StartSubcarriers
The number of start subcarriers from which a UE can randomly select a start subcarrier as specified in TS 36.321 [6]. The start subcarrier indices that the UE is allowed to randomly select from, are given by:
\[ nprach-SubcarrierOffset + \lfloor 0, nprach-NumCBRA-StartSubcarriers - 1 \rfloor \]. NOTE 1.

### nprach-NumSubcarriers
Number of sub-carriers in a NPRACH resource, see TS 36.211 [21, 10.1.6]. In number of subcarriers. NOTE 1.

### nprach-ParametersList, nprach-ParametersList-EDT
Configure NPRACH parameters for each NPRACH resource on one non-anchor UL carrier. Up to three NPRACH resources can be configured on one non-anchor UL carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.
NPRACH resources in nprach-ParametersListEDT are used to initiate EDT. Each NPRACH resource is associated with a maximum TBS signalled in the corresponding entry of edt-TBS-InfoList in SystemInformationBlockType2-NB. E-UTRAN includes the same number of entries, and listed in the same order, as in nprach-ParametersList in SystemInformationBlockType2-NB.

### nprach-ParametersListTDD
For TDD: Configure NPRACH parameters for each NPRACH resource on one non-anchor UL carrier. Up to three NPRACH resources can be configured on one non-anchor UL carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.
E-UTRAN includes the same number of entries in nprach-ParametersListTDD, and listed in the same order, as in nprach-ParametersListTDD in SystemInformationBlockType2-NB.

### nprach-Periodicity
Periodicity of a NPRACH resource, see TS 36.211 [21, 10.1.6]. Unit in millisecond. NOTE 1.
nprach-ProbabilityAnchor
Configure the selection probability for the anchor carrier NPRACH resource, see TS 36.321 [6]. Value zero corresponds to a probability of 0, oneSixteenth corresponds to the probability of 1/16, oneFifteenth corresponds to the probability of 1/15, and so on.
If the field is absent, the selection probability of the anchor carrier NPRACH resource is 1.
All non-anchor carriers NPRACH resources have equal probability between them.
If there is no NPRACH resource defined on the anchor carrier for one repetition level in nprach-ParametersList-EDT, (respectively nprach-ParametersListFmt2, nprach-ParametersListFmt2-EDT), the UE shall use the value ‘zero’ and ignore the signalled value of nprach-ProbabilityAnchor for this repetition level for the NPRACH resources defined by nprach-ParametersList-EDT (respectively nprach-ParametersListFmt2, nprach-ParametersListFmt2-EDT).

nprach-ProbabilityAnchorList
Configures the selection probability for each NPRACH resource on the anchor carrier.
E-UTRAN includes the same number of entries, and listed in the same order, as in nprach-ParametersList in SystemInformationBlockType2-NB.

nprach-StartTime
Start time of the NPRACH resource in one period, see TS 36.211 [21, 10.1.6]. Unit in millisecond. NOTE 1.

nprach-SubcarrierOffset
Frequency location of the NPRACH resource, see TS 36.211 [21, 10.1.6]. In number of subcarriers, offset from subcarrier 0. NOTE 1.

nprach-SubcarrierMSG3-RangeStart
Fraction for calculating the starting subcarrier index of the range reserved for indication of UE support for multi-tone Msg3 transmission, within the NPRACH resource, see TS 36.211 [21, 10.1.6]. Multi-tone Msg3 transmission is not supported for {32, 64, 128} repetitions of NPRACH. For at least one of the NPRACH resources with the number of NPRACH repetitions other than {32, 64, 128}, the value of nprach-SubcarrierMSG3-RangeStart should not be 0.
If nprach-SubcarrierMSG3-RangeStart is equal to zero, no start subcarrier index for the single-tone Msg3 NPRACH is allocated and the start subcarrier indexes for the multi-tone Msg3 NPRACH partition are given by nprach-SubcarrierOffset + [0, nprach-NumCBRA-StartSubcarriers - 1].
If nprach-SubcarrierMSG3-RangeStart is equal to oneThird or twoThird the start subcarrier indexes for the two partitions are given by:

- nprach-SubcarrierOffset + [0, FLOOR (nprach-NumCBRA-StartSubcarriers * nprach-SubcarrierMSG3-RangeStart) -1]
- nprach-SubcarrierOffset + [FLOOR (nprach-NumCBRA-StartSubcarriers * nprach-SubcarrierMSG3-RangeStart), nprach-NumCBRA-StartSubcarriers - 1]

If nprach-SubcarrierMSG3-RangeStart is equal to one, the start subcarrier indexs for the single-tone Msg3 NPRACH are given by nprach-SubcarrierOffset + [0, nprach-NumCBRA-StartSubcarriers - 1] and no start subcarrier index for the multi-tone Msg3 NPRACH partition is allocated. NOTE 1.

pagingDistribution
Indicates which DL carriers a UE supporting mixed operation mode monitors for paging.
If the field is present, the UE considers pagingWeightAnchor being set to w0, i.e. the anchor carrier is not used.

pagingWeight
Weight of the non-anchor paging carrier for uneven paging load distribution across the carriers. Value w1 corresponds to a relative weight of 1, w2 corresponds to a relative weight of 2, and so on.
The paging load for a carrier ‘i’ is equal to w(i)/W where i is equal to 0 for the anchor carrier and equal to the index of the carrier in the dl-ConfigList for a non-anchor carrier, W is the sum of the weights of all paging carriers.
To avoid correlation between paging carrier and paging occasion, the weights should be assigned such that: nB * W <= 16384.

pagingWeightAnchor
Weight of the anchor carrier for uneven paging load distribution across the carriers. Value w1 corresponds to a relative weight of 1, w2 corresponds to a relative weight of 2, and so on.
If the field is absent, the (default) value of w0 is applied, i.e. the anchor carrier is not used for paging.

pcch-Config
Configure the PCCH parameters for the non-anchor DL carrier.

tdd-UL-DL-AlignmentOffset
Indicates the offset between the UL carrier frequency center with respect to DL carrier frequency center for the non-anchor carrier, see TS 36.211 [21].

ul-CarrierFreq
For FDD: UL carrier frequency of the non-anchor carrier as defined in TS 36.101 [42], section 5.7.3F.
For TDD: This field is absent and the uplink carrier frequency is same as the downlink frequency.
**ul-ConfigList, ul-ConfigListMixed**
For FDD: List of UL non-anchor carriers and associated configuration that can be used for random access. E-UTRAN configures UL non-anchor carriers operating in mixed operation mode only in `ul-ConfigListMixed` and only a UE that supports mixed operation mode uses the carriers in `ul-ConfigListMixed`. A given carrier is either signalled in the `ul-ConfigList` or in `ul-ConfigListMixed`. If `nprach-Distribution` is present, the UE supporting mixed operation mode creates the list of UL carriers for random access by concatenating the entries in `ul-ConfigList` and `ul-ConfigListMixed` while maintaining the order among them; the total number of signalled UL non-anchor carriers cannot be more than `maxNonAnchorCarriers-NB-r14`. If `nprach-Distribution` is absent, the UE supporting mixed operation mode uses the list of UL carriers for random access provided in `ul-ConfigListMixed`. For TDD: E-UTRAN configures `ul-ConfigList-r15` and includes the same number of entries as in `dl-ConfigList`. The UL carrier frequency of the non-anchor carrier is same as the DL carrier frequency.

**wus-ConfigPerCarrier**
Carrier specific WUS Configuration.
NOTE 1: If the field is absent in the entry in \textit{nprach-ParametersListEDT}, the value of the same field in the corresponding entry of \textit{nprach-ParametersList} on the same UL carrier applies, if present. Otherwise, the value of the same field in the corresponding entry of \textit{nprach-ParametersList} in \textit{SystemInformationBlockType2-NB} applies.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>\textit{EDT}</td>
<td>The field is optionally present, Need OR, if \textit{edt-Parameters} in \textit{SystemInformationBlockType2-NB} is present; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>\textit{pcch-Config}</td>
<td>This field is optionally present, Need OP, if the field \textit{dl-ConfigList} is present and at least one of the carriers in \textit{dl-ConfigList} is configured for paging. Otherwise the field is not present and only the anchor carrier is used for paging.</td>
</tr>
<tr>
<td>\textit{nprach-config}</td>
<td>This field is mandatory present, if the field \textit{ul-ConfigList} is present and at least one of the carriers in \textit{ul-ConfigList} is configured for random access. Otherwise the field is not present and only the anchor carrier is used for random access.</td>
</tr>
<tr>
<td>\textit{TDD}</td>
<td>This field is optionally present, Need OR, for TDD. Otherwise the field is not present.</td>
</tr>
<tr>
<td>\textit{WUS}</td>
<td>This field is mandatory present, if the field \textit{wus-Config} is present in \textit{SystemInformationBlockType2-NB}. Otherwise the field is not present, Need OR.</td>
</tr>
</tbody>
</table>

\textbf{SystemInformationBlockType23-NB}

The IE \textit{SystemInformationBlockType23-NB} contains radio resource configuration for NPRACH resources using preamble format 2 on non-anchor carriers.

\textit{SystemInformationBlockType23-NB} information element

```
-- ASN1START

SystemInformationBlockType23-NB-r15 ::= SEQUENCE {
    ul-ConfigList-v1530                  UL-ConfigCommonList-NB-v1530 OPTIONAL,  -- Need OR
    ul-ConfigListMixed-v1530            UL-ConfigCommonList-NB-v1530 OPTIONAL,  -- Need OR
    lateNonCriticalExtension           OCTET STRING OPTIONAL,
    ...                                }

UL-ConfigCommonList-NB-v1530 ::= SEQUENCE (SIZE (1.. maxNonAnchorCarriers-NB-r14)) OF
                                  UL-ConfigCommon-NB-v1530

UL-ConfigCommon-NB-v1530 ::= SEQUENCE {
    nprach-ParametersListFmt2-r15      NPRACH-ParametersListFmt2-NB-r15 OPTIONAL,  -- Need OR
    nprach-ParametersListFmt2EDT-r15   NPRACH-ParametersListFmt2-NB-r15 OPTIONAL,  -- Cond
    EDT                               ...                                      }

-- ASN1STOP
```
**SystemInformationBlockType23-NB field descriptions**

`nprach-ParametersListFmt2, nprach-ParametersListFmt2EDT`

Configures NPRACH parameters for each NPRACH resource format 2 on one UL carrier. Up to three NPRACH resources can be configured on one carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions.

The NPRACH resources in `nprach-ParametersListFmt2EDT` are used to initiate EDT. Each NPRACH resource is associated with a TBS signalled in the corresponding entry of `edt-TBS-InfoList`.

E-UTRAN configures the NPRACH resources format 2 so that they do not overlap in time domain with the NPRACH resources configured in `nprach-ParametersList` and `nprach-ParametersListEDT` on the same UL carrier.

If there's no NPRACH resource in `nprach-ParametersListFmt2` (respectively `nprach-ParametersListFmt2EDT`) on any UL carrier, including the anchor carrier, for one NPRACH repetition level, the UE uses the NPRACH resources in `nprach-ParametersList` (respectively `nprach-ParametersListEDT`) for this NPRACH repetition level. Otherwise, the UE uses only NPRACH resources in `nprach-ParametersListFmt2` (respectively `nprach-ParametersListFmt2EDT`).

If E-UTRAN configures NPRACH resources format 2 in one NPRACH repetition level, the E-UTRAN configures NPRACH resources format 2 in all NPRACH repetition levels upwards.

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>edt-Parameters in SystemInformationBlockType2-NB</code></td>
<td>The field is optionally present, Need OR, if EDT is present; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

#### 6.7.3.2 NB-IoT Radio resource control information elements

---

**CarrierConfigDedicated-NB**

The IE `CarrierConfigDedicated-NB` is used to specify a carrier in NB-IoT.

---

**CarrierConfigDedicated-NB information elements**

---

```asn1
CarrierConfigDedicated-NB-r13 ::= SEQUENCE {
    dl-CarrierConfig-r13 DL-CarrierConfigDedicated-NB-r13,
    ul-CarrierConfig-r13 UL-CarrierConfigDedicated-NB-r13
}
DL-CarrierConfigDedicated-NB-r13 ::= SEQUENCE {
    dl-CarrierFreq-r13 CarrierFreq-NB-r13,
    downlinkBitmapNonAnchor-r13 CHOICE {
        useNoBitmap-r13 NULL,
        useAnchorBitmap-r13 NULL,
        explicitBitmapConfiguration-r13 DL-Bitmap-NB-r13,
        spare NULL
    } OPTIONAL, -- Need ON
    dl-GapNonAnchor-r13 CHOICE {
        useNoGap-r13 NULL,
        useAnchorGapConfig-r13 NULL,
        explicitGapConfiguration-r13 DL-GapConfig-NB-r13,
        spare NULL
    } OPTIONAL, -- Need ON
    inbandCarrierInfo-r13 SEQUENCE {
        samePCI-Indicator-r13 CHOICE {
            samePCI-r13 SEQUENCE {
                indexToMidPRB-r13 INTEGER (-55..54)
            },
            differentPCI-r13 SEQUENCE {
                eutra-NumCRS-Ports-r13 ENUMERATED {same, four}
            }
        } OPTIONAL, -- Cond anchor-guardband-or-standalone
        eutraControlRegionSize-r13 ENUMERATED {n1, n2, n3}
    } OPTIONAL, -- Cond non-anchor-inband
    ...
```
CarrierConfigDedicated-NB field descriptions

dl-CarrierConfig
Downlink carrier used for all unicast transmissions.

dl-CarrierFreq
DL carrier frequency. The downlink carrier is not in a E-UTRA PRB which contains E-UTRA PSS/SSS/PBCH.

dl-GapNonAnchor
Downlink transmission gap configuration for the anchor/ non-anchor carrier, see TS 36.211 [21], section 10.2.3.4. E-UTRAN may configure dl-GapNonAnchor-v1530 only if dl-GapNonAnchor-r13 is set to explicitGapConfiguration.

dl-GapNonAnchor-v1530
DL-GapConfig-NB-v1530 OPTIONAL -- Cond TDD

downlinkBitmapNonAnchor
For FDD: NB-IoT downlink subframe configuration for downlink transmission on the anchor/ non-anchor carrier. See TS 36.213 [23], section 16.4.
For TDD: NB-IoT downlink, uplink and special subframes configuration for transmission on the anchor/ non-anchor carrier. See TS 36.213 [23], section 16.4.

eutraControlRegionSize
Indicates the control region size of the E-UTRA cell for the in-band operation mode, see TS 36.213 [23]. Unit is in number of OFDM symbols. If operationModelInfo in MIB-NB is set to inband-SamePCI or inband-DifferentPCI, it should be set to the value broadcast in SIB1-NB.

eutra-NumCRS-Ports
Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23].

inbandCarrierInfo
Provides the configuration of the anchor/ non-anchor inband carrier. If operationModelInfo is set to standalone in the MIB-NB, E-UTRAN only configures this field if the UE supports mixed operation mode.

indexToMidPRB
The PRB index is signaled by offset from the middle of the EUTRA system.

nrs-PowerOffsetNonAnchor
Provides the power offset of the downlink narrowband reference-signal EPRE of the anchor/ non-anchor carrier relative to the anchor carrier, unit in dB. Value dB-12 corresponds to -12 dB, dB-10 corresponds to -10 dB and so on. See TS 36.213 [23, 16.2.2].

samePCI-Indicator
This parameter specifies whether the anchor/ non-anchor carrier reuses the same PCI as the EUTRA carrier.

ul-CarrierConfig
Uplink anchor/ non-anchor carrier used for all unicast transmissions.

ul-CarrierFreq
For FDD: UL carrier frequency as defined in TS 36.101 [42, 5.7.3F]. If absent, the same TX-RX frequency separation and carrier frequency offset as for the anchor carrier applies.
For TDD: This field is absent and the uplink carrier frequency is equal to the downlink frequency.

---

**Conditional presence**

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-anchor-inband</td>
<td>The field is mandatory present if the anchor/ non-anchor carrier is an inband carrier; otherwise it is not present.</td>
</tr>
<tr>
<td>anchor-guardband-or-standalone</td>
<td>The field is mandatory present if operationModelInfo is set to guardband or standalone in the MIB; otherwise it is not present.</td>
</tr>
<tr>
<td>TDD</td>
<td>The field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDD1</td>
<td>The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>
— **CarrierFreq-NB**

The IE *CarrierFreq-NB* is used to provide the NB-IoT carrier frequency, as defined in TS 36.101 [42].

**CarrierFreq-NB information elements**

```
-- ASN1START
CarrierFreq-NB-r13 ::= SEQUENCE {
  carrierFreq-r13    ARFCN-ValueEUTRA-r9,
  carrierFreqOffset-r13  ENUMERATED {
    v-10, v-9, v-8, v-7, v-6, v-5, v-4, v-3, v-2, v-1, v-0dot5,
    v0, v1, v2, v3, v4, v5, v6, v7, v8, v9
  } OPTIONAL -- Need ON
}
-- ASN1STOP
```

**CarrierFreq-NB field descriptions**

- **carrierFreq**
  Provides the ARFCN applicable for the NB-IoT carrier frequency as defined in TS 36.101 [42, Table 5.7.3-1].

- **carrierFreqOffset**
  Offset of the NB-IoT channel number to EARFCN as defined in TS 36.101 [42, 5.7.3F]. Value v-10 means -10, v-9 means -9, and so on.

— **ChannelRasterOffset-NB**

The IE *ChannelRasterOffset-NB* is used to specify the NB-IoT offset from LTE channel raster. Unit in kHz in set \{-7.5, -2.5, 2.5, 7.5\} See TS 36.211[21] and TS 36.213 [23].

**ChannelRasterOffset-NB information element**

```
-- ASN1START
ChannelRasterOffset-NB-r13 ::= ENUMERATED {khz-7dot5, khz-2dot5, khz2dot5, khz7dot5}
-- ASN1STOP
```

— **DL-Bitmap-NB**

The IE *DL-Bitmap-NB* is used to specify the set of NB-IoT downlink subframes for downlink transmission.

**DL-Bitmap-NB information element**

```
-- ASN1START
DL-Bitmap-NB-r13 ::= CHOICE {
  subframePattern10-r13   BIT STRING (SIZE (10)),
  subframePattern40-r13   BIT STRING (SIZE (40))
}
-- ASN1STOP
```

**DL-Bitmap-NB field descriptions**

- **subframePattern10, subframePattern40**
  For FDD: NB-IoT downlink subframe configuration over 10ms or 40ms for inband and 10ms for standalone/guardband.
  For TDD: NB-IoT downlink, uplink and special subframes configuration over 10ms or 40ms for inband and 10ms for standalone/guardband.
  The first/leftmost bit corresponds to the subframe #0 of the radio frame satisfying SFN mod x = 0, where x is the size of the bit string divided by 10. Value 0 in the bitmap indicates that the corresponding subframe is invalid for transmission. Value 1 in the bitmap indicates that the corresponding subframe is valid for transmission.
The IE DL-CarrierConfigCommon-NB is used to specify the common configuration of a DL non-anchor carrier in NB-IoT.

DL-CarrierConfigCommon-NB information elements

--- ASN1START

DL-CarrierConfigCommon-NB-r14 ::= SEQUENCE {
  dl-CarrierFreq-r14     CarrierFreq-NB-r13,
  downlinkBitmapNonAnchor-r14     CHOICE {
    useNoBitmap-r14      NULL,
    useAnchorBitmap-r14    NULL,
    explicitBitmapConfiguration-r14  DL-Bitmap-NB-r13
  },
  dl-GapNonAnchor-r14     CHOICE {
    useNoGap-r14      NULL,
    useAnchorGapConfig-r14    NULL,
    explicitGapConfiguration-r14  DL-GapConfig-NB-r13
  },
  inbandCarrierInfo-r14    SEQUENCE {
    samePCI-Indicator-r14    CHOICE {
      samePCI-r14       SEQUENCE {
        indexToMidPRB-r14     INTEGER (-55..54)
      },
      differentPCI-r14     SEQUENCE {
        eutra-NumCRS-Ports-r14    ENUMERATED {same, four}
      }
    } OPTIONAL,  -- Cond anchor-guardband-or-standalone
    eutraControlRegionSize-r14   ENUMERATED {n1, n2, n3}
  } OPTIONAL,  -- Cond non-anchor-inband
  nrs-PowerOffsetNonAnchor-r14  ENUMERATED {dB-12, dB-10, dB-8, dB-6,
                                         dB-4, dB-2, dB0, dB3} DEFAULT dB0,
  ...
} OPTIONAL,  -- Cond anchor-guardband-or-standalone

-- ASN1STOP

--- DL-CarrierConfigCommon-NB field descriptions

dl-CarrierFreq
DL carrier frequency. The downlink carrier is not in a E-UTRA PRB which contains E-UTRA PSS/SSS/PBCH.

dl-GapNonAnchor
Downlink transmission gap configuration for the non-anchor carrier, see TS 36.211 [21], section 10.2.3.4.
E-UTRAN may configure dl-GapNonAnchor-v1530 only if dl-GapNonAnchor-r14 is set to explicitGapConfiguration.

downlinkBitmapNonAnchor
For FDD: NB-IoT downlink subframe configuration for downlink transmission on the non-anchor carrier. See TS 36.213 [23], section 16.4.
For TDD: NB-IoT downlink, uplink and special subframes configuration for transmission on the anchor/ non-anchor carrier. See TS 36.213 [23], section 16.4.

eutraControlRegionSize
Indicates the control region size of the E-UTRA cell for the in-band operation mode, see TS 36.213 [23]. Unit is in number of OFDM symbols. If operationModelInfo in MIB-NB is set to inband-SamePCI or inband-DifferentPCI, it should be set to the value broadcast in SIB1-NB.

eutra-NumCRS-Ports
Number of E-UTRA CRS antenna ports, either the same number of ports as NRS or 4 antenna ports. See TS 36.211 [21], TS 36.212 [22], and TS 36.213 [23].

inbandCarrierInfo
Provides the configuration of a non-anchor inband carrier.

indexToMidPRB
The PRB index is signaled by offset from the middle of the EUTRA system.

nrs-PowerOffsetNonAnchor
Provides the downlink narrowband reference-signal EPRE offset of the non-anchor carrier relative to the downlink narrowband reference-signal EPRE of the anchor carrier, unit in dB. Value dB-12 corresponds to -12 dB, dB-10 corresponds to -10 dB and so on. See TS 36.213 [23, 16.2.2].

samePCI-Indicator
This parameter specifies whether the non-anchor carrier reuses the same PCI as the EUTRA carrier.
### Conditional presence

<table>
<thead>
<tr>
<th>Presence Type</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-anchor-inband</td>
<td>The field is mandatory present if the non-anchor carrier is an inband carrier; otherwise it is not present.</td>
</tr>
<tr>
<td>anchor-guardband-or-standalone</td>
<td>The field is mandatory present, if <code>operationModeInfo</code> is set to <code>guardband</code> or <code>standalone</code> in the MIB; otherwise it is not present.</td>
</tr>
<tr>
<td>TDD</td>
<td>The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

**DL-GapConfig-NB**

The IE `DL-GapConfig-NB` is used to specify the downlink gap configuration for NPDCCH and NPDSCH. Downlink gaps apply to all NPDCCH/NPDSCH transmissions except for BCCH.

#### DL-GapConfig-NB information element

```asn1
DL-GapConfig-NB-r13 ::= SEQUENCE {
  dl-GapThreshold-r13   ENUMERATED {n32, n64, n128, n256},
  dl-GapPeriodicity-r13  ENUMERATED {sf64, sf128, sf256, sf512},
  dl-GapDurationCoeff-r13 ENUMERATED {oneEighth, oneFourth, threeEighth, oneHalf}
}
DL-GapConfig-NB-v1530 ::= SEQUENCE {
  dl-GapPeriodicity-v1530  ENUMERATED {sf1024}
}
```

#### DL-GapConfig-NB field descriptions

**dl-GapDurationCoeff**

Coefficient to calculate the gap duration of a DL transmission: `dl-GapDurationCoeff * dl-GapPeriodicity`, Duration in number of subframes. See TS 36.211 [21, 10.2.3.4].

**dl-GapPeriodicity**

Periodicity of a DL transmission gap in number of subframes. See TS 36.211 [21], section 10.2.3.4. Value `sf64` corresponds to 64 subframes, value `sf128` corresponds to 128 subframes, value `sf256` corresponds to 256 subframes and so on. E-UTRAN may configure the value `sf64` only in FDD mode and the value `sf1024` only in TDD mode. The UE shall use the value signalled in `dl-GapPeriodicity-v1530`, if present, and ignore the value signaled in `dl-GapPeriodicity-r13`.

**dl-GapThreshold**

Threshold on the maximum number of repetitions configured for NPDCCH before application of DL transmission gap configuration. See TS 36.211 [21, 10.2.3.4].

---

**LogicalChannelConfig-NB**

The IE `LogicalChannelConfig-NB` is used to configure the logical channel parameters.

#### LogicalChannelConfig-NB information element

```asn1
LogicalChannelConfig-NB-r13 ::= SEQUENCE {
  priority-r13      INTEGER (1..16)   OPTIONAL,  -- Cond UL
  logicalChannelSR-Prohibit-r13  BOOLEAN     OPTIONAL,  -- Need ON
  ...
}
```

---
LogicalChannelConfig-NB field descriptions

**logicalChannelSR-Prohibit**
Value TRUE indicates that the logicalChannelSR-ProhibitTimer is enabled for the logical channel. If logicalChannelSR-Prohibit is configured (i.e. indicates value TRUE), E-UTRAN also configures logicalChannelSR-ProhibitTimer. See TS 36.321 [6].

**priority**
Logical channel priority in TS 36.321 [6]. Value is an integer.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL</td>
<td>The field is mandatory present for UL logical channels; otherwise it is not present.</td>
</tr>
</tbody>
</table>

—

**MAC-MainConfig-NB**

The IE MAC-MainConfig-NB is used to specify the MAC main configuration for signalling and data radio bearers.

**MAC-MainConfig-NB information element**

```plaintext
-- ASN1START
MAC-MainConfig-NB-r13 ::= SEQUENCE {
    ul-SCH-Config-r13 tagged OPTIONAL, -- Need ON
        PeriodicBSR-Timer-NB-r13 OPTIONAL, -- Need ON
        RetxBSR-Timer-r13 OPTIONAL, -- Need ON
    drx-Config-r13 OPTIONAL, -- Need ON
        TimeAlignmentTimerDedicated-r13 OPTIONAL, -- Need ON
        logicalChannelSR-Config-r13 OPTIONAL, -- Need ON
            release NULL,
            setup PeriodicBSR-Timer-NB-r13 ENUMERATED {
                pp2, pp4, pp8, pp16, pp64, pp128, pp256, pp512
            }
        }
        dataInactivityTimerConfig-r14 OPTIONAL, -- Need OR
            release NULL,
            setup dataInactivityTimer-r14 ENUMERATED {
                pp2, pp4, pp8, pp16, pp64, pp128, pp256, pp512
            }
    } OPTIONAL, -- Need ON
    ...,
    drx-Cycle-v1430 ENUMERATED {
        sf1280, sf2560, sf5120, sf10240
    } OPTIONAL -- Need ON
    ra-CFRA-Config-r14 ENUMERATED {true} OPTIONAL -- Need ON

PeriodicBSR-Timer-NB-r13 ::= ENUMERATED {
    pp2, pp4, pp8, pp16, pp64, pp128, infinity, spare
}
RetxBSR-Timer-NB-r13 ::= ENUMERATED {
    pp4, pp16, pp64, pp128, pp256, pp512, infinity, spare
}
DRX-Config-r13 ::= CHOICE {
    release NULL,
    setup PeriodicBSR-Timer-NB-r13 ENUMERATED {
        pp2, pp4, pp8, pp16, pp64, pp128, spare
    },
    drx-InactivityTimer-r13 ENUMERATED {
        pp0, pp1, pp2, pp3, pp4, pp8, pp16, pp32
    },
    drx-RetransmissionTimer-r13 ENUMERATED {
        pp0, pp1, pp2, pp4, pp8, pp16, pp32
    },
    drx-Cycle-r13 ENUMERATED {
        sf256, sf512, sf1024, sf1536, sf2048, sf3072
    },
    drx-StartOffset-r13 INTEGER (0..255),
    drx-ULRetransmissionTimer-r13 ENUMERATED {
        spare4, spare3, spare2, spare1
    }
}
```

---
MAC-MainConfig-NB field descriptions

- **drx-Config**
  Used to configure DRX as specified in TS 36.321 [6].

- **drx-Cycle**
  `longDRX-Cycle` in TS 36.321 [6]. The value of `longDRX-Cycle` is in number of sub-frames. Value sf256 corresponds to 256 sub-frames, sf512 corresponds to 512 sub-frames and so on. In case `drx-Cycle-v1430` is signalled, the UE shall ignore `drx-Cycle-r13`.

- **drx-StartOffset**
  `drxStartOffset` in TS 36.321 [6]. Value is in number of sub-frames by step of `(drx-cycle / 256)`.

- **drx-InactivityTimer**
  Timer for DRX in TS 36.321 [6]. Value in number of PDCCH periods. Value pp0 corresponds to 0 PDCCH period and behaviour as specified in 7.3.2 applies, pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on.

- **drx-RetransmissionTimer**
  Timer for DRX in TS 36.321 [6]. Value pp0 corresponds to 0 PDCCH period and behaviour as specified in 7.3.2 applies, pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on.

- **drx-ULRetransmissionTimer**
  Timer for DRX in TS 36.321 [6]. Value in number of PDCCH periods. Value pp0 corresponds to 0 PDCCH period and behaviour as specified in 7.3.2 applies, value pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on.

- **logicalChannelSR-ProhibitTimer**
  Timer used to delay the transmission of an SR. See TS 36.321 [6]. Value in number of PDCCH periods. Value pp2 corresponds to 2 PDCCH periods, pp8 corresponds to 8 PDCCH periods and so on.

- **periodicBSR-Timer**
  Timer for BSR reporting in TS 36.321 [6]. Value in number of PDCCH periods. Value pp2 corresponds to 2 PDCCH periods, pp4 corresponds to 4 PDCCH periods and so on.

NPDCCH-ConfigDedicated-NB

The IE `NPDCCH-ConfigDedicated-NB` specifies the subframes and resource blocks for NPDCCH monitoring.

NPDCCH-ConfigDedicated-NB information element

```asn1
NPDCCH-ConfigDedicated-NB-r13 ::= SEQUENCE {
  npdcch-NumRepetitions-r13  ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128,
                                      r256, r512, r1024, r2048,
                                      spare4, spare3, spare2, spare1},
  npdcch-StartSF-USS-r13     ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v64},
  npdcch-Offset-USS-r13      ENUMERATED {zero, oneEighth, oneFourth, threeEighth}
}

NPDCCH-ConfigDedicated-NB-v1530 ::= SEQUENCE {
  npdcch-StartSF-USS-v1530   ENUMERATED {v96, v128}
}
```
NPDCCH-ConfigDedicated-NB field descriptions

npdcch-NumRepetitions
Maximum number of repetitions for NPDCCH UE specific search space (USS), see TS 36.213 [23, 16.6]. UE monitors one set of values (consisting of aggregation level, number of repetitions and number of blind decodes) according to the configured maximum number of repetitions.

npdcch-Offset-USS
Fractional period offset of starting subframe for NPDCCH UE specific search space (USS), see TS 36.213 [23, 16.6].

npdcch-StartSF-USS
Starting subframe configuration for an NPDCCH UE-specific search space, see TS 36.213 [23, 16.6]. Value v1dot5 corresponds to 1.5, value 2 corresponds to 2 and so on. E-UTRAN may configure values v1dot5 and v2 only in FDD mode and values v96 and v128 only in TDD mode.
The UE shall use the value signalled in npdcch-StartSF-USS-v1530, if present, and ignore the value signalled in npdcch-StartSF-USS-r13.

NPDSCH-ConfigCommon-NB

The IE NPDSCH-ConfigCommon-NB is used to specify the common NPDSCH configuration.

NPDSCH-ConfigCommon-NB information element

nrs-Power
Provides the downlink narrowband reference-signal EPRE, see TS 36.213 [23, 16.2]. The actual value in dBm.

NPRACH-ConfigSIB-NB

The IE NPRACH-ConfigSIB-NB is used to specify the NPRACH configuration for the anchor and non anchor carriers.
NPRACH-ParametersList-NB-r13 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-r13

NPRACH-ParametersList-NB-v1330 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-Parameters-NB-v1330

NPRACH-Parameters-NB-r13 ::= SEQUENCE {
    nprach-Periodicity-r13 ENUMERATED {ms40, ms80, ms160, ms240, ms320, ms640, ms1280, ms2560, ms1280, ms2560, ms512, ms1024},
    nprach-StartTime-r13 ENUMERATED {ms8, ms16, ms32, ms64, ms128, ms256, ms512, ms1024},
    nprach-SubcarrierOffset-r13 ENUMERATED {n0, n12, n24, n36, n2, n18, n34, n36, n48},
    nprach-NumSubcarriers-r13 ENUMERATED {n12, n24, n36, n48},
    nprach-SubcarrierMSG3-RangeStart-r13 ENUMERATED {zero, oneThird, twoThird, one},
    maxNumPreambleAttemptCE-r13 ENUMERATED {n3, n4, n5, n6, n7, n8, n10, spare1},
    numRepetitionsPerPreambleAttempt-r13 ENUMERATED {n1, n2, n4, n8, n16, n32, n64, n128},
    npdcch-NumRepetitions-RA-r13 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256, r512, r1024, r2048, spare4, spare3, spare2, spare1},
    npdcch-StartSF-CSS-RA-r13 ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v64, v128},
    npdcch-Offset-RA-r13 ENUMERATED {zero, oneEighth, oneFourth, threeEighth}
}

NPRACH-Parameters-NB-v1330 ::= SEQUENCE {
    nprach-NumCBRA-StartSubcarriers-r13 ENUMERATED {n8, n10, n11, n12, n20, n22, n23, n24, n32, n34, n35, n36, n40, n44, n46, n48}
}

NPRACH-ParametersListTDD-NB-r15 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF NPRACH-ParametersTDD-NB-r15

NPRACH-ParametersTDD-NB-r15 ::= SEQUENCE {
    nprach-Periodicity-r15 ENUMERATED {ms80, ms160, ms320, ms640, ms1280, ms2560, ms5120, ms10240},
    nprach-StartTime-r15 ENUMERATED {ms10, ms20, ms40, ms80, ms160, ms320, ms640, ms1280, ms2560, ms5120, spare6, spare5, spare4, spare3, spare2, spare1},
    nprach-SubcarrierOffset-r15 ENUMERATED {n0, n12, n24, n36, n2, n18, n34, n36, n48},
    nprach-NumSubcarriers-r15 ENUMERATED {n12, n24, n36, n48},
    nprach-SubcarrierMSG3-RngeStart-r15 ENUMERATED {zero, oneThird, twoThird, one},
    npdcch-NumRepetitions-RA-r15 ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256, r512, r1024, r2048, spare4, spare3, spare2, spare1},
    npdcch-StartSF-CSS-RA-r15 ENUMERATED {v4, v8, v16, v32, v64, v96, v128},
    npdcch-Offset-RA-r15 ENUMERATED {zero, oneEighth, oneFourth, threeEighth},
    nprach-NumCBRA-StartSubcarriers-r15 ENUMERATED {n8, n10, n11, n12, n20, n22, n23, n24, n32, n34, n35, n36, n40, n44, n46, n48}
}
nprach-Parameters-r15
   SEQUENCE {
     nprach-Periodicity-r15
       ENUMERATED {ms40, ms80, ms160, ms320, ms640, ms1280, ms2560, ms5120}
       OPTIONAL, -- NEED OP
     nprach-StartTime-r15
       ENUMERATED {ms8, ms16, ms32, ms64, ms128, ms256, ms512, ms1024}
       OPTIONAL, -- NEED OP
     nprach-SubcarrierOffset-r15
       ENUMERATED {n0, n36, n72, n108, n6, n54, n102, n42, n78, n90, n12, n24, n48, n78, n1024, n144}
       OPTIONAL, -- NEED OP
     nprach-NumSubcarriers-r15
       ENUMERATED {n36, n72, n108, n144}
       OPTIONAL, -- NEED OP
     nprach-SubcarrierMSG3-RangeStart-r15
       ENUMERATED {zero, oneThird, twoThird, one}
       OPTIONAL, -- NEED OP
     npdcch-NumRepetitions-RA-r15
       ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256, r512, r1024, r2048, spare4, spare3, spare2, spare1}
       OPTIONAL, -- NEED OP
     npdcch-StartSF-CSS-RA-r15
       ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v48, v64}
       OPTIONAL, -- NEED OP
     npdcch-Offset-RA-r15
       ENUMERATED {zero, oneEighth, oneFourth, threeEighth}
       OPTIONAL, -- NEED OP
     nprach-NumCBRA-StartSubcarriers-r15
       ENUMERATED {n24, n30, n33, n36, n60, n66, n69, n72, n96, n102, n105, n108, n120, n132, n138, n144}
       OPTIONAL, -- NEED OP
     npdcch-CarrierIndex-r15
       INTEGER (1..maxNonAnchorCarriers-NB-r14)
       OPTIONAL, -- Need OP
   }
   OPTIONAL -- Need OR

RSRP-ThresholdsNPRACH-InfoList-NB-r13 := SEQUENCE (SIZE(1..2)) OF RSRP-Range

EDT-TBS-InfoList-NB-r15 := SEQUENCE (SIZE (1..maxNPRACH-Resources-NB-r13)) OF EDT-TBS-NB-r15

EDT-TBS-NB-r15 := SEQUENCE {
  edt-SmallTBS-Enabled-r15
    BOOLEAN,
  edt-TBS-r15
    ENUMERATED {b328, b408, b504, b584, b680, b808, b936, b1000}
}

-- ASN1STOP
### NPRACH-ConfigSIB-NB field descriptions

**edt-SmallTBS-Enabled**
Value TRUE indicates UE performing EDT is allowed to select TBS smaller than edt-TBS for Msg3 according to the corresponding NPRACH resource, as specified in TS 36.213 [23].

**edt-SmallTBS-Subset**
Presence indicates only two of the TBS values can be used according to edt-TBS corresponding to the NPRACH resource, as specified in TS 36.213 [23]. When the field is not present, any of the TBS values according to edt-TBS corresponding to the NPRACH resource can be used. This field is applicable for a NPRACH resource only when edt-SmallTBS-Enabled is included for the corresponding NPRACH resource.

**edt-TBS**
Largest TBS for Msg3 for a NPRACH resource applicable to a UE performing EDT. Value in bits. Value b328 corresponds to 328 bits, value b408 corresponds to 408 bits and so on. See TS 36.213 [23].

**maxNumPreambleAttemptCE**
Maximum number of preamble transmission attempts per NPRACH resource. See TS 36.321 [6]. If the UE supports enhanced random access power control and maxNumPreambleAttemptCE-r14 is included, the UE shall use maxNumPreambleAttemptCE-r14 instead of maxNumPreambleAttemptCE-r13 for the first entry in nprach-ParametersList.

**npdcch-CarrierIndex**
For FDD: Index of the carrier in the list of DL non anchor carriers. The first entry in the list has index '1', the second entry has index '2' and so on.

**npdcch-NumRepetitions-RA**
Maximum number of repetitions for NPDCCH common search space (CSS) for RAR, Msg3 retransmission and Msg4, see TS 36.213 [23], section 16.6. If the field is absent, see NOTE.

**npdcch-Offset -RA**
Fractional period offset of starting subframe for NPDCCH common search space (CSS Type 2), see TS 36.213 [23], section 16.6. If the field is absent, see NOTE.

**npdcch-StartSF-CSS-RA**
Starting subframe configuration for NPDCCH common search space (CSS), including RAR, Msg3 retransmission, and Msg4, see TS 36.213 [23], section 16.6. If the field is absent, see NOTE.

**nprach-CP-Length**
Cyclic prefix length for NPRACH transmission (Tcp), see TS 36.211 [21], section 10.1.6. Value us66dot7 corresponds to 66.7 microseconds and value us266dot7 corresponds to 266.7 microseconds. If the UE uses a NPRACH resource for preamble format 2, the UE ignores the value signalled in nprach-CP-Length and considers the value to be 800 microseconds.

**nprach-NumCBRA-StartSubcarriers**
The number of start subcarriers from which a UE can randomly select a start subcarrier as specified in TS 36.321 [6]. The start subcarrier indices that the UE is allowed to randomly select from, are given by: nprach-SubcarrierOffset + [0, nprach-NumCBRA-StartSubcarriers - 1]. If the field is absent, see NOTE.

**nprach-NumSubcarriers**
Number of sub-carriers in a NPRACH resource, see TS 36.211 [21, 10.1.6]. In number of subcarriers. If the field is absent, see NOTE.

**nprach-ParametersList, nprach-ParametersListEDT**
Configures NPRACH parameters for each NPRACH resource. Up to three NPRACH resources can be configured in nprach-ParametersList in a cell. Each NPRACH resource is associated with a different number of NPRACH repetitions. The NPRACH resources in nprach-ParametersListEDT are used to initiate EDT. Each NPRACH resource is associated with a TBS signalled in the corresponding entry of edt-TBS-InfoList.

**nprach-ParametersListTDD**
For TDD: Configure NPRACH parameters for each NPRACH. Up to three NPRACH resources can be configured in a cell. Each NPRACH resource is associated with a different number of NPRACH repetitions.

**nprach-ParametersListFmt2, nprach-ParametersListFmt2EDT**
Configures NPRACH parameters for each NPRACH resource format 2. Up to three NPRACH resources can be configured on one carrier. Each NPRACH resource is associated with a different number of NPRACH repetitions. The NPRACH resources in nprach-ParametersListFmt2EDT are used to initiate EDT. Each NPRACH resource is associated with a TBS signalled in the corresponding entry of edt-TBS-InfoList.

**nprach-Periodicity**
Periodicity of a NPRACH resource, see TS 36.211 [21, 10.1.6]. Unit in millisecond. If the field is absent, see NOTE.

**nprach-PreambleFormat**
TDD: TDD preamble format, see TS 36.211 [21], section 10.1.6, Value fmt0 corresponds to preamble format 0, value fmt1 corresponds to preamble format 1 and so on.
**NPRACH-ConfigSIB-NB field descriptions**

**nprach-Start时间为**
Start time of the NPRACH resource in one period, see TS 36.211 [21, 10.1.6]. Unit in millisecond. If the field is absent, see NOTE.

**nprach-SubcarrierOffset**
Frequency location of the NPRACH resource, see TS 36.211 [21, 10.1.6]. In number of subcarriers, offset from subcarrier 0. If the field is absent, see NOTE.

**nprach-SubcarrierMSG3-RangeStart**
Fraction for calculating the starting subcarrier index of the range reserved for indication of UE support for multi-tone Msg3 transmission, within the NPRACH resource, see TS 36.211 [21, 10.1.6]. Multi-tone Msg3 transmission is not supported for {32, 64, 128} repetitions of NPRACH. For at least one of the NPRACH resources with the number of NPRACH repetitions other than {32, 64, 128}, the value of nprach-SubcarrierMSG3-RangeStart should not be 0.

If nprach-SubcarrierMSG3-RangeStart is equal to zero, no start subcarrier index for the single-tone Msg3 NPRACH is allocated and the start subcarrier indexes for the multi-tone Msg3 NPRACH partition are given by nprach-SubcarrierOffset + [0, nprach-NumCBRA-StartSubcarriers - 1].

If nprach-SubcarrierMSG3-RangeStart is equal to oneThird or twoThird, the start subcarrier indexes for the two partitions are given by:

\[
\text{nprach-SubcarrierOffset} + \left\lfloor \frac{\text{nprach-NumCBRA-StartSubcarriers} \times \text{nprach-SubcarrierMSG3-RangeStart}}{3} \right\rfloor - 1
\]

for the single-tone Msg3 NPRACH partition;

\[
\text{nprach-SubcarrierOffset} + \left\lfloor \frac{\text{nprach-NumCBRA-StartSubcarriers} \times \text{nprach-SubcarrierMSG3-RangeStart}}{3} \right\rfloor - 1
\]

for the multi-tone Msg3 NPRACH partition.

If nprach-SubcarrierMSG3-RangeStart is equal to one, the start subcarrier indexes for the single-tone Msg3 NPRACH are given by nprach-SubcarrierOffset + [0, nprach-NumCBRA-StartSubcarriers - 1] and no start subcarrier index for the multi-tone Msg3 NPRACH partition is allocated. If the field is absent, see NOTE.

**numRepetitionsPerPreambleAttempt**
Number of NPRACH repetitions per attempt for each NPRACH resource, See TS 36.211 [21], section 10.1.6. numRepetitionsPerPreambleAttempt-r13 applies to FDD and numRepetitionsPerPreambleAttempt-r15 applies to TDD.

**rsrp-ThresholdsPrachInfoList**
The criterion for UEs to select a NPRACH resource. Up to 2 RSRP threshold values can be signalled. The first element corresponds to RSRP threshold 1, the second element corresponds to RSRP threshold 2. See TS 36.321 [6].

If absent, there is only one NPRACH resource.

A UE that supports powerClassNB-14dBm-r14 shall correct the RSRP threshold values before applying them as follows:

\[
\text{RSRP threshold} = \text{Signalled RSRP threshold} - \min\{0, (14-\min(23, P-Max))\}
\]

where P-Max is the value of p-Max field in SystemInformationBlockType1-NB.

**NOTE:**

- If the field is absent in an entry of nprach-ParametersListTDD in SystemInformationBlockType22-NB, the value of the same field in the corresponding entry of nprach-ParametersListTDD in SystemInformationBlockType2-NB applies. The field is mandatory present in nprach-ParametersListTDD in SystemInformationBlockType2-NB.

- If the field is absent in an entry of nprach-ParametersListFmt2 in SystemInformationBlockType23-NB, the value of the same field, if present, in the corresponding entry of nprach-ParametersListFmt2 in SystemInformationBlockType2-NB applies. Otherwise the value of the same field, if present, in the corresponding entry of the first occurrence of nprach-ParametersListFmt2 in the non anchor carrier list applies.

  Otherwise, the value of the same field in the corresponding entry of nprach-ParametersList in SystemInformationBlockType2-NB applies.

- If the field is absent in an entry of nprach-ParametersListFmt2EDT in SystemInformationBlockType23-NB, the value of the same field, if present, in the corresponding entry of nprach-ParametersListFmt2 on the same UL carrier applies. Otherwise, the value of the same field, if present, in the corresponding entry of nprach-ParametersListFmt2 in SystemInformationBlockType2-NB applies. Otherwise the value of the same field, if present, in the corresponding entry of the first occurrence of nprach-ParametersListFmt2 in the non anchor carrier list applies. Otherwise, the value of the same field in the corresponding entry of nprach-ParametersList in SystemInformationBlockType2-NB applies.
Conditional presence | Explanation
--- | ---
**EDT** | The field is mandatory present if cp-EDT or up-EDT in SystemInformationBlockType2-NB is present; otherwise the field is not present and the UE shall delete any existing value for this field.
**EDT2** | The field is optionally present, Need OR, if edt-Parameters is present; otherwise the field is not present and the UE shall delete any existing value for this field.
**TDD** | This field is mandatory present for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.

---

**NPUSCH-Config-NB**

The IE *NPUSCH-ConfigCommon-NB* is used to specify the common NPUSCH configuration. The IE *NPUSCH-ConfigDedicated-NB* is used to specify the UE specific NPUSCH configuration.

**NPUSCH-Config-NB information element**

```asciidiagram
-- ASN1START

NPUSCH-ConfigCommon-NB-r13 ::= SEQUENCE {
  ack-NACK-NumRepetitions-Msg4-r13 SEQUENCE (SIZE(1.. maxNPRACH-Resources-NB-r13)) OF
    ACK-NACK-NumRepetitions-NB-r13,
  srs-SubframeConfig-r13 ENUMERATED {
    sc0, sc1, sc2, sc3, sc4, sc5, sc6, sc7,
    sc8, sc9, sc10, sc11, sc12, sc13, sc14, sc15
  } OPTIONAL, -- Need OR
  dmrs-Config-r13 SEQUENCE {
    threeTone-BaseSequence-r13 INTEGER (0..12) OPTIONAL, -- Need OP
    threeTone-CyclicShift-r13 INTEGER (0..2),
    sixTone-BaseSequence-r13 INTEGER (0..14) OPTIONAL, -- Need OP
    sixTone-CyclicShift-r13 INTEGER (0..3),
    twelveTone-BaseSequence-r13 INTEGER (0..30) OPTIONAL -- Need OP
  } OPTIONAL, -- Need OR
  ul-ReferenceSignalsNPUSCH-r13 UL-ReferenceSignalsNPUSCH-NB-r13
}

UL-ReferenceSignalsNPUSCH-NB-r13 ::= SEQUENCE {
  groupHoppingEnabled-r13 BOOLEAN,
  groupAssignmentNPUSCH-r13 INTEGER (0..29)
}

NPUSCH-ConfigDedicated-NB-r13 ::= SEQUENCE {
  ack-NACK-NumRepetitions-r13 ACK-NACK-NumRepetitions-NB-r13 OPTIONAL, -- Need ON
  npusch-AllSymbols-r13 BOOLEAN OPTIONAL, -- Cond SRS
  groupHoppingDisabled-r13 ENUMERATED {true} OPTIONAL -- Need OR
}

ACK-NACK-NumRepetitions-NB-r13 ::= ENUMERATED (r1, r2, r4, r8, r16, r32, r64, r128)

-- ASN1STOP
```
NPUSCH-Config-NB field descriptions

ack-NACK-NumRepetitions
Number of repetitions for the ACK NACK resource unit carrying HARQ response to NPDSCH, see TS 36.213 [23, 16.4.2]. If absent, the value of ack-NACK-NumRepetitions.Msg4 signalled in SIB2 is used.

ack-NACK-NumRepetitions.Msg4
Number of repetitions for ACK/NACK HARQ response to NPDSCH containing Msg4 per NPRACH resource, see TS 36.213 [23, 16.4.2].

groupAssignmentNPUSCH
See TS 36.211 [21, 10.1.4.1.3].

groupHoppingDisabled
See TS 36.211 [21, 10.1.4.1.3].

groupHoppingEnabled
See TS 36.211 [21, 10.1.4.1.3].

npusch-AllSymbols
If set to TRUE, the UE shall use all NB-IoT symbols for NPUSCH transmission. If set to FALSE, the UE punctures the NPUSCH transmissions in the symbols that collides with SRS. If the field is not present, the UE uses all NB-IoT symbols for NPUSCH transmission. See TS 36.211 [21, 10.1.3.6].

sixTone-BaseSequence
The base sequence of DMRS sequence in a cell for 6 tones transmission; see TS 36.211 [21, 10.1.4.1.2]. If absent, it is given by NB-IoT CellID mod 14. Value 14 is not used.

sixTone-CyclicShift
Define 4 cyclic shifts for the 6-tone case, see TS 36.211 [21, 10.1.4.1.2].

srs-SubframeConfig
SRS SubframeConfiguration. See TS 36.211 [21, table 5.5.3.3-1]. Value sc0 corresponds to value 0, sc1 to value 1 and so on.

threeTone-BaseSequence
The base sequence of DMRS sequence in a cell for 3 tones transmission; see TS 36.211 [21, 10.1.4.1.2]. If absent, it is given by NB-IoT CellID mod 12. Value 12 is not used.

twelveTone-BaseSequence
The base sequence of DMRS sequence in a cell for 12 tones transmission; see TS 36.211 [21, 10.1.4.1.2]. If absent, it is given by NB-IoT CellID mod 30. Value 30 is not used.

ul-ReferenceSignalsNPUSCH
Used to specify parameters needed for the transmission on NPUSCH.

Conditional presence | Explanation
--- | ---
SRS | This field is optionally present, need OP, if srs-SubframeConfig is broadcasted. Otherwise, the IE is not present.

—

PDCP-Config-NB

The IE PDCP-Config-NB is used to set the configurable PDCP parameters for data radio bearers.

PDCP-Config-NB information element

-- ASN1START

PDCP-Config-NB-r13 ::= SEQUENCE {
  discardTimer-r13 ENUMERATED {
    ms5120, ms10240, ms20480, ms40960,
    ms81920, infinity, spare2, spare1
  } OPTIONAL, -- Cond Setup
  headerCompression-r13 CHOICE {
    notUsed NULL,
    rohc SEQUENCE {
      maxCID-r13 INTEGER (1..16383) DEFAULT 15,
      profile0x0002 BOOLEAN,
      profile0x0003 BOOLEAN,
      profile0x0004 BOOLEAN,
      profile0x0006 BOOLEAN,
      profile0x0102 BOOLEAN,
      profile0x0103 BOOLEAN,
      profile0x0104 BOOLEAN
    }
  } OPTIONAL, -- Cond Setup
}
### PDCP-Config-NB field descriptions

**discardTimer**
Indicates the discard timer value specified in TS 36.323 [8]. Value in milliseconds. Value ms5120 means 5120 ms, ms10240 means 10240 ms and so on.

**headerCompression**
E-UTRAN does not reconfigure header compression except optionally upon RRC Connection Resumption.

**maxCID**
Indicates the value of the MAX_CID parameter as specified in TS 36.323 [8]. The total value of MAX_CIDs across all bearers for the UE should be less than or equal to the value of `maxNumberROHC-ContextSessions` parameter as indicated by the UE.

**profiles**
The profiles used by both compressor and decompressor in both UE and E-UTRAN. The field indicates which of the ROHC profiles specified in TS 36.323 [8] are supported, i.e. value `true` indicates that the profile is supported. Profile 0x0000 shall always be supported when the use of ROHC is configured. If support of two ROHC profile identifiers with the same 8 LSB's is signalled, only the profile corresponding to the highest value shall be applied.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setup</td>
<td>The field is mandatory present in case of radio bearer setup. Otherwise the field is optionally present, need ON.</td>
</tr>
</tbody>
</table>

---

### PhysicalConfigDedicated-NB

The IE `PhysicalConfigDedicated-NB` is used to specify the UE specific physical channel configuration.

#### PhysicalConfigDedicated-NB information element

```asn1
PhysicalConfigDedicated-NB-r13 ::= SEQUENCE {
  carrierConfigDedicated-r13 CarrierConfigDedicated-NB-r13 OPTIONAL, -- Need ON
  npdcch-ConfigDedicated-r13 NPDCCH-ConfigDedicated-NB-r13 OPTIONAL, -- Need ON
  npusch-ConfigDedicated-r13 NPUSCH-ConfigDedicated-NB-r13 OPTIONAL, -- Need ON
  uplinkPowerControlDedicated-r13 UplinkPowerControlDedicated-NB-r13 OPTIONAL, -- Need ON
  ...,
  [\[ twoHARQ-ProcessesConfig-r14 ENUMERATED {true} OPTIONAL -- Need OR \]],
  [\[ interferenceRandomisationConfig-r14 ENUMERATED {true} OPTIONAL -- Need OR \]],
  [\[ npdcch-ConfigDedicated-v1530 NPDCCH-ConfigDedicated-NB-v1530 OPTIONAL -- Cond TDD \]]
}
```
PhysicalConfigDedicated-NB field descriptions

carrierConfigDedicated
Anchor/ non-anchor carrier used for all unicast transmissions.

interferenceRandomisationConfig
For FDD: Interference randomisation enabled in connected mode, except for random access procedure in connected mode, see TS 36.211 [21]. For random access in connected mode interference randomisation on non-anchor is used and is not used on anchor carrier, see TS 36.211 [21]. For TDD: the parameter is not present.

npdcch-ConfigDedicated
NPDCCH configuration.

npusch-ConfigDedicated
UL unicast configuration.

twoHARQ-ProcessesConfig
Activation of two HARQ processes, see TS 36.212 [22] and TS 36.213 [23].

uplink-PowerControlDedicated
UL power control parameter.

---

RACH-ConfigCommon-NB

The IE RACH-ConfigCommon-NB is used to specify the generic random access parameters.

RACH-ConfigCommon-NB information element

--- ASN1START

RACH-ConfigCommon-NB-r13 ::= SEQUENCE {
preambleTransMax-CE-r13 PreambleTransMax,
ra-InfoList-r13 RACH-InfoList-NB-r13,
connEstFailOffset-r13 INTEGER {0..15} OPTIONAL, -- Need OP
...,
[[ powerRampingParameters-v1450 PowerRampingParameters-NB-v1450 OPTIONAL -- Need OR
]],
[[ rach-InfoList-v1530 RACH-InfoList-NB-v1530 OPTIONAL -- Cond EDT
]]
}

RACH-InfoList-NB-r13 ::= SEQUENCE (SIZE (1.. maxNPRACH-Resources-NB-r13)) OF RACH-Info-NB-r13

RACH-Info-NB-r13 ::= SEQUENCE {
ra-ResponseWindowSize-r13 ENUMERATED {
pp2, pp3, pp4, pp5, pp6, pp7, pp8, pp10},
mac-ContentionResolutionTimer-r13 ENUMERATED {
pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64}
}

RACH-Info-NB-v1530 ::= SEQUENCE {
mac-ContentionResolutionTimer-r15 ENUMERATED {
pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64}
}

PowerRampingParameters-NB-v1450 ::= SEQUENCE {
preambleInitialReceivedTargetPower-v1450 ENUMERATED {
dBm-130, dBm-128, dBm-126, dBm-124, dBm-122,
dBm-120, dBm-118, dBm-116, dBm-114, dBm-112,
dBm-110, dBm-108, dBm-106, dBm-104, dBm-102,
dBm-100, dBm-98, dBm-96, dBm-94, dBm-92,
dBm-90, dBm-88, dBm-86, dBm-84, dBm-82, dBm-80}
OPTIONAL, -- Need OR

powerRampingStepCE1-r14 ENUMERATED {
dB0, dB2, dB4, dB6},
preambleInitialReceivedTargetPowerCE1-r14 ENUMERATED {
dBm-130, dBm-128, dBm-126, dBm-124, dBm-122,
dBm-120, dBm-118, dBm-116, dBm-114, dBm-112,
dBm-110, dBm-108, dBm-106, dBm-104, dBm-102,
dBm-100, dBm-98, dBm-96, dBm-94, dBm-92,
dBm-90, dBm-88, dBm-86, dBm-84, dBm-82, dBm-80}
OPTIONAL -- Need OR

--- ASN1END

---
RACH-ConfigCommon-NB field descriptions

connEstFailOffset
Parameter "Qoffsettemp" in TS 36.304 [4]. If the field is not present the value of infinity shall be used for "Qoffsettemp".

mac-ContentionResolutionTimer
Timer for contention resolution in TS 36.321 [6]. Value in PDCCH periods. Value pp1 corresponds to 1 PDCCH period, pp2 corresponds to 2 PDCCH periods and so on. mac-ContentionResolutionTimer-r15 is only applicable for EDT. UE performing EDT shall use mac-ContentionResolutionTimer-r15, if present.

For FDD: The value considered by the UE is: mac-ContentionResolutionTimer = Min (signaled value x PDCCH period, 10.24s).

For TDD: The value considered by the UE is: mac-ContentionResolutionTimer = Min (signaled value x PDCCH period, 20.48s).

powerRampingParameters, powerRampingParametersCE1
Power ramping step and preamble initial received target power – same as TS 36.213 [23] and TS 36.321 [6].

If the UE does not support enhanced random access power control and more than one repetition level is configured in the cell, then the UE transmits NPRACH with max power except for the lowest repetition level. Otherwise, the UE uses NPRACH power ramping.

If the UE supports enhanced random access power control and powerRampingParameters-v1450 is signalled, the UE uses NPRACH power ramping across repetition levels as specified in TS 36.321 [6]. If preambleInitialReceivedTargetPower-v1450 is present, the UE shall use preambleInitialReceivedTargetPower-v1450 instead of preambleInitialReceivedTargetPower (i.e. without suffix). If powerRampingParametersCE1 is present, the UE shall use powerRampingParametersCE1 instead of powerRampingParameters for NPRACH power ramping in the second repetition level.

preambleTransMax-CE
Maximum number of preamble transmission in TS 36.321 [6]. Value is an integer.

ra-ResponseWindowSize
Duration of the RA response window in TS 36.321 [6]. Value in PDCCH periods. Value pp2 corresponds to 2 PDCCH periods, pp3 corresponds to 3 PDCCH periods and so on.

For FDD: The value considered by the UE is: ra-ResponseWindowSize = Min (signaled value x PDCCH period, 10.24s).

For TDD: The value considered by the UE is: ra-ResponseWindowSize = Min (signaled value x PDCCH period, 20.48s).

Conditional presence

<table>
<thead>
<tr>
<th>EDT</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The field is optionally present, Need OR, if edt-Parameters is present; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
<td></td>
</tr>
</tbody>
</table>

RadioResourceConfigCommonSIB-NB

The IE RadioResourceConfigCommonSIB-NB is used to specify common radio resource configurations in the system information, e.g., the random access parameters and the static physical layer parameters.

RadioResourceConfigCommonSIB-NB information element

RadioResourceConfigCommonSIB-NB-r13 ::= SEQUENCE {
    rach-ConfigCommon-r13     RACH-ConfigCommon-NB-r13,
    bcch-Config-r13      BCCH-Config-NB-r13,
    pcch-Config-r13      PCCH-Config-NB-r13,
    nprach-Config-r13     NPRACH-ConfigSIB-NB-r13,
    npdsch-ConfigCommon-r13     NPDSCH-ConfigCommon-NB-r13,
    npusch-ConfigCommon-r13     NPUSCH-ConfigCommon-NB-r13,
    dl-Gap-r13        DL-GapConfig-NB-r13   OPTIONAL,  -- Need OP
    uplinkPowerControlCommon-r13   UplinkPowerControlCommon-NB-r13,
    ...,
    [[ nprach-Config-v1330     NPRACH-ConfigSIB-NB-v1330 OPTIONAL  -- Need OR
    ]],
    [[ nprach-Config-v1450     NPRACH-ConfigSIB-NB-v1450 OPTIONAL  -- Cond
    ]],
    [[ nprach-Config-v1530     NPRACH-ConfigSIB-NB-v1530 OPTIONAL  -- Need OR
    dl-Gap-v1530       DL-GapConfig-NB-v1530 OPTIONAL,  -- Cond TOD
    ]],
    wus-Config-r15      WUS-Config-NB-r15   OPTIONAL -- Need OR
}
RadioResourceConfigCommonSIB-NB field descriptions

defaultPagingCycle
Default paging cycle, used to derive 'T' in TS 36.304 [4]. Value rf128 corresponds to 128 radio frames, rf256 corresponds to 256 radio frames and so on.

dl-Gap
Downlink transmission gap configuration for the anchor carrier. See TS 36.211 [21, 10.2.3.4]. If the field is absent, there is no gap.

modificationPeriodCoeff
Actual modification period, expressed in number of radio frames = \( \text{modificationPeriodCoeff} \times \text{defaultPagingCycle} \). n16 corresponds to value 16, n32 corresponds to value 32, and so on. The BCCH modification period should be larger or equal to 40.96s.

nPBC
Parameter: nB is used as one of parameters to derive the Paging Frame and Paging Occasion according to TS 36.304 [4]. Value in multiples of 'T' as defined in TS 36.304 [4]. A value of fourT corresponds to 4 * T, a value of twoT corresponds to 2 * T and so on.

npdcch-NumRepetitionPaging
Maximum number of repetitions for NPDCCH common search space (CSS) for paging, see TS 36.213 [23, 16.6].

wus-Config
WUS Configuration.

Conditional presence | Explanation
--- | ---
EnhPowerControl | This field is optional present, Need OR, if PowerRampingParameters-NB-v1450 is included in SIB2-NB. Otherwise the field is not present.
TDD | The field is optionally present, Need OR, for TDD; otherwise the field is not present and the UE shall delete any existing value for this field.

RadioResourceConfigDedicated-NB

The IE RadioResourceConfigDedicated-NB is used to setup/modify/release RBs, to modify the MAC main configuration, and to modify dedicated physical configuration.

RadioResourceConfigDedicated-NB information element

--- ASNISTART

RadioResourceConfigDedicated-NB-r13 ::= SEQUENCE {
    srb-ToAddModList-r13   SRB-ToAddModList-NB-r13 OPTIONAL, -- Need ON
    drb-ToAddModList-r13   DRB-ToAddModList-NB-r13 OPTIONAL, -- Need ON
    drb-ToReleaseList-r13  DRB-ToReleaseList-NB-r13 OPTIONAL, -- Need ON
    mac-MainConfig-r13    MAC-MainConfig-NB-r13
        explicitValue-r13   MAC-MainConfig-NB-r13
        defaultValue-r13   NULL
    }
SRB-ToAddModList-NB-r13 ::= SEQUENCE (SIZE (1)) OF SRB-ToAddMod-NB-r13

SRB-ToAddMod-NB-r13 ::= SEQUENCE {
  rlc-Config-r13 CHOICE {
    explicitValue RLC-Config-NB-r13, OPTIONAL, -- Cond Setup
    defaultValue NULL
  }  OPTIONAL, -- Cond Setup
  logicalChannelConfig-r13 CHOICE {
    explicitValue LogicalChannelConfig-NB-r13, OPTIONAL, -- Cond Setup
    defaultValue NULL
  }  OPTIONAL, -- Cond Setup
  ...,
  [[ rlc-Config-v1430 RLC-Config-NB-v1430 OPTIONAL -- Need ON
  ]]
}

DRB-ToAddModList-NB-r13 ::= SEQUENCE (SIZE (1..maxDRB-NB-r13)) OF DRB-ToAddMod-NB-r13

DRB-ToAddMod-NB-r13 ::= SEQUENCE {
  eps-BearerIdentity-r13 INTEGER (0..15) OPTIONAL, -- Cond DRB-Setup
  drb-Identity-r13 DRB-Identity, -- Cond Setup
  pdcp-Config-r13 PDCP-Config-NB-r13 OPTIONAL, -- Cond Setup
  rlc-Config-r13 RLC-Config-NB-r13 OPTIONAL, -- Cond Setup
  logicalChannelIdentity-r13 INTEGER (3..10) OPTIONAL, -- Cond DRB-Setup
  logicalChannelConfig-r13 LogicalChannelConfig-NB-r13 OPTIONAL, -- Cond Setup
  ...,
  [[ rlc-Config-v1430 RLC-Config-NB-v1430 OPTIONAL -- Need ON
  ]]
}

DRB-ToReleaseList-NB-r13 ::= SEQUENCE (SIZE (1..maxDRB-NB-r13)) OF DRB-Identity

---

RadioResourceConfigDedicated-NB field descriptions

**logicalChannelConfig**
For SRB a choice is used to indicate whether the logical channel configuration is signalled explicitly or set to the default logical channel configuration for SRB1 as specified in 9.2.1.1.

**logicalChannelIdentity**
The logical channel identity for both UL and DL for a DRB. Value 3 is not used.

**mac-MainConfig**
The default MAC MAIN configuration is specified in 9.2.2.

**physicalConfigDedicated**
The default dedicated physical configuration is specified in 9.2.4.

**rlc-Config**
For SRBs a choice is used to indicate whether the RLC configuration is signalled explicitly or set to the values defined in the default RLC configuration for SRB1 in 9.2.1.1. RLC AM is the only applicable RLC mode for SRB1 and SRB1bis.

**schedulingRequestConfig**
Scheduling request configuration.

---

Conditional presence | Explanation
--- | ---
**DRB-Setup** | The field is mandatory present if the corresponding DRB is being set up; otherwise it is not present.
**Setup** | The field is mandatory present if the corresponding SRB/DRB is being setup; otherwise the field is optionally present, need ON.

---

**RLC-Config-NB**
The IE **RLC-Config-NB** is used to specify the RLC configuration of SRBs and DRBs.

---

**RLC-Config-NB Information element**

---
RRC-Config-NB field descriptions

**enableStatusReportSN-Gap**
Indicates that status reporting due to detection of reception failure is enabled, as specified in TS 36.322 [7].

**maxRetxThreshold**
Parameter for RLC AM in TS 36.322 [7]. Value t1 corresponds to 1 retransmission, t2 to 2 retransmissions and so on.

**T-PollRetransmit**
Timer for RLC AM in TS 36.322 [7], in milliseconds. Value msX means X ms, msY means Y ms and so on. E-UTRAN may configure the value msX-v1530 (with suffix) only in TDD mode.

**T-Reordering**
Timer for reordering in TS 36.322 [7], in milliseconds.

### Conditional presence

<table>
<thead>
<tr>
<th>twoHARQ</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The field is mandatory present if twoHARQ-ProcessesConfig is set to TRUE. Otherwise, the field is not present and, if previously configured, the timer is released.</td>
<td></td>
</tr>
</tbody>
</table>

---

**RLF-TimersAndConstants-NB**

The IE **RLF-TimersAndConstants-NB** contains UE specific timers and constants applicable for UEs in RRC_CONNECTED.

---

### RLF-TimersAndConstants-NB information element

```
-- ASN1START

RLF-TimersAndConstants-NB-r13 ::= CHOICE {
  release  NULL,
  setup    SEQUENCE {
    t301-r13 ENUMERATED {
      ms250, ms4000, ms6000, ms10000,
      ms15000, ms25000, ms40000, ms60000
    },
    t310-r13 ENUMERATED {
      ms0, ms200, ms500, ms1000, ms2000, ms4000, ms8000
    },
    n310-r13 ENUMERATED {
      n1, n2, n3, n4, n6, n8, n10, n20
    },
    t311-r13 ENUMERATED {
      ms1000, ms3000, ms5000, ms10000, ms15000,
      ms20000, ms30000
    },
    n311-r13 ENUMERATED {
      n1, n2, n3, n4, n5, n6, n8, n10
    }
  }
}
```
The UE shall use the extended values \texttt{t311-v1350}, \texttt{t301-v1530} and \texttt{t311-v1530}, if present, and ignore the value signaled by \texttt{t311-r13}, \texttt{t301-r13} and \texttt{t311-r13} respectively.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDD</td>
<td>The field is optionally present, Need OR, in TDD mode. Otherwise, the field is not present.</td>
</tr>
</tbody>
</table>

### SchedulingRequestConfig-NB

The IE \textit{SchedulingRequestConfig-NB} is used to specify the Scheduling Request related parameters.

**SchedulingRequestConfig-NB information element**
### SchedulingRequestConfig-NB field descriptions

#### alpha
Parameter: $\alpha_c$. Fractional power control parameter for SR without HARQ-ACK. See TS 36.213 [23], section 16.2.1.1.2, where value $a0$ corresponds to 0, value $a04$ corresponds to 0.4, value $a05$ to 0.5, value $a06$ to 0.6, value $a07$ to 0.7, value $a08$ to 0.8, value $a09$ to 0.9 and value $a1$ corresponds to 1.

#### nprach-CarrierIndex
Index of the carrier in the list of UL non anchor carriers in SystemInformationBlockType22-NB. The first entry in the list has index '1', the second entry has index '2' and so on. Value '0' indicates the anchor carrier.

#### nprach-ResourceIndex
Index of the NPRACH resource in the list of NPRACH resources in NPRACH-ParametersList or NPRACH-ParametersList-Fmt2 for the UL carrier indicated by nprach-CarrierIndex. The first entry in the list has index '1', the second entry has index '2' and so on. E-UTRAN configures a NPRACH resource in NPRACH-ParametersList-Fmt2 only to UEs that have reported support of NPRACH resource Format2.

#### nprach-SubCarrierIndex
Index of the subcarrier in the NPRACH resource in NPRACH-ParametersList or NPRACH-ParametersList-Fmt2 for the indicated UL carrier. E-UTRAN does not configure nprach-SubcarrierIndex to a smaller value than nprach-NumCBRA-StartSubcarriers for the indicated NPRACH resource.

#### po-SR
Parameter: $P_{O,SR,c}$. Target power for SR without HARQ-ACK. See TS 36.213 [23], section 16.2.1.1.2, unit dBm.

#### semiPersistSchedC-RNTI
Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].

#### semiPersistSchedIntervalUL
Semi-persistent scheduling interval in uplink, see TS 36.321 [6]. Value in number of sub-frames. Value $sf128$ corresponds to 128 sub-frames, value $sf256$ corresponds to 256 sub-frames and so on.

#### sr-SPS-BSR-Config

#### sr-NPRACH-Resource
NPRACH resource for physical layer SR without HARQ-ACK, see TS 36.211 [21] and TS 36.213 [23].

#### sr-ProhibitTimer
Timer for SR transmission on the NPRACH resource for SR in TS 36.321 [6]. Value in number of SR period, where the SR period is equal to the field nprach-Periodicity of the NPRACH resource. Value 0 means that behaviour as specified in 7.3.2 applies. Value 1 corresponds to one SR period, Value 2 corresponds to 2*SR period and so on.

#### sr-WithHARQ-ACK-Config
Activation of physical layer SR with HARQ ACK, see TS 36.213 [23].

#### sr-WithoutHARQ-ACK-Config
Activation of physical layer SR without HARQ ACK, see TS 36.211 [21] and TS 36.213 [23]. E-UTRAN cannot configure sr-WithoutHARQ-ACK-Config together with sr-SPS-BSR.

---

### TDD-Config-NB

The IE TDD-Config-NB is used to specify the TDD specific physical channel configuration.

#### TDD-Config information element

```
-- ASN1START

TDD-Config-NB-r15 ::= SEQUENCE {
  subframeAssignment-r15 ENUMERATED {
    sa1, sa2, sa3, sa4, sa5},
  specialSubframePatterns-r15 ENUMERATED {
    ssp0, ssp1, ssp2, ssp3, ssp4, ssp5, ssp6, ssp7, ssp8, ssp9, ssp10, ssp10-CRS-LessDwPTS}
}

-- ASN1STOP
```
**TDD-Config field descriptions**

*specialSubframePatterns*
Indicates Configuration as in TS 36.211 [21], table 4.2-1 where ssp0 points to Configuration 0, ssp1 to Configuration 1 etc. Value ssp10-CRS-LessDwPTS corresponds to ssp10 without CRS transmission on the 5th symbol of DwPTS.

*subframeAssignment*
Indicates DL/UL subframe configuration where sa1 points to Configuration 1, sa2 to Configuration 2 and so on, as specified in TS 36.211 [21], table 4.2-2.

E-UTRAN configures the same value for serving cells residing on same frequency band.

---

**TDD-UL-DL-AlignmentOffset-NB**

The IE **TDD-UL-DL-AlignmentOffset-NB** is used to specify the offset between the UL carrier frequency center with respect to DL carrier frequency center, see TS 36.211 [21].

**TDD-UL-DL-AlignmentOffset-NB information element**

```asn1
TDD-UL-DL-AlignmentOffset-NB-r15 ::= ENUMERATED { khz-7.5, khz0, khz7.5}
```

---

**UplinkPowerControl-NB**

The IE **UplinkPowerControlCommon-NB** and IE **UplinkPowerControlDedicated-NB** are used to specify parameters for uplink power control in the system information and in the dedicated signalling, respectively.

**UplinkPowerControl-NB information elements**

```asn1
UplinkPowerControlCommon-NB-r13 ::= SEQUENCE {
  p0-NominalNPUSCH-r13    INTEGER (-126..24),
  alpha-r13       ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1},
  deltaPreambleMsg3-r13    INTEGER (-1..6)
}
UplinkPowerControlDedicated-NB-r13 ::= SEQUENCE {
  p0-UE-NPUSCH-r13      INTEGER (-8..7)
}
```

---

**UplinkPowerControl-NB field descriptions**

*alpha*
Parameter: \(\alpha_1\). See TS 36.213 [23, 16.2.1.1] where a0 corresponds to 0, a04 corresponds to value 0.4, a05 to 0.5, a06 to 0.6, a07 to 0.7, a08 to 0.8, a09 to 0.9 and a1 corresponds to 1.

*deltaPreambleMsg3*
Parameter: \(\Delta_{PREAMBLE\_Msg3}\). See TS 36.213 [23, 16.2.1.1]. Actual value = IE value * 2 [dB].

*\(p_0\)-NominalNPUSCH*
Parameter: \(P_{O\_NOMINAL\_NPUSCH,C}\). See TS 36.213 [23, 16.2.1.1], unit dBm.

*\(p_0\)-UE-NPUSCH*
Parameter: \(P_{O\_UE\_NPUSCH,C}\). See TS 36.213 [23, 16.2.1.1], unit dB.

---

**WUS-Config-NB**

The IE **WUS-Config-NB** is used to specify the WUS configuration. For UEs supporting WUS, E-UTRAN uses WUS to indicate that the UE shall attempt to receive paging in that cell, see TS 36.304 [4].

**WUS-Config-NB information element**
--- ASN1START

WUS-Config-NB-r15 ::= SEQUENCE {
  maxDurationFactor-r15   WUS-MaxDurationFactor-NB-r15,
  numPOs-r15      ENUMERATED {n1, n2, n4}  DEFAULT n1,
  numDRX-CyclesRelaxed-r15   ENUMERATED {n1, n2, n4, n8},
  timeOffsetDRX-r15   ENUMERATED {ms40, ms80, ms160, ms240},
  timeOffset-eDRX-Short-r15 ENUMERATED {ms40, ms80, ms160, ms240},
  timeOffset-eDRX-Long-r15 ENUMERATED {ms1000, ms2000} OPTIONAL, -- Need OP
  ...
}

WUS-ConfigPerCarrier-NB-r15 ::= SEQUENCE {
  maxDurationFactor-r15   WUS-MaxDurationFactor-NB-r15
}

WUS-MaxDurationFactor-NB-r15 ::= ENUMERATED {one128th, one64th, one32th, one16th, oneEighth, oneQuarter, oneHalf}

--- ASN1STOP

--- WUS-Config-NB field descriptions

**maxDurationFactor**
Parameter "alpha" in TS 36.211 [21]. Maximum WUS duration, expressed as a ratio of Rmax for Type 1-CSS. Value one128th means Rmax * 1/128, value one64th means Rmax * 1/64 and so on.
The value considered by the UE is: maxDuration = Max (signalled value * Rmax, 1) where Rmax is the value of npdcch-NumRepetitionPaging for the carrier.

**numDRX-CyclesRelaxed**
Maximum number of consecutive DRX cycles during which the UE can use WUS for synchronisation and skip serving cell measurements, see TS 36.213 [23]. Value n1 corresponds to 1 DRX cycle, value n2 corresponds to 2 DRX cycles and so on. The actual duration during which the UE can skip serving cell measurements is: numDRX-CyclesRelaxed = Min (signaled value x Paging Cycle, 10.24s), where Paging Cycle: is the value of defaultPagingCycle field in SystemInformationBlockType2-NB.

**numPOs**
Number of consecutive Paging Occasions (PO) mapped to one Wake Up Signal (WUS), applicable to UEs configured to use extended DRX, see TS 36.304 [4]. Value n1 corresponds to 1 PO and value n2 corresponds to 2 POs and so on.

**timeOffsetDRX**
When DRX is used, non-zero gap from the end of the configured maximum WUS duration to the associated PO, see TS 36.304 [4, 7.4] and TS 36.211 [21]. In milliseconds. Value ms40 corresponds to 40ms, value ms80 corresponds to 80 ms and so on.

**timeOffset-eDRX-Short**
When eDRX is used, the short non-zero gap from the end of the configured maximum WUS duration to the associated PO, see TS 36.304 [4, 7.4] and TS 36.211 [21]. In milliseconds. Value ms40 corresponds to 40ms, value ms80 corresponds to 80 ms and so on.
E-UTRAN configures timeOffset-eDRX-Short to a value longer than or equal to timeOffsetDRX.

**timeOffset-eDRX-Long**
When eDRX is used, the long non-zero gap from the end of the configured maximum WUS duration to the associated PO, see TS 36.304 [4, 7.4] and TS 36.211 [21]. In milliseconds. Value ms1000 corresponds to 1000 ms, value ms2000 corresponds to 2000 ms.

---

### 6.7.3.3 NB-IoT Security control information elements

Void

### 6.7.3.4 NB-IoT Mobility control information elements

---

**AdditionalBandInfoList-NB**

--- ASN1START

AdditionalBandInfoList-NB-r14 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF FreqBandIndicator-NB-r13

--- ASN1STOP
--  FreqBandIndicator-NB

The IE *FreqBandIndicator-NB* indicates the E-UTRA operating band as defined in TS 36.101 [42, table 5.5-1].

**FreqBandIndicator-NB information element**

```asn1
FreqBandIndicator-NB-r13 ::= INTEGER (1.. maxFBI2)
```

-- ASN1STOP

--  MultiBandInfoList-NB

**MultiBandInfoList-NB information element**

```asn1
MultiBandInfoList-NB-r13 ::= SEQUENCE (SIZE (1..maxMultiBands)) OF MultiBandInfo-NB-r13
```

```asn1
MultiBandInfo-NB-r13 ::= SEQUENCE {
  freqBandIndicator-r13   FreqBandIndicator-NB-r13  OPTIONAL, -- Need OR
  freqBandInfo-r13    NS-PmaxList-NB-r13    OPTIONAL -- Need OR
}
```

-- ASN1STOP

--  NS-PmaxList-NB

The IE *NS-PmaxList-NB* concerns a list of *additionalPmax* and *additionalSpectrumEmission* as defined in TS 36.101 [42, 6.2.4F] for a given frequency band. E-UTRAN does not include the same value of *additionalSpectrumEmission* in *SystemInformationBlockType2-NB* within this list.

**NS-PmaxList-NB information element**

```asn1
NS-PmaxList-NB-r13 ::= SEQUENCE (SIZE (1..maxNS-Pmax-NB-r13)) OF NS-PmaxValue-NB-r13
```

```asn1
NS-PmaxValue-NB-r13 ::= SEQUENCE {
  additionalPmax-r13    P-Max      OPTIONAL, -- Need OR
  additionalSpectrumEmission-r13 AdditionalSpectrumEmission
}
```

-- ASN1STOP

--  ReselectionThreshold-NB

The IE *ReselectionThreshold-NB* is used to indicate an Rx level threshold for cell reselection. Actual value of threshold = field value * 2 [dB].

**ReselectionThreshold-NB information element**

```asn1
ReselectionThreshold-NB-v1360 ::= INTEGER (32..63)
```

-- ASN1STOP

--  T-Reselection-NB

The IE *T-Reselection-NB* concerns the cell reselection timer *TreselectionRAT* for NB-IoT.

Value in seconds. s0 means 0 second and behaviour as specified in 7.3.2 applies, s3 means 3 seconds and so on.
**T-Reselection-NB information element**

```asn1
T-Reselection-NB-r13 ::= ENUMERATED {s0, s3, s6, s9, s12, s15, s18, s21}
```

---

### 6.7.3.5 NB-IoT Measurement information elements

#### CQI-NPDCCH-NB

The IE **CQI-NPDCCH-NB** represents the downlink channel quality measurement. The codepoints for the CQI-NPDCCH measurements are according to the mapping table in TS 36.133 [16]. The value `noMeasurements` indicates no measurement reporting.

```asn1
CQI-NPDCCH-NB-r14 ::= ENUMERATED {
  noMeasurements, candidateRep-A, candidateRep-B, candidateRep-C,
  candidateRep-D, candidateRep-E, candidateRep-F, candidateRep-G,
  candidateRep-L}
```

---

#### CQI-NPDCCH-Short-NB

The IE **CQI-NPDCCH-Short-NB** represents the short version of the downlink channel quality measurement. The codepoints for the CQI-NPDCCH-Short measurements are according to the mapping table in TS 36.133 [16]. The value `noMeasurements` indicates no measurement reporting.

```asn1
CQI-NPDCCH-Short-NB-r14 ::= ENUMERATED {
  noMeasurements, candidateRep-1, candidateRep-2, candidateRep-3}
```

---

#### MeasResultServCell-NB

The IE **MeasResultServCell-NB** covers the measured results for the serving cell.

```asn1
MeasResultServCell-NB-r14 ::= SEQUENCE {
  nrsrpResult-r14         NRSRP-Range-NB-r14,
  nrsrqResult-r14         NRSRQ-Range-NB-r14
}
```

---

#### NRSRP-Range-NB

The IE **NRSRP-Range-NB** specifies the value range used in NRSRP measurements and thresholds. Integer value for NRSRP measurements according to mapping table in TS 36.133 [16, Table 9.1.22.9-1].

```asn1
NRSRP-Range-NB information element
```
NRSRP-Range-NB \(r14\) ::= INTEGER(0..113)
--- ASN1STOP

NRSRQ-Range-NB

The IE **NRSRQ-Range-NB** specifies the value range used in NRSRQ measurements and thresholds. Integer value for RSRQ measurements is according to mapping table in TS 36.133 [16, Table 9.1.22.14-1]. The UE shall not report values 0 and 34.

**NRSRQ-Range-NB information element**

--- ASN1START
NRSRQ-Range-NB \(r14\) ::= INTEGER(-30..46)
--- ASN1STOP

NSSS-RRM-Config-NB

The IE **NSSS-RRM-Config-NB** provides the configuration for NSSS-based RRM measurements. See TS 36.133 [16], TS 36.213 [23] and TS 36.214 [48]. The UE only performs NSSS-based RRM measurement on cells for which the configuration has been provided.

**NSSS-RRM-Config-NB information element**

--- ASN1START
NSSS-RRM-Config-NB \(r15\) ::= SEQUENCE {
  nsss-RRM-PowerOffset \(r15\) ENUMERATED {dB-3, dB0, dB3},
  nsss-NumOccDiffPrecoders \(r15\) ENUMERATED {n1, n2, n4, n8} OPTIONAL  -- Need OP
}
--- ASN1STOP

**NSSS-RRM-Config-NB field descriptions**

- **nsss-PowerOffset**
  NSSS to NRS ratio for the serving cell as specified in TS 36.213 [23]. Value in dB. Value dB-3 corresponds to -3 dB, dB0 corresponds to 0 dB and so on.

- **nsss-NumOccDiffPrecoders**
  Number of consecutive NSSS occasions that use different precoders for NSSS transmission. See TS 36.213 [23]. Value n1 corresponds to 1 occasion, n2 corresponds to 2 occasions and so on.
  If the field is absent, the UE makes no assumption on the antenna port(s) used for NSSS.

6.7.3.6 NB-IoT Other information elements

--- EstablishmentCause-NB

The IE **EstablishmentCause-NB** provides the establishment cause for the RRC connection request or the RRC connection resume request as provided by the upper layers.

**EstablishmentCause-NB information element**

--- ASN1START
EstablishmentCause-NB \(r13\) ::= ENUMERATED {
  mt-Access, mo-Signalling, mo-Data, mo-ExceptionData,
  delayTolerantAccess-v1330, spare3, spare2, spare1
}
--- ASN1STOP

--- UE-Capability-NB

The IE **UE-Capability-NB** is used to convey the NB-IoT UE Radio Access Capability Parameters, see TS 36.306 [5]. The IE **UE-Capability-NB** is transferred in NB-IoT only.
**UE-Capability-NB information element**

```asn1
UE-Capability-NB-r13 ::= SEQUENCE {
  accessStratumRelease-r13  ENUMERATED (rel13, rel14, rel15, spare5, spare4, spare3, spare2, spare1, ...),
  ue-Category-NB-r13 ENUMERATED (nb1) OPTIONAL,
  multipleDRB-r13 ENUMERATED (supported) OPTIONAL,
  pdcp-Parameters-r13  PDCP-Parameters-NB-r13 OPTIONAL,
  phyLayerParameters-r13  PhyLayerParameters-NB-r13 OPTIONAL,
  rf-Parameters-r13  RF-Parameters-NB-r13,
  dummy SEQUENCE () OPTIONAL
}

UE-Capability-NB-Ext-r14-IEs ::= SEQUENCE {
  ue-Category-NB-r14 ENUMERATED (nb2) OPTIONAL,
  mac-Parameters-r14 MAC-Parameters-NB-r14 OPTIONAL,
  phyLayerParameters-v1430  PhyLayerParameters-NB-v1430 OPTIONAL,
  rf-Parameters-v1430 RF-Parameters-NB-v1430,
  nonCriticalExtension UE-Capability-NB-v1440-IEs OPTIONAL
}

UE-Capability-NB-v1440-IEs ::= SEQUENCE {
  phyLayerParameters-v1440 PhyLayerParameters-NB-v1440 OPTIONAL,
  nonCriticalExtension UE-Capability-NB-v1530-IEs OPTIONAL
}

UE-Capability-NB-v1530-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension UE-Capability-NB-v15x0-IEs OPTIONAL
}

UE-Capability-NB-v15x0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension UE-Capability-NB-v1530-IEs OPTIONAL
}

TDD-UE-Capability-NB-r15 ::= SEQUENCE {
  ue-Category-NB-r15 ENUMERATED (nb2) OPTIONAL,
  phyLayerParametersRel13-r15 PhyLayerParameters-NB-r13 OPTIONAL,
  phyLayerParametersRel14-r15 PhyLayerParameters-NB-v1430 OPTIONAL,
  phyLayerParameters-v1530 PhyLayerParameters-NB-v1530 OPTIONAL,
  ...}

AccessStratumRelease-NB-r13 ::= ENUMERATED (rel13, rel14, rel15, spare5, spare4, spare3, spare2, spare1, ...)

PDCP-Parameters-NB-r13 ::= SEQUENCE {
  supportedROHC-Profiles-r13 SEQUENCE {
    profile0x0002 BOOLEAN,
    profile0x0003 BOOLEAN,
    profile0x0004 BOOLEAN,
    profile0x0006 BOOLEAN,
    profile0x0102 BOOLEAN,
    profile0x0103 BOOLEAN,
    profile0x0104 BOOLEAN
  },
  maxNumberROHC-ContextSessions-r13 ENUMERATED (cs2, cs4, cs8, cs12) DEFAULT cs2,
  ...
}

RLC-Parameters-NB-r15 ::= SEQUENCE {
  rlc-UM-r15 ENUMERATED (supported) OPTIONAL
}

MAC-Parameters-NB-r14 ::= SEQUENCE {
  dataInactMon-r14 ENUMERATED (supported) OPTIONAL,
  rai-Support-r14 ENUMERATED (supported) OPTIONAL
}

MAC-Parameters-NB-v1530 ::= SEQUENCE {
  sr-SPS-BSR-r15 ENUMERATED (supported) OPTIONAL
}```
PhyLayerParameters-NB-r13 ::= SEQUENCE {
  multiTone-r13 ENUMERATED {supported} OPTIONAL,
  multiCarrier-r13 ENUMERATED {supported} OPTIONAL
}

PhyLayerParameters-NB-v1430 ::= SEQUENCE {
  multiCarrier-NPRACh-r14 ENUMERATED {supported} OPTIONAL,
  twoHARQ-Processes-r14 ENUMERATED {supported} OPTIONAL
}

PhyLayerParameters-NB-v1440 ::= SEQUENCE {
  interferenceRandomisation-r14 ENUMERATED {supported} OPTIONAL
}

PhyLayerParameters-NB-v1530 ::= SEQUENCE {
  mixedOperationMode-r15 ENUMERATED {supported} OPTIONAL,
  sr-WithoutHARQ-ACK-r15 ENUMERATED {supported} OPTIONAL,
  npwechat-Format2-r15 ENUMERATED {supported} OPTIONAL,
  additionalTransmissionSIB1-r15 ENUMERATED {supported} OPTIONAL,
  npusch-3.75kHz-SCS-TDD-r15 ENUMERATED {supported} OPTIONAL
}

RF-Parameters-NB-r13 ::= SEQUENCE {
  supportedBandList-r13 SupportedBandList-NB-r13,
  multiNS-Pmax-r13 ENUMERATED {supported} OPTIONAL
}

RF-Parameters-NB-v1430 ::= SEQUENCE {
  powerClassNB-14dBm-r14 ENUMERATED {supported} OPTIONAL
}

SupportedBandList-NB-r13 ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBand-NB-r13

SupportedBand-NB-r13 ::= SEQUENCE {
  band-r13 FreqBandIndicator-NB-r13,
  powerClassNB-20dBm-r13 ENUMERATED {supported} OPTIONAL
}

-- ASN1STOP
<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD</th>
<th>FDD/TDD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>accessStratumRelease</strong></td>
<td></td>
<td>Set to rel15 in this version of the specification.</td>
</tr>
<tr>
<td><strong>additionalTransmissionSIB1</strong></td>
<td></td>
<td>Indicates whether the UE supports additional SIB1 transmission as specified in TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>dataInactMon</strong></td>
<td></td>
<td>Indicates whether the UE supports the data inactivity monitoring as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>dummy</strong></td>
<td></td>
<td>This field is not used in the specification. It shall not be sent by the UE.</td>
</tr>
<tr>
<td><strong>earlyData-UP</strong></td>
<td></td>
<td>Indicates whether the UE supports EDT for User plane CIoT EPS optimisations, as defined in TS 24.301 [35].</td>
</tr>
<tr>
<td><strong>interferenceRandomisation</strong></td>
<td></td>
<td>For FDD: Indicates whether the UE supports interference randomisation in connected mode as defined in TS.36.211 [21].</td>
</tr>
<tr>
<td><strong>maxNumberOfROHC-ContextSessions</strong></td>
<td></td>
<td>Set to the maximum number of concurrently active ROHC contexts supported by the UE, excluding context sessions that leave all headers uncompressed. cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on. The network ignores this field if the UE supports none of the ROHC profiles in supportedROHC-Profiles.</td>
</tr>
<tr>
<td><strong>mixedOperationMode</strong></td>
<td></td>
<td>Defines whether the UE supports multi-carrier operation with mixed operation mode, standalone or inband/guardband, between the anchor carrier and the non-anchor carrier for unicast, paging, and random access as specified in TS 36.300 [9].</td>
</tr>
<tr>
<td><strong>multiCarrier</strong></td>
<td></td>
<td>Defines whether the UE supports multi-carrier operation.</td>
</tr>
<tr>
<td><strong>multiCarrier-NPRACH</strong></td>
<td></td>
<td>Defines whether the UE supports NPRACH on non-anchor carrier as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>multipleDRB</strong></td>
<td></td>
<td>Defines whether the UE supports multiple DRBs.</td>
</tr>
<tr>
<td><strong>multiNS-Pmax</strong></td>
<td></td>
<td>Defines whether the UE supports the mechanisms defined for NB-IoT cells broadcasting NS-PmaxList-NB.</td>
</tr>
<tr>
<td><strong>multiTone</strong></td>
<td></td>
<td>Defines whether the UE supports UL multi-tone transmissions on NPUSCH.</td>
</tr>
<tr>
<td><strong>nprach-Format2</strong></td>
<td></td>
<td>Defines whether the UE supports NPRACH resources using preamble format 2.</td>
</tr>
<tr>
<td><strong>npusch-3dot75kHz-SCS-TDD</strong></td>
<td></td>
<td>Indicates whether the UE supports NPUSCH with 3.75kHz SCS for TDD.</td>
</tr>
<tr>
<td><strong>powerClassNB-14dBm</strong></td>
<td></td>
<td>Defines whether the UE supports power class 14dBm in all the bands supported by the UE as specified in TS 36.101 [42]. If powerClassNB-20dBm is included, the UE shall not include the field powerClassNB-14dBm.</td>
</tr>
<tr>
<td><strong>powerClassNB-20dBm</strong></td>
<td></td>
<td>Defines whether the UE supports power class 20dBm in NB-IoT for the band, as specified in TS 36.101 [42]. If neither powerClassNB-14dBm nor powerClassNB-20dBm is included, UE supports power class 23 dBm in the NB-IoT band.</td>
</tr>
<tr>
<td><strong>rai-Support</strong></td>
<td></td>
<td>Defines whether the UE supports release assistance indication (RAI) as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>rlc-UM</strong></td>
<td></td>
<td>Defines whether the UE supports RLC UM as specified in TS 36.322 [7].</td>
</tr>
<tr>
<td><strong>supportedBandList</strong></td>
<td></td>
<td>Includes the supported NB-IoT bands as defined in TS 36.101 [42].</td>
</tr>
<tr>
<td><strong>sr-SPS-BSR</strong></td>
<td></td>
<td>Defines whether the UE supports SR using SPS BSR as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>sr-withHARQ-ACK</strong></td>
<td></td>
<td>Defines whether the UE supports physical layer SR with HARQ ACK as specified in TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>sr-withoutHARQ-ACK</strong></td>
<td></td>
<td>Defines whether the UE supports physical layer SR without HARQ ACK as specified in TS 36.211 [21] and TS 36.213 [23].</td>
</tr>
</tbody>
</table>
### UE-Capability-NB field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>FDD/TDD appl</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>supportedROHC-Profiles</td>
<td>FDD/TDD</td>
<td>No</td>
</tr>
<tr>
<td>List of supported ROHC profiles as defined in TS 36.323 [8].</td>
<td></td>
<td></td>
</tr>
<tr>
<td>twoHARQ-Processes</td>
<td>FDD/TDD</td>
<td>Yes</td>
</tr>
<tr>
<td>Defines whether the UE supports two HARQ processes as specified in TS 36.212 [22] and TS 36.213 [23].</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ue-Category-NB</td>
<td>FDD/TDD</td>
<td>Yes</td>
</tr>
<tr>
<td>UE category as defined in TS 36.306 [5]. Value nb1 corresponds to UE category NB1, value nb2 corresponds to UE category NB2. A UE shall always include the field ue-Category-NB-r13 in this version of the specification.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE 1:** The IE UE-Capability-NB does not include AS security capability information, since these are the same as the security capabilities that are signalled by NAS. Consequently AS need not provide "man-in-the-middle" protection for the security capabilities.

**NOTE 2:** The column ‘FDD/TDD appl’ indicates the applicability to the xDD mode: ‘FDD’ means applicable to FDD only, ‘TDD’ means applicable to TDD only and ‘FDD/TDD’ means applicable to FDD and TDD.

**NOTE 3:** The column ‘FDD/TDD diff’ indicates if the UE is allowed to signal a different value for FDD and TDD when the capability applies to both FDD and TDD modes. ‘-‘ is used when the capability applies to one mode only, ‘No’ is used for dual mode capabilities where a common value is signalled for both modes, and ‘Yes’ is used for dual mode capabilities where a separate value is signalled for each mode. Common capabilities and FDD capabilities are reported in the fields of UE-Capability-NB except field tdd-UE-Capability. TDD capabilities are reported in tdd-UE-Capability.

---

### UE-RadioPagingInfo-NB

The IE UE-RadioPagingInfo-NB contains UE NB-IoT capability information needed for paging.

---

#### UE-RadioPagingInfo-NB information element

```
-- ASN1START

UE-RadioPagingInfo-NB-r13 ::= SEQUENCE {
  ue-Category-NB-r13             ENUMERATED {nb1} OPTIONAL,
  ...,
  [[ multiCarrierPaging-r14    ENUMERATED {true} OPTIONAL
  ],
  [[ mixedOperationMode-r15    ENUMERATED {supported} OPTIONAL,
    wakeUpSignal-r15           ENUMERATED {true} OPTIONAL,
    wakeUpSignalMinGap-eDRX-r15 ENUMERATED {ms40, ms240, ms1000, ms2000} OPTIONAL,
    multiCarrierPagingTDD-r15  ENUMERATED {true} OPTIONAL
  ]]
}
-- ASN1STOP
```
### UE-RadioPagingInfo-NB field descriptions

**mixedOperationMode**
Indicates whether the UE supports multi-carrier operation with mixed operation mode, standalone or inband/guardband, between the anchor carrier and non-anchor carrier for unicast, paging, and random access, as specified in TS 36.300 [9].

**multiCarrierPaging**
Indicates whether the UE supports paging on non-anchor carriers as defined in TS 36.304 [4].

**multiCarrierPagingTDD**
Indicates whether the UE supports paging on non-anchor carriers for TDD as defined in TS 36.304 [4].

**ue-Category-NB**
UE NB-IoT category as defined in TS 36.306 [5]. A UE shall always include the field `ue-Category-NB-r13` in this version of the specification.

**wakeUpSignal**
Indicates whether the UE supports WUS for paging in DRX in FDD as specified in TS 36.304 [4]. If this field is included, the minimum gap between WUS and associated PO for DRX is fixed as 40 ms.

**wakeUpSignalMinGap-eDRX**
Indicates the minimum gap the UE supports between WUS and associated PO in case of eDRX in FDD, as specified in TS 36.304 [4]. Value `ms40` corresponds to 40 ms, value `ms240` corresponds to 240 ms and so on. If this field is included, the UE shall also indicate support for WUS for paging in DRX.

---

**UE-TimersAndConstants-NB**

The IE `UE-TimersAndConstants-NB` contains timers and constants used by the UE in either RRC_CONNECTED or RRC_IDLE.

#### UE-TimersAndConstants-NB information element

```
-- ASN1START

UE-TimersAndConstants-NB-r13 ::= SEQUENCE {
  t300-r13             ENUMERATED {
    ms2500, ms4000, ms6000, ms10000, ms15000, ms25000, ms40000, ms60000),
  t301-r13             ENUMERATED {
    ms2500, ms4000, ms6000, ms10000, ms15000, ms25000, ms40000, ms60000),
  t310-r13             ENUMERATED {
    ms0, ms200, ms500, ms1000, ms2000, ms4000, ms8000),
  n310-r13             ENUMERATED {
    n1, n2, n3, n4, n6, n8, n10, n20),
  t311-r13             ENUMERATED {
    ms1000, ms3000, ms5000, ms10000, ms15000, ms20000, ms30000),
  n311-r13             ENUMERATED {
    n1, n2, n3, n4, n5, n6, n8, n10),
  ...,
  [[ t311-v1350         ENUMERATED {
      ms40000, ms60000, ms90000, ms120000}\n      OPTIONAL    -- Need OR
    ]],
  [[ t300-v1530         ENUMERATED {
      ms80000, ms100000, ms120000) OPTIONAL, -- Cond TDD
    t301-v1530         ENUMERATED {
      ms80000, ms100000, ms120000) OPTIONAL, -- Cond TDD
    t311-v1530         ENUMERATED {
      ms360000, ms200000) OPTIONAL, -- Cond TDD
    t300-r15            ENUMERATED {ms6000, ms10000, ms15000, ms25000, ms40000, ms60000, ms80000, ms120000) OPTIONAL -- Cond EDT
    ]]
}
-- ASN1STOP
```
**UE-TimersAndConstants-NB field descriptions**

\[ n3xy \]
Constants are described in section 7.4. \( n1 \) corresponds with 1, \( n2 \) corresponds with 2 and so on.

\[ t3xy \]
Timers are described in section 7.3. Value \( ms0 \) corresponds with 0 ms, \( ms200 \) corresponds with 200 ms and so on. The UE shall use the extended values \( t311-v1350 \), \( t300-v1530 \), \( t301-v1530 \) and \( t311-v1530 \), if present, and ignore the value signaled by \( t311-r13 \), \( t300-r13 \), \( t301-r13 \) and \( t311-r13 \) respectively. \( t300-r15 \) is only applicable for EDT. UE performing EDT shall use \( t300-r15 \), if present.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDT</td>
<td>The field is optionally present. Need OR, if edt-Parameters is present in SIB2-NB; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
<tr>
<td>TDD</td>
<td>The field is optionally present, Need OR, in TDD mode. Otherwise, the field is not present.</td>
</tr>
</tbody>
</table>

### 6.7.3.7 NB-IoT MBMS information elements

Void

### 6.7.3.7a NB-IoT SC-PTM information elements

SC-MTCH-InfoList-NB

The IE SC-MTCH-InfoList-NB provides the list of ongoing MBMS sessions transmitted via SC-MRB and for each MBMS session, the associated G-RNTI and scheduling information.

**SC-MTCH-InfoList-NB information element**

```asn1
SC-MTCH-InfoList-NB-r14 ::= SEQUENCE (SIZE (0.. maxSC-MTCH-NB-r14)) OF SC-MTCH-Info-NB-r14
SC-MTCH-Info-NB-r14 ::= SEQUENCE {
   sc-mtch-CarrierConfig-r14      DL-CarrierConfigCommon-NB-r14,
   sc-mtchIndex-r14               INTEGER (0..maxNonAnchorCarriers-NB-r14)
},
mbmsSessionInfo-r14             MBMSSessionInfo-r13,
g-RNTI-r14                      BIT STRING(SIZE(16)),
sc-mtch-SchedulingInfo-r14      SC-MTCH-SchedulingInfo-NB-r14 OPTIONAL, -- Need OP
sc-mtch-NeighbourCell-r14      BIT STRING (SIZE(maxNeighCell-SCPTM-NB-r14)) OPTIONAL, -- Need OP
npdcch-NPDSCH-MaxTBS-SC-MTCH-r14 ENUMERATED {n680, n2536},
npdcch-NumRepetitions-SC-MTCH-r14ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128, r256, r512, r1024, r2048, spare4, spare3, spare2, spare1},
npdcch-StartSF-SC-MTCH-r14      ENUMERATED {v1dot5, v2, v4, v8, v16, v32, v48, v64},
npdcch-Offset-SC-MTCH-r14       ENUMERATED {zero, oneEighth, oneQuarter, threeEighth, oneHalf, fiveEighth, threeQuarter, sevenEighth},
}...
SC-MTCH-SchedulingInfo-NB-r14 ::= SEQUENCE {
   onDurationTimerSCPTM-r14        ENUMERATED {pp1, pp2, pp3, pp4, pp8, pp16, pp32, spare},
   drx-InactivityTimerSCPTM-r14    ENUMERATED {pp0, pp1, pp2, pp3, pp4, pp8, pp16, pp32},
   schedulingPeriodStartOffsetSCPTM-r14
      CHOICE {
         sf10       INTEGER (0..9),
         sf20       INTEGER (0..19),
         sf32       INTEGER (0..31),
         sf40       INTEGER (0..39),
         sf64       INTEGER (0..63),
         sf80       INTEGER (0..79),
         sf128      INTEGER (0..127),
         sf160      INTEGER (0..159),
      }
}...
```
---

**SC-MTCH-InfoList-NB field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dl-CarrierConfig</strong></td>
<td>Downlink carrier used for SC-MTCH. E-UTRAN cannot configure a downlink carrier operating in mixed operation mode.</td>
</tr>
<tr>
<td><strong>dl-CarrierIndex</strong></td>
<td>Index to a downlink carrier signalled in system information. Value '0' corresponds to the anchor carrier, value '1' corresponds to the first entry in dl-ConfigList in SystemInformationBlockType22-NB, value '2' corresponds to the second entry in dl-ConfigList and so on.</td>
</tr>
<tr>
<td><strong>drx-InactivityTimerSCPTM</strong></td>
<td>Timer for SC-MTCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on.</td>
</tr>
<tr>
<td><strong>g-RNTI</strong></td>
<td>G-RNTI used to scramble the scheduling and transmission of a SC-MTCH.</td>
</tr>
<tr>
<td><strong>mbmsSessionInfo</strong></td>
<td>Indicates the ongoing MBMS session in a SC-MTCH.</td>
</tr>
<tr>
<td><strong>npdcch-NPDSCH-MaxTBS-SC-MTCH</strong></td>
<td>Maximum NPDSCH TBS for the SC-MTCH, see TS 36.213 [23]. Value n680 corresponds to 680 bits and value n2536 corresponds to 2536 bits.</td>
</tr>
<tr>
<td><strong>npdcch-NumRepetition-SC-MTCH</strong></td>
<td>The maximum number of NPDCCH repetitions the UE needs to monitor for SC-MTCH multicast search space, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>npdcch-Offset-SC-MTCH</strong></td>
<td>Fractional period offset of starting subframe for NPDCCH multicast search space for SC-MTCH, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>npdcch-startSF-SC-MTCH</strong></td>
<td>Starting subframes configuration of the NPDCCH multicast search space for SC-MTCH, see TS 36.213 [23].</td>
</tr>
<tr>
<td><strong>onDurationTimerSCPTM</strong></td>
<td>Timer for SC-MTCH reception in TS 36.321 [6]. Value in number of NPDCCH periods. Value pp1 corresponds to 1 NPDCCH period, pp2 corresponds to 2 NPDCCH periods and so on.</td>
</tr>
<tr>
<td><strong>schedulingPeriodStartOffsetSCPTM</strong></td>
<td>SCPTM-SchedulingCycle and SCPTM-SchedulingOffset in TS 36.321 [6]. The value of SCPTM-SchedulingCycle is in number of sub-frames. Value sf10 corresponds to 10 sub-frames, sf20 corresponds to 20 sub-frames and so on. The value of SCPTM-SchedulingOffset is in number of sub-frames.</td>
</tr>
<tr>
<td><strong>sc-mtch-CarrierConfig</strong></td>
<td>Downlink carrier that is used for SC-MTCH.</td>
</tr>
<tr>
<td><strong>sc-mtch-NeighbourCell</strong></td>
<td>Indicates neighbour cells which also provide this service on SC-MTCH. The first bit is set to 1 if the service is provided on SC-MTCH in the first cell in scptmNeighbourCellList, otherwise it is set to 0. The second bit is set to 1 if the service is provided on SC-MTCH in the second cell in scptmNeighbourCellList, and so on. If this field is absent, the UE shall assume that this service is not available on SC-MTCH in any neighbour cell.</td>
</tr>
<tr>
<td><strong>sc-mtch-SchedulingInfo</strong></td>
<td>DRX information for the SC-MTCH. If this field is absent, DRX is not used for the SC-MTCH.</td>
</tr>
</tbody>
</table>

---

The IE **SCPTM-NeighbourCellList-NB** indicates a list of neighbour cells where ongoing MBMS sessions provided via SC-MRBM in the current cells are also provided.
PCI-ARFCN-NB-r14 ::= SEQUENCE {
  physCellId-r14      PhysCellId,
  carrierFreq-r14      CarrierFreq-NB-r13  OPTIONAL -- Need OP
}

SCPTM-NeighbourCellList-NB field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>physCellId</td>
<td>Physical Cell Identity of the neighbour cell.</td>
</tr>
<tr>
<td>carrierFreq</td>
<td>Carrier frequency of the neighbour cell.</td>
</tr>
<tr>
<td></td>
<td>Absence of the IE means that the neighbour cell is on the same frequency as the current cell.</td>
</tr>
</tbody>
</table>

6.7.4 NB-IoT RRC multiplicity and type constraint values

– Multiplicity and type constraint definitions

-- ASN1START

maxNPRACH-Resources-NB-r13 INTEGER ::= 3 -- Maximum number of NPRACH resources for NB-IoT
maxNonAnchorCarriers-NB-r14 INTEGER ::= 15 -- Maximum number of non-anchor carriers for NB-IoT
maxDRB-NB-r13 INTEGER ::= 2 -- Maximum number of Data Radio Bearers for NB-IoT
maxNeighCell-SCPTM-NB-r14 INTEGER ::= 8 -- Maximum number of SCPTM neighbour cells
maxNS-Pmax-NB-r13 INTEGER ::= 4 -- Maximum number of NS and P-Max values per band
maxSC-MTCH-NB-r14 INTEGER ::= 64 -- Maximum number of SC-MTCHs in one cell for NB-IoT
maxSI-Message-NB-r13 INTEGER ::= 8 -- Maximum number of SI messages for NB-IoT

-- ASN1STOP

– End of NBIOT-RRC-Definitions

-- ASN1START

END

-- ASN1STOP

6.7.5 Direct Indication Information

Direct Indication information is transmitted on NPDCCH using P-RNTI but without associated Paging-NB message. Table 6.7.5-1 defines the Direct Indication information, see TS 36.212 [22, 6.4.3.3].

When bit n is set to 1, the UE shall behave as if the corresponding field is set in the Paging-NB message, see 5.3.2.3. Bit 1 is the least significant bit.

<table>
<thead>
<tr>
<th>Bit</th>
<th>Field in Direct Indication information</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>systemInfoModification</td>
</tr>
<tr>
<td>2</td>
<td>systemInfoModification-eDRX</td>
</tr>
<tr>
<td>3, 4, 5, 6, 7, 8</td>
<td>Not used, and shall be ignored by UE if received</td>
</tr>
</tbody>
</table>

Table 6.7.5-1: Direct Indication information
7 Variables and constants

7.1 UE variables

NOTE: To facilitate the specification of the UE behavioural requirements, UE variables are represented using ASN.1. Unless explicitly specified otherwise, it is however up to UE implementation how to store the variables. The optionality of the IEs in ASN.1 is used only to indicate that the values may not always be available.

-- EUTRA-UE-Variables

This ASN.1 segment is the start of the E-UTRA UE variable definitions.

```
-- ASN1START
EUTRA-UE-Variables DEFINITIONS AUTOMATIC TAGS ::==
BEGIN
IMPORTS
  AbsoluteTimeInfo-r10,
  AreaConfiguration-r10,
  AreaConfiguration-v1130,
  ARFCN-ValueNR-r15,
  BT-NameList-r15,
  CarrierFreqGERAN,
  CellIdentity,
  CellList-r15,
  ConnEstFailReport-r11,
  EUTRA-CarrierList-r15,
  SpeedStateScaleFactors,
  C-RNTI,
  LoggingDuration-r10,
  LoggingInterval-r10,
  LogMeasInfo-r10,
  MeasCSI-RS-Id-r12,
  MeasId,
  MeasId-v1250,
  MeasIdToAddModList,
  MeasIdToAddModListExt-r12,
  MeasIdToAddModList-v1310,
  MeasObjectToAddModListExt-v1310,
  MeasResultListIdle-r15,
  MeasScaleFactor-r12,
  MobilityStateParameters,
  NeighCellConfig,
  PhysCellId,
  PhysCellIdCDMA2000,
  PhysCellIdGERAN,
  PhysCellIdUTRA-FDD,
  PhysCellIdUTRA-TDD,
  PLMN-Identity,
  PLMN-IdentityList3-r11,
  QuantityConfig,
  ReportConfigToAddModList,
  RLF-Report-r9,
  TargetMBSFN-AreaList-r12,
  TraceReference-r10,
  Tx-ResourcePoolMeasList-r14,
  VisitedCellInfoList-r12,
  maxCellMeas,
  maxCSI-RS-Meas-r12,
  maxMeasId,
  maxMeasId-r12,
  maxRS-Index-r15,
  PhysCellIdNR-r15,
  RS-IndexNR-r15,
  UL-DelayConfig-r13,
  WLAN-CarrierInfo-r13,
  WLAN-Identifiers-r12,
  WLAN-Id-List-r13,
```
VarConnEstFailReport

The UE variable VarConnEstFailReport includes the connection establishment failure information.

VarConnEstFailReport UE variable

VarLogMeasConfig

The UE variable VarLogMeasConfig includes the configuration of the logging of measurements to be performed by the UE while in RRC_IDLE, covering intra-frequency, inter-frequency, inter-RAT mobility and MBSFN related measurements. If MBSFN logging is configured, the UE performs logging of measurements while in both RRC_IDLE and RRC_CONNECTED. Otherwise, the UE performs logging of measurements only while in RRC_IDLE.

VarLogMeasConfig UE variable
---

**VarLogMeasReport**

The UE variable *VarLogMeasReport* includes the logged measurements information.

**VarLogMeasReport UE variable**

```asn1
VarLogMeasReport-r10 ::= SEQUENCE {
  traceReference-r10     TraceReference-r10,
  traceRecordingSessionRef-r10  OCTET STRING (SIZE (2)),
  tce-Id-r10       OCTET STRING (SIZE (1)),
  plmn-Identity-r10     PLMN-Identity,
  absoluteTimeInfo-r10 AbsoluteTimeInfo-r10,
  logMeasInfoList-r10     LogMeasInfoList2-r10
}

VarLogMeasReport-r11 ::= SEQUENCE {
  traceReference-r10     TraceReference-r10,
  traceRecordingSessionRef-r10  OCTET STRING (SIZE (2)),
  tce-Id-r10       OCTET STRING (SIZE (1)),
  plmn-IdentityList-r11    PLMN-IdentityList3-r11,
  absoluteTimeInfo-r10 AbsoluteTimeInfo-r10,
  logMeasInfoList-r10     LogMeasInfoList2-r10
}

LogMeasInfoList2-r10 ::= SEQUENCE (SIZE (1..maxLogMeas-r10)) OF LogMeasInfo-r10
```

---

**VarMeasConfig**

The UE variable *VarMeasConfig* includes the accumulated configuration of the measurements to be performed by the UE, covering intra-frequency, inter-frequency and inter-RAT mobility related measurements.

**NOTE:** The amount of measurement configuration information, which a UE is required to store, is specified in subclause 11.1. If the number of frequencies configured for a particular RAT exceeds the minimum performance requirements specified in [16], it is up to UE implementation which frequencies of that RAT are measured. If the total number of frequencies for all RATs provided to the UE in the measurement configuration exceeds the minimum performance requirements specified in [16], it is up to UE implementation which frequencies/RATs are measured.

**VarMeasConfig UE variable**

```asn1
VarMeasConfig ::=     SEQUENCE {
  -- Measurement identities
  measIdList       MeasIdToAddModList     OPTIONAL,
  measIdListExt-r12     MeasIdToAddModListExt-r12   OPTIONAL,
  measIdList-v1310     MeasIdToAddModList-v1310    OPTIONAL,
  -- Measurement objects
  measObjectList      MeasObjectToAddModList    OPTIONAL,
  measObjectListExt-r13    MeasObjectToAddModListExt-r13  OPTIONAL,
  measObjectList-v910     MeasObjectToAddModList-v9e0   OPTIONAL,
  -- Reporting configurations
  reportConfigList     ReportConfigToAddModList   OPTIONAL,
  -- Other parameters
  quantityConfig      QuantityConfig      OPTIONAL,
  measScaleFactor-r12     MeasScaleFactor-r12   OPTIONAL,
  s-Measure       INTEGER (-140...-44)     OPTIONAL,
  speedStatePars      CHOICE {
    release      NULL,
    setup        SEQUENCE {
      mobilityStateParameters    MobilityStateParameters,
      timeToTrigger-SF     SpeedStateScaleFactors
    }
  }

  allowInterruptions-r11   BOOLEAN        OPTIONAL
}
```

---
VarMeasIdleConfig

The UE variable *VarMeasIdleConfig* includes the configuration of the measurements to be performed by the UE while in RRC_IDLE for E-UTRA inter-frequency measurements. The UE performs logging of these measurements only while in RRC_IDLE.

### VarMeasIdleConfig UE variable

```
VarMeasIdleConfig-r15 ::= SEQUENCE {
  measIdleCarrierListEUTRA-r15    EUTRA-CarrierList-r15   OPTIONAL,
  measIdleDuration-r15     ENUMERATED {sec10, sec30, sec60, sec120,
                                      sec180, sec240, sec300}
}
```

---

VarMeasIdleReport

The UE variable *VarMeasIdleReport* includes the logged measurements information.

### VarMeasIdleReport UE variable

```
VarMeasIdleReport-r15 ::= SEQUENCE {
  measReportIdle-r15    MeasResultListIdle-r15
}
```

---

VarMeasReportList

The UE variable *VarMeasReportList* includes information about the measurements for which the triggering conditions have been met.

### VarMeasReportList UE variable

```
VarMeasReportList ::=    SEQUENCE (SIZE (1..maxMeasId)) OF VarMeasReport
VarMeasReportList-r12 ::=   SEQUENCE (SIZE (1..maxMeasId-r12)) OF VarMeasReport
VarMeasReport ::=     SEQUENCE {
  -- List of measurement that have been triggered
  measId        MeasId,
  measId-v1250   MeasId-v1250   OPTIONAL,
  cellsTriggeredList     CellsTriggeredList    OPTIONAL,
  csi-RS-TriggeredList-r12   CSI-RS-TriggeredList-r12  OPTIONAL,
  poolsTriggeredList-r14    Tx-ResourcePoolMeasList-r14 OPTIONAL,
  numberOfReportsSent     INTEGER
}
CellsTriggeredList ::=    SEQUENCE (SIZE (1..maxCellMeas)) OF CHOICE {
  physCellIdEUTRA       PhysCellId,
  physCellIdUTRA       CHOICE {
    fdd          PhysCellIdUTRA-FDD,
    tdd          PhysCellIdUTRA-TDD
  },
  physCellIdGERAN       SEQUENCE {
    carrierFreq        CarrierFreqGERAN,
    physCellId         PhysCellIdGERAN
  },
  physCellIdCDMA2000     PhysCellIdCDMA2000,
  wlan-Identifiers-r13   WLAN-Identifiers-r12,
  physCellIdNR-r15      SEQUENCE {
    carrierFreq        ARFCN-ValueNR-r15,
    physCellId         PhysCellIdNR-r15,
    rs-IndexList-r15    SSB-IndexList-r15
  }
```
CSI-RS-TriggeredList-r12 ::= SEQUENCE (SIZE (1..maxCSI-RS-Meas-r12)) OF MeasCSI-RS-Id-r12
SSB-IndexList-r15 ::= SEQUENCE (SIZE (1..maxRS-Index-r15)) OF RS-IndexNR-r15

-- ASN1STOP

--- VarMobilityHistoryReport

The UE variable VarMobilityHistoryReport includes the mobility history information.

-- ASN1START
VarMobilityHistoryReport-r12 ::= VisitedCellInfoList-r12
-- ASN1STOP

--- VarPendingRnaUpdate

The UE variable VarPendingRnaUpdate indicates whether there is a pending RNAU procedure or not. The setting of this BOOLEAN variable to TRUE means that there is a pending RANU procedure.

VarPendingRnaUpdate UE variable

-- ASN1START
VarPendingRnaUpdate-r15 ::= SEQUENCE {
  pendingRnaProcedure     BOOLEAN        OPTIONAL
}
-- ASN1STOP

--- VarRLF-Report

The UE variable VarRLF-Report includes the radio link failure information or handover failure information.

VarRLF-Report UE variable

-- ASN1START
VarRLF-Report-r10 ::= SEQUENCE {
  rlf-Report-r10       RLF-Report-r9,
  plmn-Identity-r10      PLMN-Identity
}
VarRLF-Report-r11 ::= SEQUENCE {
  rlf-Report-r10       RLF-Report-r9,
  plmn-IdentityList-r11    PLMN-IdentityList3-r11
}
-- ASN1STOP

--- VarShortINACTIVE-MAC-Input

The UE variable VarShortINACTIVE-MAC-Input specifies the input used to generate the shortResume-MAC-I during RRC Connection Resume procedure for RRC_INACTIVE.

VarShortINACTIVE-MAC-Input UE variable

-- ASN1START
VarShortINACTIVE-MAC-Input-r15 ::= SEQUENCE {
  cellIdentity-r15       CellIdentity,
  physCellId-r15       PhysCellId,
  c-RNTI-r15        C-RNTI
}
-- ASN1STOP
VarShortINACTIVE-MAC-Input field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cellIdentity</td>
<td>Set to CellIdentity of the current cell.</td>
</tr>
<tr>
<td>c-RNTI</td>
<td>Set to C-RNTI that the UE had in the PCell it was connected to prior to suspension of the RRC connection.</td>
</tr>
<tr>
<td>physCellId</td>
<td>Set to the physical cell identity of the PCell the UE was connected to prior to suspension of the RRC connection.</td>
</tr>
</tbody>
</table>

VarShortMAC-Input

The UE variable VarShortMAC-Input specifies the input used to generate the shortMAC-I.

VarShortMAC-Input UE variable

```asn1
VarShortMAC-Input ::= SEQUENCE {
  cellIdentity       CellIdentity,
  physCellId        PhysCellId,
  c-RNTI         C-RNTI
}
```

VarShortMAC-Input field descriptions

- **cellIdentity**: Set to CellIdentity included in cellIdentity (without suffix) in SIB1 of the current cell.
- **c-RNTI**: Set to C-RNTI that the UE had in the PCell it was connected to prior to suspension of the RRC connection.
- **physCellId**: Set to the physical cell identity of the PCell the UE was connected to prior to suspension of the RRC connection.

VarShortResumeMAC-Input

The UE variable VarShortResumeMAC-Input specifies the input used to generate the shortResumeMAC-I during RRC Connection Resume procedure.

VarShortResumeMAC-Input UE variable

```asn1
VarShortResumeMAC-Input-r13 ::=  SEQUENCE {
  cellIdentity-r13      CellIdentity,
  physCellId-r13       PhysCellId,
  c-RNTI-r13        C-RNTI,
  resumeDiscriminator-r13     BIT STRING(SIZE(1))
}
```

VarShortResumeMAC-Input field descriptions

- **cellIdentity**: Set to CellIdentity of the current cell.
- **c-RNTI**: Set to C-RNTI that the UE had in the PCell it was connected to prior to suspension of the RRC connection.
- **physCellId**: Set to the physical cell identity of the PCell the UE was connected to prior to suspension of the RRC connection.
- **resumeDiscriminator**: A constant that allows differentiation in the calculation of the MAC-I for shortResumeMAC-I. The resumeDiscriminator is set to ‘1’.
-- VarWLAN-MobilityConfig

The UE variable VarWLAN-MobilityConfig includes information about WLAN for access selection and mobility.

VarWLAN-MobilityConfig UE variable

-- ASN1START

VarWLAN-MobilityConfig ::= SEQUENCE {
  wlan-MobilitySet-r13     WLAN-Id-List-r13   OPTIONAL,
  successReportRequested     ENUMERATED {true}   OPTIONAL,
  wlan-SuspendConfig-r14     WLAN-SuspendConfig-r14  OPTIONAL
}

-- ASN1STOP

VarWLAN-MobilityConfig field descriptions

wlan-MobilitySet
Indicates the WLAN mobility set configured.

successReportRequested
Indicates whether the UE shall report successful connection to WLAN. Applicable to LWA and LWIP.

-- VarWLAN-Status

The UE variable VarWLAN-Status includes information about the status of WLAN connection for LWA, RCLWI or LWIP.

VarWLAN-Status UE variable

-- ASN1START

VarWLAN-Status-r13 ::= SEQUENCE {
  status-r13        WLAN-Status-r13,
  status-r14        WLAN-Status-v1430 OPTIONAL
}

-- ASN1STOP

VarWLAN-Status field descriptions

status
Indicates the connection status to WLAN and causes for connection failures.

-- Multiplicity and type constraint definitions

This section includes multiplicity and type constraints applicable (only) for UE variables.

-- ASN1START

maxLogMeas-r10    INTEGER ::= 4060-- Maximum number of logged measurement entries
  -- that can be stored by the UE

-- ASN1STOP

-- End of EUTRA-UE-Variables

-- ASN1START

END

-- ASN1STOP
7.1a NB-IoT UE variables

NOTE: To facilitate the specification of the UE behavioural requirements, UE variables are represented using ASN.1. Unless explicitly specified otherwise, it is however up to UE implementation how to store the variables. The optionality of the IEs in ASN.1 is used only to indicate that the values may not always be available.

-- NBIOT-UE-Variables

This ASN.1 segment is the start of the NB-IoT UE variable definitions.

-- ASN1START

NBIOT-UE-Variables DEFINITIONS AUTOMATIC TAGS ::= 
BEGIN 
IMPORTS 
  VarShortMAC-Input, 
  VarShortResumeMAC-Input-r13
FROM EUTRA-UE-Variables;
VarShortMAC-Input-NB-r13 ::= VarShortMAC-Input 
VarShortResumeMAC-Input-NB-r13 ::= VarShortResumeMAC-Input-r13

-- ASN1STOP

-- End of NBIOT-UE-Variables

-- ASN1START
END 

-- ASN1STOP

7.2 Counters

<table>
<thead>
<tr>
<th>Counter</th>
<th>Reset</th>
<th>Incremented</th>
<th>When reaching max value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.3 Timers
7.3.1 Timers (Informative)
<table>
<thead>
<tr>
<th>Timer</th>
<th>Start</th>
<th>Stop</th>
<th>At expiry</th>
</tr>
</thead>
<tbody>
<tr>
<td>T300</td>
<td>Transmission of RRCConnectionRequest or RRCConnectionResume Request or RRCEarlyDataRequest</td>
<td>Reception of RRCConnectionSetup, RRCConnectionReject or RRCConnectionResume or RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT, cell re-selection and upon abortion of connection establishment by upper layers</td>
<td>Perform the actions as specified in 5.3.3.6</td>
</tr>
<tr>
<td>NOTE1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T301</td>
<td>Transmission of RRCConnectionReestablishmentRequest</td>
<td>Reception of RRCConnectionReestablishmentReject or RRCConnectionReestablishmentReject message as well as when the selected cell becomes unsuitable</td>
<td>Go to RRC_IDLE</td>
</tr>
<tr>
<td>NOTE1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T302</td>
<td>Reception of RRCConnectionReject while performing RRC connection establishment</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection, or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T303</td>
<td>Access barred while performing RRC connection establishment for mobile originating calls</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection, or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T304</td>
<td>Reception of RRCConnectionReconfiguration message including the MobilityControlInfo or reception of MobilityFromEUTRACemand message including CellChangeOrder</td>
<td>Criterion for successful completion of handover within E-UTRA, handover to E-UTRA or cell change order is met (the criterion is specified in the target RAT in case of inter-RAT)</td>
<td>In case of cell change order from E-UTRA or intra E-UTRA handover, initiate the RRC connection re-establishment procedure; In case of handover to E-UTRA, perform the actions defined in the specifications applicable for the source RAT.</td>
</tr>
<tr>
<td>T305</td>
<td>Access barred while performing RRC connection establishment for mobile originating signalling</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection, or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T306</td>
<td>Access barred while performing RRC connection establishment for mobile originating CS fallback.</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection, or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T307</td>
<td>Reception of RRCConnectionReconfiguration message including MobilityControlInfoSCG</td>
<td>Successful completion of random access on the PSCell, upon initiating re-establishment and upon SCG release</td>
<td>Inform E-UTRAN about the SCG change failure by initiating the SCG failure information procedure as specified in 5.6.13.</td>
</tr>
<tr>
<td>T308</td>
<td>Access barred due to ACDC while performing RRC connection establishment subject to ACDC</td>
<td>Upon entering RRC_CONNECTED and upon cell re-selection, or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Inform upper layers about barring alleviation for ACDC as specified in 5.3.3.7</td>
</tr>
<tr>
<td>Timer</td>
<td>Start</td>
<td>Stop</td>
<td>At expiry</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>T309</td>
<td>When access attempt is barred at access barring check for an Access Category. The UE shall maintain one instance of this timer per Access Category.</td>
<td>As specified in 5.3.16.3.</td>
<td>Perform the actions as specified in 5.3.16.4.</td>
</tr>
<tr>
<td>T310</td>
<td>Upon detecting physical layer problems for the PCell i.e. upon receiving N310 consecutive out-of-sync indications from lower layers</td>
<td>Upon receiving N311 consecutive in-sync indications from lower layers for the PCell, upon triggering the handover procedure and upon initiating the connection re-establishment procedure</td>
<td>If security is not activated and the UE is not a NB-IoT UE that supports RRC connection re-establishment for the Control Plane CIoT EPS optimisation: go to RRC_IDLE else: initiate the connection re-establishment procedure</td>
</tr>
<tr>
<td>T311</td>
<td>Upon initiating the RRC connection re-establishment procedure</td>
<td>Selection of a suitable E-UTRA cell or a cell using another RAT.</td>
<td>Enter RRC_IDLE</td>
</tr>
<tr>
<td>T312</td>
<td>Upon triggering a measurement report for a measurement identity for which T312 has been configured, while T310 is running</td>
<td>Upon receiving N311 consecutive in-sync indications from lower layers, upon triggering the handover procedure, upon initiating the connection re-establishment procedure, and upon the expiry of T310</td>
<td>If security is not activated: go to RRC_IDLE else: initiate the connection re-establishment procedure</td>
</tr>
<tr>
<td>T313</td>
<td>Upon detecting physical layer problems for the PSCell i.e. upon receiving N313 consecutive out-of-sync indications from lower layers</td>
<td>Upon receiving N314 consecutive in-sync indications from lower layers for the PSCell, upon initiating the connection re-establishment procedure, upon SCG release and upon receiving RRCConnectionReconfiguration including MobilityControlInfoSCG</td>
<td>Inform E-UTRAN about the SCG radio link failure by initiating the SCG failure information procedure as specified in 5.6.13.</td>
</tr>
<tr>
<td>T320</td>
<td>Upon receiving t320 or upon cell (re)selection to E-UTRA from another RAT with validity time configured for dedicated priorities (in which case the remaining validity time is applied).</td>
<td>Upon entering RRC_CONNECTED, when PLMN selection is performed on request by NAS, or upon cell (re)selection to another RAT (in which case the timer is carried on to the other RAT) , or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Discard the cell reselection priority information provided by dedicated signalling.</td>
</tr>
<tr>
<td>T321</td>
<td>Upon receiving measConfig including a reportConfig with the purpose set to reportCGI</td>
<td>Upon acquiring the information needed to set all fields of cellGlobalId for the requested cell, upon receiving measConfig that includes removal of the reportConfig with the purpose set to reportCGI</td>
<td>Initiate the measurement reporting procedure, stop performing the related measurements and remove the corresponding measId</td>
</tr>
<tr>
<td>T322</td>
<td>Upon receiving redirectedCarrierOffsetDedicated included in RedirectedCarrierInfo</td>
<td>Upon entering RRC_CONNECTED, when PLMN selection is performed on request by NAS, or upon cell (re)selection to another RAT, or upon reception of RRCEarlyDataComplete or RRCConnectionRelease for UP-EDT</td>
<td>Release redirectedCarrierOffsetDedicated.</td>
</tr>
<tr>
<td>T325</td>
<td>Timer (re)started upon receiving RRCConnectionReject message with de prioritisationTimer.</td>
<td></td>
<td>Stop de prioritisation of all frequencies or E-UTRA signalled by RRCConnectionReject.</td>
</tr>
<tr>
<td>Timer</td>
<td>Start</td>
<td>Stop</td>
<td>At expiry</td>
</tr>
<tr>
<td>-------</td>
<td>-------</td>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td>T330</td>
<td>Upon receiving <strong>LoggedMeasurementConfiguration</strong> message</td>
<td>Upon log volume exceeding the suitable UE memory, upon initiating the release of <strong>LoggedMeasurementConfiguration</strong> procedure</td>
<td>Perform the actions specified in 5.6.6.4</td>
</tr>
<tr>
<td>T331</td>
<td>Upon receiving <strong>MeasIdleConfigDedicated</strong>.</td>
<td>Upon receiving <strong>RRCCollectionSetup</strong>, <strong>RRCCollectionResume</strong> or, if <strong>validityArea</strong> is configured, upon reselecting to cell that does not belong to <strong>validityArea</strong>.</td>
<td>Release the stored VarMeasIdleConfig.</td>
</tr>
<tr>
<td>T340</td>
<td>Upon transmitting <strong>UEAssistanceInformation</strong> message with <strong>powerPrefIndication</strong> set to <strong>normal</strong></td>
<td>Upon initiating the connection re-establishment procedure</td>
<td>No action.</td>
</tr>
<tr>
<td>T341</td>
<td>Upon transmitting <strong>UEAssistanceInformation</strong> message with <strong>bw-Preference</strong>.</td>
<td>Upon resuming an RRC connection or upon initiating the connection re-establishment procedure</td>
<td>No action.</td>
</tr>
<tr>
<td>T342</td>
<td>Upon transmitting <strong>DelayBudgetReport</strong> message.</td>
<td>Upon initiating the connection re-establishment and connection resume procedures</td>
<td>No action.</td>
</tr>
<tr>
<td>T350</td>
<td>Upon entering RRC_IDLE if <strong>t350</strong> has been received in wlan-OffloadInfo.</td>
<td>Upon entering <strong>RRC_CONNECTED</strong>, or upon cell reselection.</td>
<td>Perform the actions specified in 5.6.12.4.</td>
</tr>
<tr>
<td>T351</td>
<td>Receipt of <strong>RRCCollectionReconfiguration</strong> message including the association <strong>Timer in WLAN-MobilityConfig</strong>.</td>
<td>Upon successful connection to WLAN, upon WLAN connection failure, upon leaving <strong>RRC_CONNECTED</strong>, upon triggering the handover procedure, or upon initiating the connection re-establishment procedure.</td>
<td>Perform WLAN Connection Status Reporting specified in 5.6.15.2.</td>
</tr>
<tr>
<td>T360</td>
<td>Upon performing the redistribution target selection as specified in TS 36.304 [4].</td>
<td>Upon entering <strong>RRC_CONNECTED</strong>, upon receiving a Paging message including <strong>redistributionIndication</strong>; upon reselecting a cell not belonging to the redistribution target.</td>
<td>Stop considering a frequency or cell to be redistribution target, and perform the redistribution target selection if the condition specified in TS 36.304 [4] is met.</td>
</tr>
<tr>
<td>T370</td>
<td>Upon receiving <strong>SL-DiscConfig</strong> including a <strong>discSysInfoToReportConfig</strong> set to <strong>setup</strong>.</td>
<td>Upon initiating the transmission of <strong>SidelinkUEInformation</strong> including <strong>discSysInfoReportFreqList</strong>, upon receiving <strong>SL-DiscConfig</strong> including <strong>discSysInfoToReportConfig</strong> set to <strong>release</strong>, upon handover and re-establishment.</td>
<td>Release <strong>discSysInfoToReportConfig</strong>.</td>
</tr>
<tr>
<td>T314</td>
<td>Upon early detecting physical layer problems for the PCell i.e. upon receiving N310 consecutive “early-out-of-sync” indications from lower layers.</td>
<td>Upon receiving N311 consecutive in-sync indications from lower layers for the PCell, upon triggering the handover procedure and upon initiating the connection re-establishment procedure.</td>
<td>Initiate the UE Assistance Information procedure to report early detection of physical layer problems in accordance with 5.6.10.</td>
</tr>
<tr>
<td>T315</td>
<td>Upon detecting physical layer improvements of the PCell i.e. upon receiving N311 consecutive “early-in-sync” indications from lower layers.</td>
<td>Upon receiving N310 consecutive “early-out-of-sync” indications from lower layers for the PCell.</td>
<td>Initiate the UE Assistance Information procedure to report detection of physical layer improvements in accordance with 5.6.10.</td>
</tr>
</tbody>
</table>
7.3.2 Timer handling

When the UE applies zero value for a timer, the timer shall be started and immediately expire unless explicitly stated otherwise.

7.4 Constants

<table>
<thead>
<tr>
<th>Constant</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N310</td>
<td>Maximum number of consecutive &quot;out-of-sync&quot; or &quot;early-out-of-sync&quot; indications for the PCell received from lower layers</td>
</tr>
<tr>
<td>N311</td>
<td>Maximum number of consecutive &quot;in-sync&quot; or &quot;early-in-sync&quot; indications for the PCell received from lower layers</td>
</tr>
<tr>
<td>N313</td>
<td>Maximum number of consecutive &quot;out-of-sync&quot; indications for the PSCell received from lower layers</td>
</tr>
<tr>
<td>N314</td>
<td>Maximum number of consecutive &quot;in-sync&quot; indications for the PSCell received from lower layers</td>
</tr>
</tbody>
</table>

8 Protocol data unit abstract syntax

8.1 General

The RRC PDU contents in clause 6, clause 9.3.2 and clause 10 are described using abstract syntax notation one (ASN.1) as specified in ITU-T Rec. X.680 [13] and X.681 [14]. Transfer syntax for RRC PDUs is derived from their ASN.1 definitions by use of Packed Encoding Rules, unaligned as specified in ITU-T Rec. X.691 [15].

The following encoding rules apply in addition to what has been specified in X.691:

- When a bit string value is placed in a bit-field as specified in 15.6 to 15.11 in X.691, the leading bit of the bit string value shall be placed in the leading bit of the bit-field, and the trailing bit of the bit string value shall be placed in the trailing bit of the bit-field.

NOTE: The terms 'leading bit' and 'trailing bit' are defined in ITU-T Rec. X.680. When using the 'bstring' notation, the leading bit of the bit string value is on the left, and the trailing bit of the bit string value is on the right.
- When decoding types constrained with the ASN.1 Contents Constraint ("CONTAINING"), automatic decoding of the contained type should not be performed because errors in the decoding of the contained type should not cause the decoding of the entire RRC message PDU to fail. It is recommended that the decoder first decodes the outer PDU type that contains the OCTET STRING or BIT STRING with the Contents Constraint, and then decodes the contained type that is nested within the OCTET STRING or BIT STRING as a separate step.

- When decoding a) RRC message PDUs, b) BIT STRING constrained with a Contents Constraint, or c) OCTET STRING constrained with a Contents Constraint, PER decoders are required to never report an error if there are extraneous zero or non-zero bits at the end of the encoded RRC message PDU, BIT STRING or OCTET STRING.

8.2 Structure of encoded RRC messages

An RRC PDU, which is the bit string that is exchanged between peer entities/ across the radio interface contains the basic production as defined in X.691.

RRC PDUs shall be mapped to and from PDCP SDUs (in case of DCCH) or RLC SDUs (in case of PCCH, BCCH, BR-BCCH, CCCH or MCCH) upon transmission and reception as follows:

- when delivering an RRC PDU as an PDCP SDU to the PDCP layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the PDCP SDU and onwards; and

- when delivering an RRC PDU as an RLC SDU to the RLC layer for transmission, the first bit of the RRC PDU shall be represented as the first bit in the RLC SDU and onwards; and

- upon reception of an PDCP SDU from the PDCP layer, the first bit of the PDCP SDU shall represent the first bit of the RRC PDU and onwards; and

- upon reception of an RLC SDU from the RLC layer, the first bit of the RLC SDU shall represent the first bit of the RRC PDU and onwards.

8.3 Basic production

The 'basic production' is obtained by applying UNALIGNED PER to the abstract syntax value (the ASN.1 description) as specified in X.691. It always contains a multiple of 8 bits.

8.4 Extension

The following rules apply with respect to the use of protocol extensions:

- A transmitter compliant with this version of the specification shall, unless explicitly indicated otherwise on a PDU type basis, set the extension part empty. Transmitters compliant with a later version may send non-empty extensions;

- A transmitter compliant with this version of the specification shall set spare bits to zero;

8.5 Padding

If the encoded RRC message does not fill a transport block, the RRC layer shall add padding bits. This applies to PCCH, BCCH and BR-BCCH.

Padding bits shall be set to 0 and the number of padding bits is a multiple of 8.
9 Specified and default radio configurations

Specified and default configurations are configurations of which the details are specified in the standard. Specified configurations are fixed while default configurations can be modified using dedicated signalling.

9.1 Specified configurations

9.1.1 Logical channel configurations

9.1.1.1 BCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP config</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC config</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC config</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

9.1.1.2 CCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP config</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC config</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC config</td>
<td></td>
<td>Normal MAC headers are used</td>
<td></td>
</tr>
<tr>
<td>Logical channel config</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 9.1.1.3 PCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>priority</td>
<td>1</td>
<td>Highest priority</td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>infinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelGroup</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelISR-Mask-r9</td>
<td>release</td>
<td></td>
<td>v920</td>
</tr>
</tbody>
</table>

**NOTE:** RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

### 9.1.1.4 MCCH and MTCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>sn-FieldLength</td>
<td>size5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-Reordering</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 9.1.1.5 SBCCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

### 9.1.1.6 STCH configuration

Parameters
<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>discardTimer</td>
<td>Undefined</td>
<td>Up to UE implementation</td>
<td></td>
</tr>
<tr>
<td>pdcp-SN-Size</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>maxCID</td>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>profiles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-Reordering (PDCP)</td>
<td>Undefined</td>
<td>Only used for V2X sidelink communication. Selected by the receiving UE, up to UE implementation</td>
<td>V1520</td>
</tr>
<tr>
<td>RLC configuration</td>
<td></td>
<td>Uni-directional UM RLC</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>UM window size is set to 0</td>
<td>v1440</td>
</tr>
<tr>
<td>sn-FieldLength</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
<td>Undefined</td>
<td>Selected by the transmitting UE, up to UE implementation</td>
<td></td>
</tr>
<tr>
<td>Logical channel configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>priority</td>
<td>Undefined</td>
<td>Selected by the transmitting UE, up to UE implementation</td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>Undefined</td>
<td>Selected by the transmitting UE, up to UE implementation</td>
<td></td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>Undefined</td>
<td>Selected by the transmitting UE, up to UE implementation</td>
<td></td>
</tr>
<tr>
<td>logicalChannelGroup</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-Reordering</td>
<td>Undefined</td>
<td>Only used for V2X sidelink communication. Selected by the receiving UE, up to UE implementation</td>
<td>v1440</td>
</tr>
<tr>
<td>MAC configuration</td>
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<td></td>
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</tr>
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### 9.1.1.7 SC-MCCH and SC-MTCH configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>UM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sn-FieldLength</td>
<td>size5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t-Reordering</td>
<td>0</td>
<td></td>
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</tr>
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</table>

### 9.1.1.8 BR-BCCH configuration

Parameters

<table>
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<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDCP configuration</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC configuration</td>
<td>TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTE: RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5.

### 9.1.2 SRB configurations

#### 9.1.2.1 SRB1

Parameters
9.2 Default radio configurations

The following sections only list default values for REL-8 parameters included in protocol version v8.5.0. For all fields introduced in a later protocol version, the default value is "released" unless explicitly specified otherwise. If UE is to apply default configuration while it is configured with some critically extended fields, the UE shall apply the original version with only default values. For the following fields, introduced in a protocol version later than v8.5.0, the default corresponds with "value not applicable":

- `codeBookSubsetRestriction-v920`;
- `pmi-RI-Report`;

**NOTE 1:** Value "N/A" indicates that the UE does not apply a specific value (i.e. upon switching to a default configuration, E-UTRAN can not assume the UE keeps the previously configured value). This implies that E-UTRAN needs to configure a value before invoking the related functionality.

**NOTE 2:** In general, the signalling should preferably support a "release" option for fields introduced after v8.5.0. The "value not applicable" should be used restrictively, mainly limited to for fields which value is relevant only if another field is set to a value other than its default.

### 9.1.2.1a SRB1bis

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
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<tbody>
<tr>
<td>RLC configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
<td>1</td>
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### 9.1.2.2 SRB2

Parameters

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<th>Semantics description</th>
<th>Ver</th>
</tr>
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<tbody>
<tr>
<td>RLC configuration</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
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### 9.1.2.3 SRB4

Parameters

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<td>RLC configuration</td>
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<td></td>
<td></td>
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<tr>
<td>logicalChannelIdentity</td>
<td>4</td>
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### 9.2.1.2 SRB2

**Parameters**

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<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
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<tr>
<td>RLC configuration CHOICE</td>
<td>am</td>
<td>am</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>ul-RLC-Config</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; t-PollRetransmit</td>
<td>ms45</td>
<td>ms25000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; pollPDU</td>
<td>infinity</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; pollByte</td>
<td>infinity</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; maxRetxThreshold</td>
<td>t4</td>
<td>t4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>dl-RLC-Config</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; t-Reordering</td>
<td>ms35</td>
<td>released</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; t-StatusProhibit</td>
<td>ms0</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; enableStatusReportSN-Gap</td>
<td>N/A</td>
<td>disabled</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logical channel configuration</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>priority</td>
<td>1</td>
<td>1</td>
<td>Highest priority</td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>infinity</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bucketSizeDuration</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelGroup</td>
<td>0</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelISR-Prohibit</td>
<td>N/A</td>
<td>TRUE</td>
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<table>
<thead>
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<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
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<tbody>
<tr>
<td>RLC configuration CHOICE</td>
<td>am</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>ul-RLC-Config</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; t-PollRetransmit</td>
<td>ms45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; pollPDU</td>
<td>infinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; pollByte</td>
<td>infinity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; maxRetxThreshold</td>
<td>t4</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>dl-RLC-Config</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; t-Reordering</td>
<td>ms35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; t-StatusProhibit</td>
<td>ms0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logical channel configuration</td>
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<td>priority</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>infinity</td>
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<tr>
<td>bucketSizeDuration</td>
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9.2.2 Default MAC main configuration

Parameters

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<th>Semantics description</th>
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<td>MAC main configuration</td>
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<td>maxHARQ-tx</td>
<td>n5</td>
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<td>periodicBSR-Timer</td>
<td>infinity</td>
<td>pp8</td>
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<td>retxBSR-Timer</td>
<td>sf2560</td>
<td>infinity</td>
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<td>ttiBundling</td>
<td>FALSE</td>
<td>N/A</td>
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<td>drx-Config</td>
<td>release</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>phr-Config</td>
<td>release</td>
<td>N/A</td>
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<td></td>
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</table>

9.2.3 Default semi-persistent scheduling configuration

SPS-Config

| >sps-ConfigDL          | release |        |                       |     |
| >sps-ConfigUL          | release |        |                       |     |

9.2.4 Default physical channel configuration

Parameters (not applicable for NB-IoT)

<table>
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<tr>
<td>PDSCH-ConfigDedicated</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&gt;p-a</td>
<td>dB0</td>
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</tr>
<tr>
<td>PUCCH-ConfigDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; tdd-AckNackFeedbackMode</td>
<td>bundling</td>
<td>release</td>
<td>Only valid for TDD mode</td>
</tr>
<tr>
<td>&gt;ackNackRepetition</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUSCH-ConfigDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;betaOffset-ACK-Index</td>
<td>10</td>
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<td></td>
</tr>
<tr>
<td>&gt;betaOffset-RI-Index</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;betaOffset-CQI-Index</td>
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<tr>
<td>UplinkPowerControlDedicated</td>
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<tr>
<td>&gt;p0-UE-PUSCH</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;deltaMCS-Enabled</td>
<td>en0 (disabled)</td>
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</tr>
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<td>&gt;accumulationEnabled</td>
<td>TRUE</td>
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<td>&gt;p0-UE-PUCCH</td>
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</tr>
<tr>
<td>Name</td>
<td>Value</td>
<td>Semantics description</td>
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<td>-------------------------------------------</td>
<td>--------</td>
<td>---------------------------------------------------------------------------------------</td>
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<tr>
<td>(pSRS\text{-}Offset)</td>
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<td>filterCoefficient</td>
<td>fc4</td>
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<td></td>
</tr>
<tr>
<td>tpc-pdcch-ConfigPUCCH</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>tpc-pdcch-ConfigPUSCH</td>
<td>release</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CQI-ReportConfig</td>
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<td>CQI-ReportPeriodic</td>
<td>release</td>
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<tr>
<td>cqi-ReportModeAperiodic</td>
<td>N/A</td>
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<td></td>
</tr>
<tr>
<td>nomPDSCH\text{-}RS\text{-}EPRE-Offset</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SoundingRS-UL-ConfigDedicated</td>
<td>release</td>
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<td></td>
</tr>
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<td>AntennaInfoDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>transmissionMode</td>
<td>tm1, tm2</td>
<td>If the number of PBCH antenna ports is one, tm1 is used as default; otherwise</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>tm2 is used as default</td>
<td></td>
</tr>
<tr>
<td>codebookSubsetRestriction</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ue-TransmitAntennaSelection</td>
<td>release</td>
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</tr>
<tr>
<td>SchedulingRequestConfig</td>
<td>release</td>
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</table>

Parameters applicable for NB-IoT

<table>
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<tr>
<th>Name</th>
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<th>Semantics description</th>
</tr>
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<tr>
<td>NPUSCH-ConfigDedicated-NB</td>
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<td>ack-NACK-NumRepetitions</td>
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<td>npusch-AllSymbols</td>
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9.2.5 Default values timers and constants

Parameters

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<th>Value</th>
<th>Semantics description</th>
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<td>t310</td>
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<td>n310</td>
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<td>ms1000</td>
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<td>n311</td>
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</table>
9.3 Sidelink pre-configured parameters

9.3.1 Specified parameters

This section only list parameters which value is specified in the standard.

Parameters

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<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
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<tr>
<td>preconfigSync</td>
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</tr>
<tr>
<td>&gt;syncTxParameters</td>
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<td></td>
</tr>
<tr>
<td>&gt;&gt;alpha</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>preconfigComm</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&gt;sc-TxParameters</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;alpha</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;dataTxParameters</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;alpha</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>v2x-CommPreconfigSync</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;syncTxParameters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;alpha</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>v2x-CommTxPoolList, p2x-CommTxPoolList</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&gt;dataTxParameters</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;alpha</td>
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</table>

9.3.2 Pre-configurable parameters

This ASN.1 segment is the start of the E-UTRA definitions of pre-configured sidelink parameters.

NOTE 1: Upper layers are assumed to provide a set of pre-configured parameters that are valid at the current UE location if any, see TS 24.334 [69, 10.2].

--- ASN1START

EUTRA-Sidelink-Preconf DEFINITIONS AUTOMATIC TAGS ::= BEGIN

IMPORTS

AdditionalSpectrumEmission, AdditionalSpectrumEmission-v1010, ARFCN-ValueEUTRA-r9, FilterCoefficient, maxCBR-Level-r14, maxCBR-Level-1-r14, maxFreq, maxFreqV2X-r14, maxSL-TxPool1-r12, maxSL-CommTxPoolPreconf-v1310, maxSL-CommTxPoolPreconf-v1310, maxSL-DiscRxPoolPreconf-r13, maxSL-DiscTxPoolPreconf-r13, maxSL-V2X-CBRCfg2-r14, maxSL-V2X-CBRCfg2-1-r14, maxSL-V2X-RxPoolPreconf-r14, maxSL-V2X-TxConfig2-r14, maxSL-V2X-TxConfig2-1-r14, maxSL-V2X-TxPoolPreconf-r14, P-Max, ReselectionInfoRelay-r13, SL-AnchorCarrierFreqList-V2X-r14, SL-CBR-Levels-Cfg-r14, SL-CBR-PSSCH-TxConfig-r14, SL-CommTxPoolSensingConfig-r14, SL-CP-Len-r12, SL-HoppingConfigComm-r12, SL-OffsetIndicator-r12, SL-OffsetIndicatorSync-r12, SL-OffsetIndicatorSync-v1430, SL-PeriodComm-r12, RSRP-RangeSL3-r12,
-- ASN1START

SL-Preconfiguration-r12 ::= SEQUENCE {
  preconfigGeneral-r12    SL-PreconfigGeneral-r12,
  preconfigComm-r12    SL-PreconfigCommPoolList4-r12,
  ...
},
[[
  preconfigComm-v1310    SEQUENCE {
    commRxPoolList-r13   SL-PreconfigCommRxPoolList-r13,
    commTxPoolList-r13   SL-PreconfigCommTxPoolList-r13  OPTIONAL
  }
],
  preconfigDisc-r13    SEQUENCE {
    discRxPoolList-r13    SL-PreconfigDiscRxPoolList-r13,
    discTxPoolList-r13    SL-PreconfigDiscTxPoolList-r13  OPTIONAL
  }
],
  preconfigRelay-r13    SL-PreconfigRelay-r13    OPTIONAL
}]

}

SL-PreconfigGeneral-r12 ::= SEQUENCE {
  -- PDCP configuration
  rohc-Profiles-r12     SEQUENCE {
    profile0x0001-r12      BOOLEAN,
    profile0x0002-r12      BOOLEAN,
    profile0x0004-r12      BOOLEAN,
    profile0x0006-r12      BOOLEAN,
    profile0x0101-r12      BOOLEAN,
    profile0x0102-r12      BOOLEAN,
    profile0x0104-r12      BOOLEAN,
  },
  -- Physical configuration
  carrierFreq-r12      ARFCN-ValueEUTRA-r9,
  maxTxPower-r12       P-Max,
  additionalSpectrumEmission-r12  AdditionalSpectrumEmission,
  sl-bandwidth-r12     ENUMERATED {n6, n15, n25, n50, n75, n100},
  tdd-ConfigSL-r12     TDD-ConfigSL-r12,
  reserved-r12         BIT STRING (SIZE (19)),
  ...
},
[[
  additionalSpectrumEmission-v1440  AdditionalSpectrumEmission-v1010  OPTIONAL
]]

}

SL-PreconfigSync-r12 ::= SEQUENCE {
  syncCP-Len-r12  SL-CP-Len-r12,
  syncOffsetIndicator1-r12  SL-OffsetIndicatorSync-r12,
  syncOffsetIndicator2-r12  SL-OffsetIndicatorSync-r12,
  syncTxParameters-r12     P0-SL-r12,

-- ASNI STOP

-- SL-Preconfiguration

The IE "SL-Preconfiguration" includes the sidelink pre-configured parameters.

---

--- ASNI START

SL-Preconfiguration information elements

--- ASNI STOP
syncTxThrshOoC-r12       RSRP-RangeSL3-r12,
filterCoefficient-r12    FilterCoefficient,
syncRefMinHyst-r12      ENUMERATED {dB0, dB3, dB6, dB9, dB12},
syncRefDiffHyst-r12      ENUMERATED {dB0, dB3, dB6, dB9, dB12, dBInf},
[ [ syncTxPeriodic-r13   ENUMERATED {true}  OPTIONAL
  ] ]
}

SL-PreconfigCommPoolList4-r12 ::= SEQUENCE (SIZE (1..maxSL-TxPool-r12)) OF SL-PreconfigCommPool-r12
SL-PreconfigCommRxPoolList-r13 ::= SEQUENCE (SIZE (1..maxSL-CommRxPoolPreconf-v1310)) OF SL-
PreconfigCommPool-r12
SL-PreconfigCommTxPoolList-r13 ::= SEQUENCE (SIZE (1..maxSL-CommTxPoolPreconf-v1310)) OF SL-
PreconfigCommPool-r12

SL-PreconfigCommPool-r12 ::= SEQUENCE {
  -- This IE is same as SL-CommResourcePool with rxParametersNCell absent
  sc-CP-Len-r12         SL-CP-Len-r12,
  sc-Period-r12         SL-PeriodComm-r12,
  sc-TF-ResourceConfig-r12     SL-TF-ResourceConfig-r12,
  sc-TxParameters-r12    P0-SL-r12,
  data-CP-Len-r12       SL-CP-Len-r12,
  data-TF-ResourceConfig-r12     SL-TF-ResourceConfig-r12,
  dataHoppingConfig-r12  SL-HoppingConfigComm-r12,
  dataTxParameters-r12   P0-SL-r12,
  trpt-Subset-r12       SL-TRPT-Subset-r12,
  ...,
  [ [ priorityList-r13  SL-PriorityList-r13 OPTIONAL -- For Tx
    ] ]
}

SL-PreconfigDiscRxPoolList-r13 ::= SEQUENCE (SIZE (1..maxSL-DiscRxPoolPreconf-r13)) OF SL-
PreconfigDiscPool-r13
SL-PreconfigDiscTxPoolList-r13 ::= SEQUENCE (SIZE (1..maxSL-DiscTxPoolPreconf-r13)) OF SL-
PreconfigDiscPool-r13

SL-PreconfigDiscPool-r13 ::= SEQUENCE {
  -- This IE is same as SL-DiscResourcePool with rxParameters absent
  cp-Len-r13            SL-CP-Len-r12,
  discPeriod-r13        ENUMERATED {rf4, rf6, rf7, rf8, rf12, rf14, rf16, rf24, rf28,
                                   rf32, rf64, rf128, rf256, rf512, rf1024, spare},
  numRetx-r13           INTEGER (0..3),
  numRepetition-r13     INTEGER (1..50),
  tf-ResourceConfig-r13  SL-TF-ResourceConfig-r12,
  txParameters-r13      SEQUENCE {
    txParametersGeneral-r13    P0-SL-r12,
    txProbability-r13         ENUMERATED {p25, p50, p75, p100} OPTIONAL,
  }
  ...
}

SL-PreconfigRelay-r13 ::= SEQUENCE {
  reselectionInfoOoC-r13  ReselectionInfoRelay-r13
}

-- ASN1STOP
**SL-Preconfiguration field descriptions**

**carrierFreq**
Indicates the carrier frequency for out of coverage sidelink communication and sidelink discovery. In case of FDD it is uplink carrier frequency and the corresponding downlink frequency can be determined from the default TX-RX frequency separation defined in TS 36.101 [42, table 5.7.3-1].

**additionalSpectrumEmission**
The UE requirements related to IE **AdditionalSpectrumEmission** are defined in TS 36.101 [42, 6.2.4]. If **additionalSpectrumEmissionExt-r14** is configured, the UE only considers **additionalSpectrumEmissionExt-r14** (and ignores **additionalSpectrumEmission-r12**).

**commRxPoolList**
Indicates a list of reception pools for sidelink communication in addition to the resource pools indicated by **preconfigComm**.

**commTxPoolList**
Indicates a list of transmission pools for sidelink communication in addition to the first resource pool within **preconfigComm**.

**preconfigComm**
Indicates a list of resource pools. The first resource pool in the list is used for both reception and transmission of sidelink communication. The other resource pools, if present, are only used for reception of sidelink communication.

**syncRefDiffHyst**
Hysteresis when evaluating a SyncRef UE using relative comparison. Value dB0 corresponds to 0 dB, dB3 to 3 dB and so on. value dBinf corresponds to infinite dB.

**syncRefMinHyst**
Hysteresis when evaluating a SyncRef UE using absolute comparison. Value dB0 corresponds to 0 dB, dB3 to 3 dB and so on.

NOTE 1: The network may configure one or more of the reception only resource pools in **preconfigComm** to cover reception from in coverage UEs using scheduled resource allocation. For such a resource pool the network should set all bits of **subframeBitmap** to 1 and **offsetIndicator** to indicate the subframe immediately following the sidelink control information.

NOTE 2: The network should ensure that the resources defined by the first entry in **preconfigComm** (used for transmission by an out of coverage UE) do not overlap with those of the pool(s) covering scheduled transmissions by in coverage UEs. Furthermore, the network should ensure that for none of the entries in **preconfigComm** the resources defined by **sc-TF-ResourceConfig** overlap.

---

**SL-V2X-Preconfiguration**
The IE **SL-V2X-Preconfiguration** includes the sidelink pre-configured parameters used for V2X sidelink communication.

---

**SL-V2X-Preconfiguration information elements**

```asn1
-- ASN1START

SL-V2X-Preconfiguration-r14 ::= SEQUENCE {
  v2x-PreconfigFreqList-r14  SL-V2X-PreconfigFreqList-r14,  
  anchorCarrierFreqList-r14  SL-AnchorCarrierFreqList-V2X-r14,  
  cbr-PreconfigList-r14     SL-CBR-PreconfigList-r14,  
  ...,  
  [  
    v2x-PacketDuplicationConfig-r15 SL-V2X-PacketDuplicationConfig-r15,  
    syncFreqList-r15          SL-V2X-SyncFreqList-r15,  
    slss-TxMultiFreq-r15      ENUMERATED {true}    OPTIONAL,  
    v2x-TxProfileList-r15     SL-V2X-TxProfileList-r15,  
  ]  
}

SL-CBR-PreconfigList-r14 ::= SEQUENCE {
  cbr-RangeCommonConfigList-r14 SEQUENCE (SIZE (1..maxSL-V2X-CBRConfig2-r14)) OF SL-CBR-Levels-Config-r14,  
  sl-CBR-PPSCH-TxConfigList-r14 SEQUENCE (SIZE (1..maxSL-V2X-TxConfig2-r14)) OF SL-CBR-PPSCH-TxConfig-r14  
}

SL-V2X-PreconfigFreqList-r14 ::= SEQUENCE (SIZE (1..maxFreqV2X-r14)) OF SL-V2X-PreconfigFreqInfo-r14

SL-V2X-PreconfigFreqInfo-r14 ::=  SEQUENCE {  
  v2x-CommPreconfigGeneral-r14  SL-PreconfigGeneral-r12,  
}

-- ASN1END
```
v2x-CommPreconfigSync-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-SyncPreconf-r14)) OF SL-V2X-SyncPreconfig-r14

v2x-CommRxPoolList-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-RxPoolPreconf-r14)) OF SL-V2X-RxPoolPreconf-r14

v2x-CommTxPoolList-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-TxPoolPreconf-r14)) OF SL-V2X-TxPoolPreconf-r14

v2x-ResourceSelectionConfig-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-ResourceSelectionPreconf-r14)) OF SL-V2X-ResourceSelectionPreconf-r14

zoneConfig-r14 ::= SEQUENCE (SIZE (1..maxSL-ZoneConfig-r14)) OF SL-ZoneConfig-r14

syncPriority-r14 ::= ENUMERATED {gnss, enb},

cbr-pppp-TxConfigList-r14 ::= SEQUENCE (SIZE (1..maxSL-CBR-PPPP-TxPreconfigList-r14)) OF SL-CBR-PPPP-TxPreconfigList-r14

thresSL-TxPrioritization-r14 ::= SEQUENCE (SIZE (1..maxSL-SyncAllowed-r14)) OF SL-SyncAllowed-r14

dataRxParameters-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-DataRxPreconf-r14)) OF SL-V2X-DataRxPreconf-r14

dataTxParameters-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-DatarxPreconf-r14)) OF SL-V2X-DatarxPreconf-r14

dataTxParameters-r14 ::= SEQUENCE (SIZE (1..maxSL-V2X-DatarxPreconf-r14)) OF SL-V2X-DatarxPreconf-r14

...
SL-PPPP-TxPreconfigIndex-v1530 ::= SEQUENCE {
  mcs-PSSCH-Range-r15  SEQUENCE (SIZE (1..maxCBR-Level-r14)) OF MCS-PSSCH-Range-r15
    OPTIONAL  --Need OR
}

MCS-PSSCH-Range-r15 ::= SEQUENCE{
  minMCS-PSSCH-r15    INTEGER (0..31),
  maxMCS-PSSCH-r15    INTEGER (0..31)
}

SL-V2X-TxProfileList-r15 ::= SEQUENCE (SIZE (1..256)) OF SL-V2X-TxProfile-r15

SL-V2X-TxProfile-r15 ::= ENUMERATED {
  rel14, rel15, spare6, spare5, spare4,
  spare3, spare2, spare1, ...}

END

-- ASN.1 STOP
SL-V2X-Preconfiguration field descriptions

adjacencyPSCCH-PSSCH
Indicates whether a UE always transmits PSCCH and PSSCH in adjacent RBs (indicated by TRUE) or it may transmit PSCCH and PSSCH in non-adjacent RBs (indicated by FALSE). This parameter appears only when a pool is configured such that a UE transmits PSCCH and the associated PSSCH in the same subframe.

anchorCarrierFreqList
Indicates carrier frequencies which may include inter-carrier resource configuration for V2X sidelink communication.

cbr-PreconfigList
Indicates the preconfigured list of CBR ranges and the list of PSSCH transmission configurations available to configure congestion control to the UE for V2X sidelink communication.

cbr-psch-TxConfigList
Indicates the mapping between PPPPs, CBR ranges by using indexes of the entry in cbr-RangeCommonConfigList in cbr-PreconfigList, and PSSCH transmission parameters and CR limits by using indexes of the entry in sl-CBR-PSSCH-TxConfigList in cbr-PreconfigList.

numSubchannel
Indicates the number of subchannels in the corresponding resource pool.

offsetDFN
Indicates the timing offset for the UE to determine DFN timing when GNSS is used for timing reference. Value 0 corresponds to 0 milliseconds, value 1 corresponds to 0.001 milliseconds, value 2 corresponds to 0.002 milliseconds, and so on.

resourceSelectionConfigP2X
Indicates the allowed resource selection mechanism(s), i.e. partial sensing and/or random selection, for P2X related V2X sidelink communication.

restrictResourceReservationPeriod
If configured, the field restrictResourceReservationPeriod configured in v2x-ResourceSelectionConfig shall be ignored for transmission on this pool.

sizeSubchannel
Indicates the number of PRBs of each subchannel in the corresponding resource pool. The value n5 denotes 5 PRBs; n6 denotes 6 PRBs and so on. The values n5, n6, n10, n15, n20, n25, n50, n75 and n100 apply in the case of adjacencyPSCCH-PSSCH set to TRUE; the values n4, n5, n6, n8, n9, n10, n12, n15, n16, n18, n20, n30, n48, n72 and n96 apply in the case of adjacencyPSCCH-PSSCH set to FALSE.

sl-OffsetIndicator
Indicates the offset of the first subframe of a resource pool within a SFN cycle. If absent, the resource pool starts from first subframe of SFN=0. This field is not applicable to V2X sidelink communication.

sl-Subframe
Indicates the bitmap of the resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 36.213 [23]).

startRB-Subchannel
Indicates the lowest RB index of the subchannel with the lowest index.

startRB-PSCCH-Pool
Indicates the lowest RB index of the PSCCH pool.

syncAllowed
Indicates the allowed synchronization reference(s) which is (are) allowed to use the pre-configured resource pool.

syncPriority
Indicates the synchronization priority order. In case the UE does not detect any cell which configures synchronization configuration on the carrier frequency in anchorCarrierFreqList, if this field is set to gnss, the UE shall prioritize GNSS over the UE directly synchronized to eNB; if this field is set to enb, the UE shall prioritize the UE directly synchronized to eNB over GNSS.

thresSL-TxPrioritization
Indicates the threshold used to determine whether SL V2X transmission is prioritized over uplink transmission if they overlap in time (see TS 36.321 [6]).

thresS-RSSI-CBR
Indicates the S-RSSI threshold for determining the contribution of a sub-channel to the CBR measurement, as specified in TS 36.214 [48]. Value 0 corresponds to -112 dBm, value 1 to -110 dBm, value n to (-112 + n*2) dBm, and so on.

v2x-CommRxPoolList
Indicates a list of reception pools for V2X sidelink communication.

v2x-CommTxPoolList
Indicates a list of transmission pools for V2X sidelink communication.

v2x-ResourceSelectionConfig
Indicates V2X sidelink communication configurations used for UE autonomous resource selection.
10 Radio information related interactions between network nodes

10.1 General

This section specifies RRC messages that are transferred between network nodes. These RRC messages may be transferred to or from the UE via another Radio Access Technology. Consequently, these messages have similar characteristics as the RRC messages that are transferred across the E-UTRA radio interface, i.e. the same transfer syntax and protocol extension mechanisms apply.

10.2 Inter-node RRC messages

10.2.1 General

This section specifies RRC messages that are sent either across the X2- or the S1-interface, either to or from the eNB, i.e. a single 'logical channel' is used for all RRC messages transferred across network nodes. The information could originate from or be destined for another RAT.

---

**EUTRA-InterNodeDefinitions**

This ASN.1 segment is the start of the E-UTRA inter-node PDU definitions.

```asnc
-- ASN1START

EUTRA-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::= BEGIN

IMPORTS
  AntennaInfoCommon,
  AntennaInfoDedicated-v10i0,
  ARFCN-ValueEUTRA,
  ARFCN-ValueEUTRA-v9e0,
  ARFCN-ValueEUTRA-r9,
  CellIdentity,
  C-RNTI,
  DL-DCCH-Message,
  DRB-Identity,
  DRB-ToReleaseList,
  DRB-ToReleaseList-r15,
  FreqBandIndicator-r11,
  InDeviceCoexIndication-r11,
  LWA-Config-r13,
  MasterInformationBlock,
  maxBands,
  maxFREQ,
  maxDRB,
  maxDRBExt-r15,
  maxDRB-r15,
  maxSCell-r10,

```
10.2.2 Message definitions

-- HandoverCommand

This message is used to transfer the handover command generated by the target eNB.

Direction: target eNB to source eNB/ source RAN

HandoverCommand message

-- ASN1START

HandoverCommand ::= SEQUENCE {
  criticalExtensions  CHOICE {
    c1  CHOICE {
      handoverCommand-r8     HandoverCommand-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {} }
}

HandoverCommand-r8-IEs ::= SEQUENCE { maxSCell-r13, maxServCell-r10, maxServCell-r13, MMBSInterestIndication-r11, MeasConfig, MeasGapConfig, MeasGapConfigPerCC-List-r14, MeasResultForRSRQ-r13, MeasResultListWLAN-r13, OtherConfig-r9, PhysCellId, P-Max, PowerCoordinationInfo-r12, SidelinkUEInformation-r12, SL-CommConfig-r12, SL-DiscConfig-r12, RadioResourceConfigDedicated, RAN-NotificationAreaInfo-r15, RCLWI-Configuration-r13, RSRP-Range, RSRQ-Range, RSRQ-Range-v1250, RS-SINR-Range-r13, SCellToAddModList-r10, SCellToAddModListExt-r13, SCG-ConfigPartSCG-r12, SecurityAlgorithmConfig, SCellIndex-r10, SCellIndex-r13, SCellToReleaseList-r10, SCellToReleaseListExt-r13, ServCellIndex-r10, ServCellIndex-r13, ShortMAC-I, MeasResultServFreqListNR-r15, MeasResultSSDC-r13, SL-V2X-ConfigDedicated-r14, SystemInformationBlockType1, SystemInformationBlockType1-v890-IEs, SystemInformationBlockType2, UEAssistanceInformation-r11, UECapabilityInformation, UE-CapabilityRAT-ContainerList, UE-RadioPagingInfo-r12, WLANConnectionStatusReport-r13, WLAN-OffloadConfig-r12 }
FROM EUTRA-RRC-Definitions;
handoverCommandMessage OCTET STRING (CONTAINING DL-DCCCH-Message),
nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- ASN1STOP

**HandoverCommand field descriptions**

**handoverCommandMessage**
Contains the entire DL-DCCCH-Message including the RRCCConnectionReconfiguration message used to perform handover within E-UTRAN or handover to E-UTRAN, generated (entirely) by the target eNB.

**NOTE:** The source BSC, in case of inter-RAT handover from GERAN to E-UTRAN, expects that the HandoverCommand message includes DL-DCCCH-Message only. Thus, criticalExtensionsFuture, spare1-spare7 and nonCriticalExtension should not be used regardless whether the source RAT is E-UTRAN, UTRAN or GERAN.

**HandoverPreparationInformation**
This message is used to transfer the E-UTRA RRC information used by the target eNB during handover preparation, including UE capability information.

Direction: source eNB/ source RAN to target eNB

**HandoverPreparationInformation message**

--- ASN1START

HandoverPreparationInformation ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1 CHOICE{
      handoverPreparationInformation-r8 HandoverPreparationInformation-r8-IEs,
      spare7 NULL,
      spare6 NULL, spare5 NULL, spare4 NULL,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE {}
  }

HandoverPreparationInformation-r8-IEs ::= SEQUENCE {
  ue-RadioAccessCapabilityInfo UE-CapabilityRAT-ContainerList,
  as-Config AS-Config OPTIONAL, -- Cond HO
  rrm-Config RRM-Config OPTIONAL,
  as-Context AS-Context OPTIONAL, -- Cond HO
  nonCriticalExtension HandoverPreparationInformation-v920-IEs OPTIONAL
}

HandoverPreparationInformation-v920-IEs ::= SEQUENCE {
  ue-ConfigRelease-r9 ENUMERATED {
    rel9, rel10, rel11, rel12, v10j0, v11e0,
    v1280, rel13, ..., rel14, rel15} OPTIONAL, -- Cond HO
  nonCriticalExtension HandoverPreparationInformation-v9d0-IEs OPTIONAL
}

HandoverPreparationInformation-v9d0-IEs ::= SEQUENCE {
  lateNonCriticalExtension HandoverPreparationInformation-v9d0-IEs OPTIONAL
}

HandoverPreparationInformation-v9j0-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING (CONTAINING HandoverPreparationInformation-v9j0-IEs) OPTIONAL,
  nonCriticalExtension HandoverPreparationInformation-v9e0-IEs OPTIONAL
}

-- Late non-critical extensions:
HandoverPreparationInformation-v9j0-IEs ::= SEQUENCE {
  -- Following field is only for pre REL-10 late non-critical extensions
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension HandoverPreparationInformation-v10j0-IEs OPTIONAL
}

HandoverPreparationInformation-v10j0-IEs ::= SEQUENCE {
  as-Config-v10j0 AS-Config-v10j0 OPTIONAL,
  -- Following field is only for late non-critical extensions from REL-10
HandoverPreparationInformation field descriptions

**as-Config**
The radio resource configuration. Applicable in case of intra-E-UTRA handover. If the target receives an incomplete MeasConfig and RadioResourceConfigDedicated in the as-Config, the target eNB may decide to apply the full configuration option based on the ue-ConfigRelease.

**as-Context**
Local E-UTRAN context required by the target eNB.

**makeBeforeBreakReq**
To request the target eNB to add the makeBeforeBreak indication in the mobilityControlInfo in case of intra-frequency handover.

**rrm-Config**
Local E-UTRAN context used depending on the target node’s implementation, which is mainly used for the RRM purpose.

**ue-ConfigRelease**
Indicates the RRC protocol release or version applicable for the current UE configuration. This could be used by target eNB to decide if the full configuration approach should be used. If this field is not present, the target assumes that the current UE configuration is based on the release 8 version of RRC protocol. NOTE 1.

**ue-RadioAccessCapabilityInfo**
For E-UTRA radio access capabilities, it is up to E-UTRA how the backward compatibility among supportedBandCombinationReduced, supportedBandCombination and supportedBandCombinationAdd is ensured. If supportedBandCombinationReduced and supportedBandCombinationAdd are included into ueCapabilityRAT-Container, it can be assumed that the value of fields, requestedBands, reducedIntNonContCombRequested and requestedCCsXL are consistent with all supported band combination fields. NOTE 2

**ue-SupportedEARFCN**
Includes UE supported EARFCN of the handover target E-UTRA cell if the target E-UTRA cell belongs to multiple frequency bands.
NOTE 1: The source typically sets the `ue-ConfigRelease` to the release corresponding with the current dedicated radio configuration. The source may however also consider the common radio resource configuration e.g. in case interoperability problems would appear if the UE temporarily continues extensions of this part of the configuration in a target PCell not supporting them.

NOTE 2: The following table indicates per source RAT whether RAT capabilities are included or not.

<table>
<thead>
<tr>
<th>Source RAT</th>
<th>E-UTRA capabilities</th>
<th>UTRA capabilities</th>
<th>GERAN capabilities</th>
<th>MR DC capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>UTRAN</td>
<td>Included</td>
<td>May be included, ignored by eNB if received</td>
<td>May be included</td>
<td>May be included</td>
</tr>
<tr>
<td>GERAN CS</td>
<td>Excluded</td>
<td>May be included, ignored by eNB if received</td>
<td>Included</td>
<td>May be included</td>
</tr>
<tr>
<td>GERAN PS</td>
<td>Excluded</td>
<td>May be included, ignored by eNB if received</td>
<td>Included</td>
<td>May be included</td>
</tr>
<tr>
<td>E-UTRAN</td>
<td>Included</td>
<td>May be included, ignored by eNB if received</td>
<td>May be included</td>
<td>May be included</td>
</tr>
<tr>
<td>NR</td>
<td>Included</td>
<td>May be included, ignored by eNB if received</td>
<td>May be included</td>
<td>May be included</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>HO</td>
<td>The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
<tr>
<td>HO2</td>
<td>The field is optional present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
<tr>
<td>HO3</td>
<td>The field is optional present in case of handover from GERAN to E-UTRA, otherwise the field is not present.</td>
</tr>
</tbody>
</table>

**SCG-Config**

This message is used to transfer the SCG radio configuration generated by the SeNB.

Direction: Secondary eNB to master eNB

**SCG-Config message**

```
-- ASN1START

SCG-Config-r12 ::= SEQUENCE {
    criticalExtensions CHOICE {
        c1 CHOICE{
            scg-Config-r12 SCG-Config-r12-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture SEQUENCE {}  
    }
}

SCG-Config-r12-IEs ::= SEQUENCE {
    scg-RadioConfig-r12 SCG-ConfigPartSCG-r12 OPTIONAL,
    nonCriticalExtension SEQUENCE {} OPTIONAL
}

-- ASN1STOP
```

**SCG-Config field descriptions**

*scg-RadioConfig-r12*  
Includes the change of the dedicated SCG configuration and, upon addition of an SCG cell, the common SCG configuration.  
The SeNB only includes a new SCG cell in response to a request from MeNB, but may include release of an SCG cell release or release of the SCG part of an SCG/Split DRB without prior request from MeNB. The SeNB does not use this field to initiate release of the SCG.
---

**SCG-ConfigInfo**

This message is used by MeNB to request the SeNB to perform certain actions e.g. to establish, modify or release an SCG, and it may include additional information e.g. to assist the SeNB with assigning the SCG configuration.

**Direction:** Master eNB to secondary eNB

**SCG-ConfigInfo message**

```asn1
SCG-ConfigInfo-r12 ::= SEQUENCE {
    criticalExtensions     CHOICE {
        c1         CHOICE{
            scg-ConfigInfo-r12     SCG-ConfigInfo-r12-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}

SCG-ConfigInfo-r12-IEs ::=   SEQUENCE {
    radioResourceConfigDedMCG-r12 RadioResourceConfigDedicated OPTIONAL,
    sCellToAddModListMCG-r12 SCellToAddModList-r10    OPTIONAL,
    measGapConfig-r12     MeasGapConfig OPTIONAL,
    powerCoordinationInfo-r12 PowerCoordinationInfo-r12 OPTIONAL,
    scg-RadioConfig-r12    SCG-ConfigPartSCG-r12 OPTIONAL,
    eutra-CapabilityInfo-r12 OCTET STRING (CONTAINING UECapabilityInformation) OPTIONAL,
    scg-ConfigRestrictInfo-r12     SCG-ConfigRestrictInfo-r12 OPTIONAL,
    mmMBSInterestIndication-r12 OCTET STRING (CONTAINING MBMSInterestIndication-r11) OPTIONAL,
    measResultServCellListSCG-r12 MeasResultServCellListSCG-r12 OPTIONAL,
    drb-ToAddModListSCG-r12 DRB-InfoListSCG-r12 OPTIONAL,
    drb-ToReleaseListSCG-r12 DRB-ToReleaseList OPTIONAL,
    sCellToAddModListSCG-r12 SCellToAddModListSCG-r12 OPTIONAL,
    sCellToReleaseListSCG-r12 SCellToReleaseList-r10 OPTIONAL,
    p-Max-r12       P-Max OPTIONAL,
    nonCriticalExtension   SCG-ConfigInfo-v1310-IEs OPTIONAL
}

SCG-ConfigInfo-v1310-IEs ::=  SEQUENCE {
    measResultSSTD-r13    MeasResultSSTD-r13     OPTIONAL,
    sCellToAddModListMCG-Ext-r13  SCellToAddModListExt-r13   OPTIONAL,
    measResultServCellListSCG-Ext-r13 MeasResultServCellListSCG-Ext-r13 OPTIONAL,
    sCellToAddModListSCG-Ext-r13  SCellToAddModListSCG-Ext-r13   OPTIONAL,
    sCellToReleaseListSCG-Ext-r13 SCellToReleaseListExt-r13 OPTIONAL,
    nonCriticalExtension   SCG-ConfigInfo-v1330-IEs OPTIONAL
}

SCG-ConfigInfo-v1330-IEs ::=  SEQUENCE {
    measResultListRSSI-SCG-r13  MeasResultListRSSI-SCG-r13   OPTIONAL,
    nonCriticalExtension   SCG-ConfigInfo-v1430-IEs OPTIONAL
}

SCG-ConfigInfo-v1430-IEs ::=  SEQUENCE {
    makeBeforeBreakSCG-Req-r14  ENUMERATED {true}     OPTIONAL,
    measGapConfigPerCC-List    MeasGapConfigPerCC-List-r14 OPTIONAL,
    nonCriticalExtension   SCG-ConfigInfo-v1530-IEs OPTIONAL
}

SCG-ConfigInfo-v1530-IEs ::=  SEQUENCE {
    drb-ToAddModListSCG-r15    DRB-InfoListSCG-r15     OPTIONAL,
    drb-ToReleaseListSCG-r15  DRB-ToReleaseList-r15    OPTIONAL,
    nonCriticalExtension   SEQUENCE {}       OPTIONAL
}

DRB-InfoListSCG-r12 ::=    SEQUENCE (SIZE (1..maxDRB)) OF DRB-InfoSCG-r12
DRB-InfoListSCG-r15 ::=    SEQUENCE (SIZE (1..maxDRB-r15)) OF DRB-InfoSCG-r12
```
SCellToAddModListSCG-r12 ::= SEQUENCE (SIZE (1..maxSCell-r10)) OF CellToAddMod-r12

SCellToAddModListSCG-Ext-r13 ::= SEQUENCE (SIZE (1..maxSCell-r13)) OF CellToAddMod-r12

CellToAddMod-r12 ::= SEQUENCE {
sCellIndex-r12 SCellIndex-r10,  
cellIdIdentification-r12 SEQUENCE {  
physCellId-r12 PhysCellId,  
dl-CarrierFreq-r12 ARFCN-ValueEUTRA-r9  
}
measResultCellToAdd-r12 SEQUENCE {  
rsrpResult-r12 RSRP-Range,  
rsrqResult-r12 RSRQ-Range  
} OPTIONAL, -- Cond SCellAdd
...  
[[  
  sCellIndex-r13 SCellIndex-r13 OPTIONAL,  
  measResultCellToAdd-v1310 SEQUENCE {  
    rs-sinr-Result-r13 RS-SINR-Range-r13  
  } OPTIONAL -- Cond SCellAdd2  
]]
}

MeasResultServCellListSCG-r12 ::= SEQUENCE (SIZE (1..maxServCell-r10)) OF MeasResultServCellSCG-r12

MeasResultServCellListSCG-Ext-r13 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasResultServCellSCG-r12

MeasResultServCellSCG-r12 ::= SEQUENCE {  
servCellId-r12 ServCellIndex-r10,  
measResultSCell-r12 SEQUENCE {  
  rsrpResultSCell-r12 RSRP-Range,  
  rsrqResultSCell-r12 RSRQ-Range  
  },  
...  
[[  
  servCellId-r13 ServCellIndex-r13 OPTIONAL,  
  measResultSCell-v1310 SEQUENCE {  
    rs-sinr-ResultSCell-r13 RS-SINR-Range-r13  
  } OPTIONAL  
]]
}

MeasResultListRSSI-SCG-r13 ::= SEQUENCE (SIZE (1..maxServCell-r13)) OF MeasResultRSSI-SCG-r13

MeasResultRSSI-SCG-r13 ::= SEQUENCE {  
servCellId-r13 ServCellIndex-r13,  
measResultForRSSI-r13 MeasResultForRSSI-r13  
}

SCG-ConfigRestrictInfo-r12 ::= SEQUENCE {  
  maxSCH-TB-BitsDL-r12 INTEGER (1..100),  
  maxSCH-TB-BitsUL-r12 INTEGER (1..100)  
}
### SCG-ConfigInfo field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>drb-ToAddModListSCG</strong></td>
<td>Includes DRBs the SeNB is requested to establish or modify (DRB type change). When <code>drb-ToAddModListSCG-r15</code> is configured, UE shall ignore the <code>drb-ToAddModListSCG-r12</code>.</td>
</tr>
<tr>
<td><strong>drb-ToReleaseListSCG</strong></td>
<td>Includes DRBs the SeNB is requested to release. When <code>drb-ToReleaseListSCG-r15</code> is configured, UE shall ignore the <code>drb-ToReleaseListSCG-r12</code>.</td>
</tr>
<tr>
<td><strong>makeBeforeBreakSCG-Req</strong></td>
<td>To request the target eNB to add the <code>makeBeforeBreakSCG</code> indication in the <code>mobilityControlInfoSCG</code> in case of intra-frequency SCG change.</td>
</tr>
<tr>
<td><strong>maxSCH-TB-BitsXL</strong></td>
<td>Indicates the maximum DL-SCH/UL-SCH TB bits that may be scheduled in a TTI. Specified as a percentage of the value defined for the applicable UE category.</td>
</tr>
<tr>
<td><strong>measGapConfig</strong></td>
<td>Includes the current measurement gap configuration.</td>
</tr>
<tr>
<td><strong>measResultListRSSI-SCG</strong></td>
<td>Includes RSSI measurement results of SCG (serving) cells.</td>
</tr>
<tr>
<td><strong>measResultSSSTD</strong></td>
<td>Includes measurement results of UE SFN and Subframe Timing Difference between the PCell and the PSCell.</td>
</tr>
<tr>
<td><strong>measResultServCellListSCG</strong></td>
<td>Includes measurement results of SCG (serving) cells.</td>
</tr>
<tr>
<td><strong>radioResourceConfigDedMCG</strong></td>
<td>Includes the current dedicated MCG radio resource configuration.</td>
</tr>
<tr>
<td><strong>sCellIndex</strong></td>
<td>If <code>sCellIndex-r13</code> is present, <code>sCellIndex-r12</code> shall be ignored.</td>
</tr>
<tr>
<td><strong>sCellToAddModListMCG</strong></td>
<td>Includes the current MCG SCell configuration. Field <code>sCellToAddModListMCG</code> is used to add the first 4 SCells with <code>sCellIndex-r10</code> while <code>sCellToAddModListExtMCG</code> is used to add the rest.</td>
</tr>
<tr>
<td><strong>sCellToAddModListSCG</strong></td>
<td>Includes SCG cells the SeNB is requested to establish. Measurement results may be provided for these cells. Field <code>sCellToAddModListSCG</code> is used to add the first 4 SCells with <code>sCellIndex-r12</code> while <code>sCellToAddModListSCG-Ext</code> is used to add the rest.</td>
</tr>
<tr>
<td><strong>sCellToReleaseListSCG</strong></td>
<td>Includes SCG cells the SeNB is requested to release.</td>
</tr>
<tr>
<td><strong>scg-RadioConfig</strong></td>
<td>Includes the current dedicated SCG configuration.</td>
</tr>
<tr>
<td><strong>scg-ConfigRestrictInfo</strong></td>
<td>Includes fields for which MeNB explicitly indicates the restriction to be observed by SeNB.</td>
</tr>
<tr>
<td><strong>servCellId</strong></td>
<td>If <code>servCellId-r13</code> is present, <code>servCellId-r12</code> shall be ignored.</td>
</tr>
<tr>
<td><strong>p-Max</strong></td>
<td>Cell specific value i.e. as broadcast by PCell.</td>
</tr>
</tbody>
</table>

#### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRB-Setup</strong></td>
<td>The field is mandatory present in case DRB establishment is requested; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>SCellAdd</strong></td>
<td>The field is mandatory present in case SCG cell establishment is requested; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>SCellAdd2</strong></td>
<td>The field is optional present in case SCG cell establishment is requested; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**UEPagingCoverageInformation**

This message is used to transfer UE paging coverage information, covering both upload to and download from the EPC.

Direction: eNB to/from EPC

**UEPagingCoverageInformation message**

```asn1
UEPagingCoverageInformation ::= SEQUENCE {
  criticalExtensions  CHOICE {
    c1                 CHOICE{
      },
    },
  ..
}
```
UEPagingCoverageInformation 

field descriptions

mpdcch-NumRepetition
Number of repetitions for MPDCCH. The value is an estimate of the required number of repetitions for MPDCCH for paging.

-- ASN1STOP

UERadioAccessCapabilityInformation

This message is used to transfer UE radio access capability information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

-- ASN1START

UERadioAccessCapabilityInformation ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE{
      ueRadioAccessCapabilityInformation-r8  |
      \UERadioAccessCapabilityInformation-r8-IEs, |
      spare7 NULL, |
      spare6 NULL, spare5 NULL, spare4 NULL, |
      spare3 NULL, spare2 NULL, spare1 NULL |
    }, |
    \criticalExtensionsFuture \SEQUENCE {} |
  }
}

UERadioAccessCapabilityInformation-r8-IEs ::= SEQUENCE {
  ue-RadioAccessCapabilityInfo  OCTET STRING (CONTAINING UECapabilityInformation), |
  \nonCriticalExtension \SEQUENCE {} \OPTIONAL |
}

-- ASN1STOP

UERadioAccessCapabilityInformation field descriptions

ue-RadioAccessCapabilityInfo
Including E-UTRA, GERAN, and CDMA2000-1xRTT Bandclass radio access capabilities (separated). UTRA radio access capabilities are not included. For E-UTRA radio access capabilities, it is up to E-UTRA how the backward compatibility among supportedBandCombinationReduced, supportedBandCombination and supportedBandCombinationAdd is ensured. If supportedBandCombinationReduced and supportedBandCombination/supportedBandCombinationAdd are included into ueCapability/RAT-Container, it can be assumed that the value of fields, requestedBands, reducedIntNonContCombRequested and requestedCCsXL are consistent with all supported band combination fields.

-- ETSI

UERadioPagingInformation

This message is used to transfer radio paging information, covering both upload to and download from the EPC.
Direction: eNB to/ from EPC

**UERadioPagingInformation** message

```asn1
-- ASN1START
UERadioPagingInformation ::= SEQUENCE {
    criticalExtensions     CHOICE {
        c1         CHOICE{
            ueRadioPagingInformation-r12   UERadioPagingInformation-r12-IEs,
            spare7 NULL,
            spare6 NULL, spare5 NULL, spare4 NULL,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}
UERadioPagingInformation-r12-IEs ::= SEQUENCE {
    ue-RadioPagingInfo-r12    OCTET STRING (CONTAINING UE-RadioPagingInfo-r12),
    nonCriticalExtension    UERadioPagingInformation-v1310-IEs   OPTIONAL
}
UERadioPagingInformation-v1310-IEs ::= SEQUENCE {
    supportedBandListEUTRAForPaging-r13  SEQUENCE (SIZE (1..maxBands)) OF FreqBandIndicator-r11
    OPTIONAL,
    nonCriticalExtension     SEQUENCE {}        OPTIONAL
}
-- ASN1STOP
```

**UERadioPagingInformation** field descriptions

- **ue-RadioPagingInfo**
  The field is used to transfer UE capability information used for paging. The eNB generates the **ue-RadioPagingInfo** and the contained UE capability information is absent when not supported by the UE.

- **supportedBandListEUTRAForPaging**
  Indicates the UE supported frequency bands which is derived by the eNB from **UE-EUTRA-Capability**.

### 10.3 Inter-node RRC information element definitions

- **AS-Config**

The **AS-Config** IE contains information about RRC configuration information in the source eNB which can be utilized by target eNB to determine the need to change the RRC configuration during the handover preparation phase. The information can also be used after the handover is successfully performed or during the RRC connection re-establishment or resume.

**AS-Config** information element

```asn1
-- ASN1START
AS-Config ::= SEQUENCE {
    sourceMeasConfig     MeasConfig,
    sourceRadioResourceConfig   RadioResourceConfigDedicated,
    sourceSecurityAlgorithmConfig  SecurityAlgorithmConfig,
    sourceUE-Identity     C-RNTI,
    sourceMasterInformationBlock  MasterInformationBlock,
    sourceSystemInformationBlockType1 SystemInformationBlockType1(WITH COMPONENTS
        {..., nonCriticalExtension ABSENT}),
    sourceSystemInformationBlockType2 SystemInformationBlockType2,
    antennaInfoCommon     AntennaInfoCommon,
    sourceDl-CarrierFreq    ARFCN-ValueEUTRA,
    ...
    [{ sourceSystemInformationBlockType1Ext OCTET STRING (CONTAINING
        SystemInformationBlockType1-v890-IEs) } OPTIONAL,
    sourceOtherConfig-r9   OtherConfig-r9
-- sourceOtherConfig-r9 should have been optional. A target eNB compliant with this transfer
-- syntax should support receiving an AS-Config not including this extension addition group
-- e.g. from a legacy source eNB ]],
-- ASN1STOP
```
NOTE: The AS-Config re-uses information elements primarily created to cover the radio interface signalling requirements. Consequently, the information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the MasterInformationBlock.
AS-Config field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>antennaInfoCommon</td>
<td>This field provides information about the number of antenna ports in the source PCell.</td>
</tr>
<tr>
<td>sourceOtherConfigSN-NR</td>
<td>Other NR config set by SN (cell group, measurements) in case of EN-DC i.e. as defined by the RRCReconfiguration message in TS 38.331 [82].</td>
</tr>
<tr>
<td>sourceRB-ConfigNR</td>
<td>NR radio bearer config, as defined by RadioBearerConfig IE in TS 38.331 [82]. The field may e.g. be set by MN in case of EN-DC, by source eNB connected to 5GCN.</td>
</tr>
<tr>
<td>sourceRB-ConfigSN-NR</td>
<td>NR radio bearer config set by SN in case of EN-DC, as defined by RadioBearerConfig IE in TS 38.331 [82].</td>
</tr>
<tr>
<td>sourceDL-CarrierFreq</td>
<td>Provides the parameter Downlink EARFCN in the source PCell, see TS 36.101 [42]. If the source eNB provides AS-Config-v9e0, it sets sourceDL-CarrierFreq (i.e. without suffix) to maxEARFCN.</td>
</tr>
<tr>
<td>sourceLWA-Config</td>
<td>LWA configuration in the source PCell when handover is triggered.</td>
</tr>
<tr>
<td>sourceOtherConfig</td>
<td>Provides other configuration in the source PCell.</td>
</tr>
<tr>
<td>sourceMasterInformationBlock</td>
<td>MasterInformationBlock transmitted in the source PCell.</td>
</tr>
<tr>
<td>sourceMeasConfig</td>
<td>Measurement configuration in the source cell. The measurement configuration for all measurements existing in the source eNB when handover is triggered shall be included. See 10.5.</td>
</tr>
<tr>
<td>sourceRCLWI-Configuration</td>
<td>RCLWI Configuration in the source PCell.</td>
</tr>
<tr>
<td>sourceSL-CommConfig</td>
<td>This field covers the sidelink communication configuration.</td>
</tr>
<tr>
<td>sourceSL-DiscConfig</td>
<td>This field covers the sidelink discovery configuration.</td>
</tr>
<tr>
<td>sourceRadioResourceConfig</td>
<td>Radio configuration in the source PCell. The radio resource configuration for all radio bearers existing in the source PCell when handover is triggered shall be included. See 10.5.</td>
</tr>
<tr>
<td>sourceSCellConfigList</td>
<td>Radio resource configuration (common and dedicated) of the SCells configured in the source eNB.</td>
</tr>
<tr>
<td>sourceSecurityAlgorithmConfig</td>
<td>This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source PCell.</td>
</tr>
<tr>
<td>sourceSystemInformationBlockType1</td>
<td>SystemInformationBlockType1 (or SystemInformationBlockType1-BR) transmitted in the source PCell.</td>
</tr>
<tr>
<td>sourceSystemInformationBlockType2</td>
<td>SystemInformationBlockType2 transmitted in the source PCell.</td>
</tr>
<tr>
<td>sourceSL-V2X-CommConfig</td>
<td>Indicates the V2X sidelink communication related configurations configured in the source eNB.</td>
</tr>
<tr>
<td>sourceWLAN-MeasResult</td>
<td>WLAN measurement results in the source PCell when handover is triggered.</td>
</tr>
</tbody>
</table>

---

AS-Context

The IE AS-Context is used to transfer local E-UTRAN context required by the target eNB.

AS-Context information element

```asn1
-- ASN1START

AS-Context ::= SEQUENCE {
  reestablishmentInfo  ReestablishmentInfo  OPTIONAL  -- Cond HO
}

AS-Context-v1130 ::= SEQUENCE {
  idc-Indication-r11  OCTET STRING (CONTAINING InDeviceCoexIndication-r11) OPTIONAL,  -- Cond HO2
  mbmsInterestIndication-r11  OCTET STRING (CONTAINING MBMSInterestIndication-r11) OPTIONAL,  -- Cond HO2
  powerPrefIndication-r11  OCTET STRING (CONTAINING

-- ASN1END
```
**AS-Context field descriptions**

<table>
<thead>
<tr>
<th><strong>idc-Indication</strong></th>
<th>Including information used for handling the IDC problems.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>reestablishmentInfo</strong></td>
<td>Including information needed for the RRC connection re-establishment.</td>
</tr>
<tr>
<td><strong>sourceContextEN-DC</strong></td>
<td>EN-DC related context information, in particular regarding the UE capability coordination, as defined by the SCG-ConfigRestrictInfoSCG IE specified in TS 38.331 [82].</td>
</tr>
</tbody>
</table>

**Conditional presence**

| **HO** | The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present. |
| **HO2** | The field is optional present in case of handover within E-UTRA; otherwise the field is not present. |

---

**ReestablishmentInfo**

The **ReestablishmentInfo** IE contains information needed for the RRC connection re-establishment.

**ReestablishmentInfo information element**

```asn1
ReestablishmentInfo ::= SEQUENCE {
    sourcePhysCellId     PhysCellId,
    targetCellShortMAC-I  ShortMAC-I,
    additionalReestabInfoList   AdditionalReestabInfoList OPTIONAL,
    ...}
```

```asn1
AdditionalReestabInfoList ::= SEQUENCE ( SIZE (1..maxReestabInfo) ) OF AdditionalReestabInfo
```

```asn1
AdditionalReestabInfo ::= SEQUENCE{
    cellIdentity      CellIdentity,
    key-eNodeB-Star   Key-eNodeB-Star,
    shortMAC-I        ShortMAC-I}
```

```asn1
Key-eNodeB-Star ::= BIT STRING (SIZE (256))
```

---

**ETSI**
ReestablishmentInfo field descriptions

**additionalReestabInfoList**
Contains a list of shortMAC-I and KeNB* for cells under control of the target eNB, required for potential re-establishment by the UE in these cells to succeed.

**Key-eNodeB-Star**
Parameter KeNB*: See TS 33.401 [32, 7.2.8.4]. If the cell identified by *cellIdentity* belongs to multiple frequency bands, the source eNB selects the DL-EARFCN for the KeNB* calculation using the same logic as UE uses when selecting the DL-EARFCN in IDLE as defined in section 6.2.2. This parameter is only used for X2 handover, and for S1 handover, it shall be ignored by target eNB.

**sourcePhyCellId**
The physical cell identity of the source PCell, used to determine the UE context in the target eNB at re-establishment.

**targetCellShortMAC-I**
The ShortMAC-I for the handover target PCell, in order for potential re-establishment to succeed.

---

**RRM-Config**

The **RRM-Config** IE contains information about UE specific RRM information before the handover which can be utilized by target eNB.

---

**RRM-Config information element**

```asn1
-- ASN1START
RRM-Config ::= SEQUENCE {
    ue-InactiveTime ENUMERATED {
        s1, s2, s3, s5, s7, s10, s15, s20,
        s25, s30, s40, s50, min1, min1s20c, min1s40,
        min2, min2s30, min3, min3s30, min4, min5, min6,
        min7, min8, min9, min10, min12, min14, min17, min20,
        min24, min28, min33, min38, min44, min50, hr1,
        hr1min30, hr2, hr2min30, hr3, hr3min30, hr4, hr5, hr6,
        hr8, hr10, hr13, hr16, hr20, day1, day1hr12, day2,
        day2hr12, day3, day4, day5, day7, day10, day14, day19,
        day24, day30, dayMoreThan30} OPTIONAL,
    ...,
    [[ candidateCellInfoList-r10 CandidateCellInfoList-r10 OPTIONAL ]],
    [[ candidateCellInfoListNR-r15 MeasResultServFreqListNR-r15 OPTIONAL ]]
}

CandidateCellInfoList-r10 ::= SEQUENCE (SIZE (1..maxFreq)) OF CandidateCellInfo-r10

CandidateCellInfo-r10 ::= SEQUENCE {
    -- cellIdentification
    physCellId-r10 PhysCellId,
    dl-CarrierFreq-r10 ARFCN-ValueEUTRA,
    -- available measurement results
    rsrpResult-r10 RSRP-Range OPTIONAL,
    rsrqResult-r10 RSRQ-Range OPTIONAL,
    ...,
    [[ dl-CarrierFreq-v1090 ARFCN-ValueEUTRA-v9e0 OPTIONAL ]],
    [[ rsrqResult-v1250 RSRQ-Range-v1250 OPTIONAL ]],
    [[ rs-sinr-Result-r13 RS-SINR-Range-r13 OPTIONAL ]]
}

-- ASN1STOP
```
RRM-Config field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>candidateCellInfoList</td>
<td>A list of the best cells on each frequency for which measurement information was available, in order of decreasing RSRP.</td>
</tr>
<tr>
<td>dl-CarrierFreq</td>
<td>The source includes dl-CarrierFreq-v1090 if and only if dl-CarrierFreq-r10 is set to maxEARFCN.</td>
</tr>
<tr>
<td>ue-InactiveTime</td>
<td>Duration while UE has not received or transmitted any user data. Thus the timer is still running in case e.g., UE measures the neighbour cells for the HO purpose. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on. Value min1 corresponds to 1 minute, value min1s20 corresponds to 1 minute and 20 seconds, value min1s40 corresponds to 1 minute and 40 seconds and so on. Value hr1 corresponds to 1 hour, hr1min30 corresponds to 1 hour and 30 minutes and so on.</td>
</tr>
</tbody>
</table>

10.4 Inter-node RRC multiplicity and type constraint values

- Multiplicity and type constraints definitions

```
-- ASN1START
maxReestabInfo    INTEGER ::= 32 -- Maximum number of KeNB* and shortMAC-I forwarded
                                   -- at handover for re-establishment preparation
-- ASN1STOP
```

- End of EUTRA-InterNodeDefinitions

```
-- ASN1START
END
-- ASN1STOP
```

10.5 Mandatory information in AS-Config

The AS-Config transferred between source eNB and target-eNB shall include all IEs necessary to describe the AS context. The conditional presence in section 6 is only applicable for eNB to UE communication.

The "need" or "cond" statements are not applied in case of sending the IEs from source eNB to target eNB. Some fields shall be included regardless of the "need" or "cond" e.g. discardTimer. The AS-Config re-uses information elements primarily created to cover the radio interface signalling requirements. The information elements may include some parameters that are not relevant for the target eNB e.g. the SFN as included in the MasterInformationBlock.

All the fields in the AS-Config as defined in 10.3 that are introduced after v9.2.0 and that are optional for eNB to UE communication shall be included, if the functionality is configured. The fields in the AS-Config that are defined before and including v9.2.0 shall be included as specified in the following.

Within the sourceRadioResourceConfig, sourceMeasConfig and sourceOtherConfig, the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explicitly specified otherwise in the following:

- in accordance with a condition that is explicitly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

The following fields, if the functionality is configured, are not mandatory for the source eNB to include in the AS-Config since delta signalling by the target eNB for these fields is not supported:

- semiPersistSchedC-RNTI
10.6 Inter-node NB-IoT messages

10.6.1 General

This section specifies NB-IoT RRC messages that are sent either across the X2- or the S1-interface, either to or from the eNB, i.e. a single ‘logical channel’ is used for all NB-IoT RRC messages transferred across network nodes.

— **NB-IoT-InterNodeDefinitions**

This ASN.1 segment is the start of the NB-IoT inter-node PDU definitions.

```asn1
-- ASN1START
NBIOT-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::= BEGIN
IMPORTS
  C-RNTI,
  PhysCellId,
  SecurityAlgorithmConfig,
  ShortMAC-I
FROM EUTRA-RRC-Definitions
AdditionalReestabInfoList
FROM EUTRA-InterNodeDefinitions
  CarrierFreq-NB-r13,
  RadioResourceConfigDedicated-NB-r13,
  UECapabilityInformation-NB,
  UE-Capability-NB-r13,
  UE-Capability-NB-Ext-r14-IEs,
  UE-RadioPagingInfo-NB-r13
FROM NBIOT-RRC-Definitions;
-- ASN1STOP
```

10.6.2 Message definitions

— **HandoverPreparationInformation-NB**

This message is used to transfer the UE context from the eNB where the RRC connection has been suspended and transfer it to the eNB where the RRC Connection has been requested to be resumed.

Direction: source eNB to target eNB

**HandoverPreparationInformation-NB message**

```asn1
-- ASN1START
HandoverPreparationInformation-NB ::= SEQUENCE {
criticalExtensions      CHOICE {
c1          CHOICE{
  handoverPreparationInformation-r13  HandoverPreparationInformation-NB-IEs,
  spare3 NULL, spare2 NULL, spare1 NULL
 },
criticalExtensionsFuture   SEQUENCE {} }
}
HandoverPreparationInformation-NB-IEs ::= SEQUENCE {
  ue-RadioAccessCapabilityInfo-r13  UE-Capability-NB-r13,
as-Config-r13       AS-Config-NB,
rrm-Config-r13       RRM-Config-NB     OPTIONAL,
as-Context-r13       AS-Context-NB     OPTIONAL,
nonCriticalExtension     HandoverPreparationInformation-NB-v1380-IEs
OPTIONAL
}
-- ASN1STOP
```
HandoverPreparationInformation-NB-v1380-IEs ::= SEQUENCE {
  lateNonCriticalExtension OCTET STRING OPTIONAL,
  nonCriticalExtension HandoverPreparationInformation-NB-Ext-r14-IEs OPTIONAL
}

HandoverPreparationInformation-NB-Ext-r14-IEs ::= SEQUENCE {
  ue-RadioAccessCapabilityInfoExt-r14 OCTET STRING (CONTAINING UE-Capability-NB-Ext-r14-IEs) OPTIONAL,
  nonCriticalExtension SEQUENCE () OPTIONAL
}

-- ASN1STOP

<table>
<thead>
<tr>
<th>HandoverPreparationInformation-NB field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>as-Config</td>
</tr>
<tr>
<td>The radio resource configuration.</td>
</tr>
<tr>
<td>as-Context</td>
</tr>
<tr>
<td>The local E-UTRAN context required by the target eNB.</td>
</tr>
<tr>
<td>rrm-Config</td>
</tr>
<tr>
<td>The local E-UTRAN context used depending on the target node's implementation, which is mainly used for the RRM purpose.</td>
</tr>
<tr>
<td>ue-RadioAccessCapabilityInfo, ue-RadioAccessCapabilityInfoExt</td>
</tr>
<tr>
<td>The NB-IoT UE Radio Access Capability Parameters, see TS 36.306 [5].</td>
</tr>
</tbody>
</table>

---

UEPagingCoverageInformation-NB

This message is used to transfer UE paging coverage information for NB-IoT, covering both upload to and download from the EPC.

Direction: eNB to/from EPC

UEPagingCoverageInformation-NB message

-- ASN1START

UEPagingCoverageInformation-NB ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1 CHOICE{
      uePagingCoverageInformation-r13 UEPagingCoverageInformation-NB-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture SEQUENCE ()
  }
}

UEPagingCoverageInformation-NB-IEs ::= SEQUENCE {
  -- the possible value(s) can differ from those sent on Uu
  npdcch-NumRepetitionPaging-r13 INTEGER (1..2048) OPTIONAL,
  nonCriticalExtension SEQUENCE () OPTIONAL
}

-- ASN1STOP

<table>
<thead>
<tr>
<th>UEPagingCoverageInformation-NB field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>npdcch-NumRepetitionPaging</td>
</tr>
<tr>
<td>Number of repetitions for NPDCCH, see TS 36.211 [21].This value is an estimate of the required number of repetitions for NPDCCH.</td>
</tr>
</tbody>
</table>

---

UERadioAccessCapabilityInformation-NB

This message is used to transfer UE NB-IoT Radio Access capability information, covering both upload to and download from the EPC.
Direction: eNB to/ from EPC

**UERadioAccessCapabilityInformation-NB message**

-- ASN1START

UERadioAccessCapabilityInformation-NB ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1            CHOICE{
      ueRadioAccessCapabilityInformation-r13  UERadioAccessCapabilityInformation-NB-IEs,
    spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture  SEQUENCE {}}
}

UERadioAccessCapabilityInformation-NB-IEs ::= SEQUENCE {
  ue-RadioAccessCapabilityInfo-r13  OCTET STRING (CONTAINING UE-Capability-NB-r13),
  nonCriticalExtension  UERadioAccessCapabilityInformation-NB-v1380-IEs  OPTIONAL
}

UERadioAccessCapabilityInformation-NB-v1380-IEs ::= SEQUENCE {
  lateNonCriticalExtension  OCTET STRING  OPTIONAL,
  nonCriticalExtension  UERadioAccessCapabilityInformation-NB-r14-IEs  OPTIONAL
}

UERadioAccessCapabilityInformation-NB-r14-IEs ::= SEQUENCE {
  ue-RadioAccessCapabilityInfo-r14  OCTET STRING (CONTAINING UECapabilityInformation-NB)  OPTIONAL,
  nonCriticalExtension  SEQUENCE {}  OPTIONAL
}

-- ASN1STOP

**UERadioAccessCapabilityInformation-NB field descriptions**

**ue-RadioAccessCapabilityInfo**
The NB-IoT UE Radio Access Capability Parameters, see TS 36.306 [5].

---

**UERadioPagingInformation-NB**

This message is used to transfer NB-IoT radio paging information, covering both upload to and download from the EPC.

Direction: eNB to/ from EPC

**UERadioPagingInformation-NB message**

-- ASN1START

UERadioPagingInformation-NB ::= SEQUENCE {
  criticalExtensions CHOICE {
    c1            CHOICE{
      ueRadioPagingInformation-r13  UERadioPagingInformation-NB-IEs,
    spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture  SEQUENCE {}}
}

UERadioPagingInformation-NB-IEs ::= SEQUENCE {
  ue-RadioPagingInfo-r13  OCTET STRING (CONTAINING UE-RadioPagingInfo-NB-r13),
  nonCriticalExtension  SEQUENCE {}  OPTIONAL
}

-- ASN1STOP
### 10.7 Inter-node NB-IoT RRC information element definitions

---

**AS-Config-NB**

The **AS-Config-NB** IE contains information about NB-IoT RRC configuration information in the source eNB which can be utilized by target eNB.

#### AS-Config-NB information element

```asn1
AS-Config-NB ::= SEQUENCE {
    sourceRadioResourceConfig-r13   RadioResourceConfigDedicated-NB-r13,
    sourceSecurityAlgorithmConfig-r13  SecurityAlgorithmConfig,
    sourceUE-Identity-r13     C-RNTI,
    sourceDl-CarrierFreq-r13    CarrierFreq-NB-r13,
    ...
}
```

---

**AS-Context-NB**

The **AS-Context-NB** IE is used to transfer the UE context required by the target eNB.

#### AS-Context-NB information element

```asn1
AS-Context-NB ::= SEQUENCE {
    reestablishmentInfo-r13     ReestablishmentInfo-NB   OPTIONAL,
    ...
}
```

---

**ReestablishmentInfo-NB**

The **ReestablishmentInfo-NB** IE contains information needed for the RRC connection re-establishment.

#### ReestablishmentInfo-NB information element

```asn1
ReestablishmentInfo-NB ::= SEQUENCE {
    ...
}
```
--- ASN1START

sourcePhysCellId-r13  PhysCellId,
targetCellShortMAC-I-r13  ShortMAC-I,
additionalReestabInfoList-r13  AdditionalReestabInfoList

-- ASN1STOP

--- ASN1START

additionalReestabInfoList

Contains a list of shortMAC-I and KeNB* for cells under control of the target eNB, required for potential re-
establishment by the UE in these cells to succeed.

sourcePhysCellId

The physical cell identity of the source PCell, used to determine the UE context in the target eNB at re-establishment.

targetCellShortMAC-I

The ShortMAC-I for the target PCell, in order for potential re-establishment to succeed.

--- ASN1START

RRM-Config-NB

The RRM-Config-NB IE contains information about UE specific RRM information which can be utilized by target eNB.

RRM-Config-NB information element

--- ASN1START

RRM-Config-NB ::= SEQUENCE {
    ue-InactiveTime  ENUMERATED {
        s1, s2, s3, s5, s7, s10, s15, s20,
        s25, s30, s40, s50, min1, min1s20, min1s40,
        min2, min2s30, min3, min3s30, min4, min5, min6,
        min7, min8, min9, min10, min12, min14, min17, min20,
        min24, min28, min33, min38, min44, min50, hr1,
        hr1min30, hr2, hr2min30, hr3, hr3min30, hr4, hr5, hr6,
        hr8, hr10, hr13, hr16, hr20, day1, day1hr12, day2,
        day2hr12, day3, day4, day5, day7, day10, day14, day19,
        day24, day30, dayMoreThan30}  OPTIONAL,

    ...  }

-- ASN1STOP

--- ASN1START

ue-InactiveTime

Duration while UE has not received or transmitted any user data. Value s1 corresponds to 1 second, s2 corresponds to 2 seconds and so on. Value min1 corresponds to 1 minute, value min1s20 corresponds to 1 minute and 20 seconds, value min1s40 corresponds to 1 minute and 40 seconds and so on. Value hr1 corresponds to 1 hour, hr1min30 corresponds to 1 hour and 30 minutes and so on.

10.8 Inter-node RRC multiplicity and type constraint values

--- ASN1START

Multiplicity and type constraints definitions

--- ASN1START

End of NB-IoT-InterNodeDefinitions

-- ASN1START

END

-- ASN1STOP
10.9 Mandatory information in AS-Config-NB

The AS-Config-NB transferred between source eNB and target-eNB shall include all IEs necessary to describe the AS context. The conditional presence in section 6 is only applicable for eNB to UE communication.

The "Need" or "Cond" statements are not applied in case of sending the IEs from source eNB to target eNB. Some information elements shall be included regardless of the "Need" or "Cond" e.g. discardTimer. The AS-Config-NB re-uses information elements primarily created to cover the radio interface signalling requirements.

Within the sourceRadioResourceConfig, the source eNB shall include fields that are optional for eNB to UE communication, if the functionality is configured unless explicitly specified otherwise in the following:

- in accordance with a condition that is explicitly stated to be applicable; or
- a default value is defined for the concerned field; and the configured value is the same as the default value that is defined; or
- the need of the field is OP and the current UE configuration corresponds with the behaviour defined for absence of the field;

11 UE capability related constraints and performance requirements

11.1 UE capability related constraints

The following table lists constraints regarding the UE capabilities that E-UTRAN is assumed to take into account.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Value</th>
<th>NB-IoT</th>
</tr>
</thead>
<tbody>
<tr>
<td>#DRBs</td>
<td>The number of DRBs that a UE shall support</td>
<td>8, 15</td>
<td>(0, 1, 2)</td>
</tr>
<tr>
<td>#RLC-AM</td>
<td>The number of RLC AM entities that a UE shall support</td>
<td>10, 17</td>
<td>(2, 3)</td>
</tr>
<tr>
<td>#minCellperMeasObjectEUTRA</td>
<td>The minimum number of neighbour cells (excluding black list cells) that a UE shall be able to store within a MeasObjectEUTRA. NOTE.</td>
<td>32</td>
<td>N/A</td>
</tr>
<tr>
<td>#minBlackCellRangesperMeasObjectEUTRA</td>
<td>The minimum number of blacklist cell PCI ranges that a UE shall be able to store within a MeasObjectEUTRA</td>
<td>32</td>
<td>N/A</td>
</tr>
<tr>
<td>#minCellperMeasObjectUTRA</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a MeasObjectUTRA. NOTE.</td>
<td>32</td>
<td>N/A</td>
</tr>
<tr>
<td>#minCellperMeasObjectGERAN</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a measObjectGERAN. NOTE.</td>
<td>32</td>
<td>N/A</td>
</tr>
<tr>
<td>#minCellperMeasObjectCDMA2000</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a measObjectCDMA2000. NOTE.</td>
<td>32</td>
<td>N/A</td>
</tr>
<tr>
<td>#minCellTotal</td>
<td>The minimum number of neighbour cells (excluding black list cells) that UE shall be able to store in total in all measurement objects configured</td>
<td>256</td>
<td>N/A</td>
</tr>
</tbody>
</table>
### 11.2 Processing delay requirements for RRC procedures

The UE performance requirements for RRC procedures are specified in the following tables, by means of a value N:

\[ N = \text{the number of 1ms subframes from the end of reception of the E-UTRAN -> UE message on the UE physical layer up to when the UE shall be ready for the reception of uplink grant for the UE -> E-UTRAN response message with no access delay other than the TTI-alignment (e.g. excluding delays caused by scheduling, the random access procedure or physical layer synchronisation).} \]

**NOTE:** No processing delay requirements are specified for RN-specific procedures.

![Figure 11.2-1: Illustration of RRC procedure delay](image)

#### Table 11.2-1: UE performance requirements for RRC procedures for UEs other than NB-IoT UEs
### RRC Connection Control Procedures

<table>
<thead>
<tr>
<th>Procedure title</th>
<th>E-UTRAN -&gt; UE</th>
<th>UE -&gt; E-UTRAN</th>
<th>N</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRC connection establishment</td>
<td>RRCConnectionSetup or RRCConnectionResume</td>
<td>RRCConnectionSetupComplete or RRCConnectionResumeComplete</td>
<td>15 or 3</td>
<td>N = 3 applies for the case of reception of RRCConnectionResume if reducedCP-LatencyEnabled is configured, the UE supports reduced CP latency, and the RRC message only includes MAC and PHY (re-)configurations and does not include (re-)configurations of DRX, SPS, SCells, and MIMO. Further, the UL grant is sent using PDCCH DCI format 0 in common search space. In this scenario, the RRC procedure delay can extend beyond the reception of the UL grant, up to 7 ms. For other cases N = 15 applies.</td>
</tr>
<tr>
<td>RRC connection release</td>
<td>RRCConnectionRelease</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (radio resource configuration)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (measurement configuration)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (intra-LTE mobility)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection reconfiguration (SCell addition/release)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>RRC connection reconfiguration (SCG establishment/release, SCG cell addition/release)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (NR measurement configuration)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection reconfiguration (NR SCG establishment/modification/release)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (intra-LTE mobility with NR SCG establishment/modification/release)</td>
<td>RRCConnectionReconfiguration</td>
<td>RRCConnectionReconfigurationComplete</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-establishment</td>
<td>RRCConnectionReestablishment</td>
<td>RRCConnectionReestablishmentComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Procedure title</td>
<td>E-UTRAN -&gt; UE</td>
<td>UE -&gt; E-UTRAN</td>
<td>N</td>
<td>Notes</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>---------------------------</td>
<td>-----------------------------------</td>
<td>-----</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Initial security activation</td>
<td>SecurityModeCommand</td>
<td>SecurityModeCommandComplete/SecurityModeCommandFailure</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Initial security activation + RRC connection reconfig</td>
<td>SecurityModeCommand</td>
<td>RRCCconnectionReconfiguration</td>
<td>20</td>
<td>The two DL messages are transmitted in the same TTI</td>
</tr>
<tr>
<td>EDT</td>
<td>RRCEarlyDataComplete or RRCCconnectionRelease for UP-EDT</td>
<td>RRCCconnectionComplete</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Paging</td>
<td>Paging</td>
<td></td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

**Inter RAT mobility**

| Handover to E-UTRA                                   | RRCCconnectionReconfiguration (sent by other RAT) | RRCCconnectionReconfigurationComplete | NA  | The performance of this procedure is specified in [50] in case of handover from GSM and [29], [30] in case of handover from UTRA. |
| Handover from E-UTRA to CDMA2000                     | HandoverFromEUTRAPreparationRequest (CDMA2000)    |                                   | NA  | Used to trigger the handover preparation procedure with a CDMA2000 RAT. The performance of this procedure is specified in [16]. |

**Measurement procedures**

<table>
<thead>
<tr>
<th>Measurement Reporting</th>
<th>MeasurementReport</th>
<th>NA</th>
</tr>
</thead>
</table>

**Other procedures**

<table>
<thead>
<tr>
<th>UE capability transfer</th>
<th>UECapabilityEnquiry</th>
<th>UECapabilityInformation</th>
<th>10/15</th>
<th>The value of 15ms applies in case the UE has to report EN-DC band combinations.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counter check</td>
<td>CounterCheck</td>
<td>CounterCheckResponse</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Proximity indication</td>
<td>ProximityIndication</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UE information</td>
<td>UEInformationRequest</td>
<td>UEInformationResponse</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>MBMS counting</td>
<td>MBMSCountingRequest</td>
<td>MBMSCountingResponse</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>MBMS interest indication</td>
<td>MBMSInterestIndication</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-device coexistence indication</td>
<td>InDeviceCoexIndication</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UE assistance information</td>
<td>UEAssistanceInformation</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCG failure information</td>
<td>SCGFailureInformation</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NR SCG failure information</td>
<td>SCGFailureInformationNR</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sidelink UE information</td>
<td>SidelinkUEInformation</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WLAN Connection Status Reporting</td>
<td>WLANConnectionStatusReport</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delay Budget Report</td>
<td>DelayBudgetReport</td>
<td>NA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11.2-2: UE performance requirements for RRC procedures for NB-IoT UEs
### RRC Connection Control Procedures

<table>
<thead>
<tr>
<th>Procedure title</th>
<th>E-UTRAN -&gt; UE</th>
<th>UE -&gt; E-UTRAN</th>
<th>N</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRC connection establishment</td>
<td>RRCConnectionSetup-NB or RRCConnectionResume-NB</td>
<td>RRCConnectionSetupComplete-NB or RRCConnectionResumeComplete-NB</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>RRC connection release</td>
<td>RRCConnectionRelease-NB</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>RRC connection re-configuration (radio resource configuration)</td>
<td>RRCConnectionReconfiguration-NB</td>
<td>RRCConnectionReconfigurationComplete-NB</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-establishment</td>
<td>RRCConnectionReestablishment-NB</td>
<td>RRCConnectionReestablishmentComplete-NB</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Initial security activation</td>
<td>SecurityModeCommand</td>
<td>SecurityModeCommandComplete/SecurityModeCommandFailure</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Initial security activation + RRC connection re-configuration (RB establishment)</td>
<td>SecurityModeCommand, RRCConnectionReconfiguration-NB</td>
<td>RRCConnectionReconfigurationComplete-NB</td>
<td>55</td>
<td>The two DL messages are transmitted in the same TTI</td>
</tr>
<tr>
<td>EDT</td>
<td>RRCEarlyDataComplete-NB or RRCConnectionRelease-NB for Up-EDT</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>Paging</td>
<td>Paging-NB</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>

### Other procedures

| UE capability transfer | UECapabilityEnquiry-NB | UECapabilityInformation-NB | 35 | |

#### 11.3 Void
Annex A (informative):
Guidelines, mainly on use of ASN.1

Editor's note  No agreements have been reached concerning the extension of RRC PDUs so far. Any statements in
this section about the protocol extension mechanism should be considered as FFS.

A.1 Introduction

The following clauses contain guidelines for the specification of RRC protocol data units (PDUs) with ASN.1.

A.2 Procedural specification

A.2.1 General principles

The procedural specification provides an overall high level description regarding the UE behaviour in a particular
scenario.

It should be noted that most of the UE behaviour associated with the reception of a particular field is covered by the
applicable parts of the PDU specification. The procedural specification may also include specific details of the UE
behaviour upon reception of a field, but typically this should be done only for cases that are not easy to capture in the
PDU section e.g. general actions, more complicated actions depending on the value of multiple fields.

Likewise, the procedural specification need not specify the UE requirements regarding the setting of fields within the
messages that are send to E-UTRAN i.e. this may also be covered by the PDU specification.

A.2.2 More detailed aspects

The following more detailed conventions should be used:

- Bullets:
  - Capitals should be used in the same manner as in other parts of the procedural text i.e. in most cases no
capital applies since the bullets are part of the sentence starting with 'The UE shall:'
  - All bullets, including the last one in a sub-clause, should end with a semi-colon i.e. an ‘;’
  - Conditions
    - Whenever multiple conditions apply, a semi-colon should be used at the end of each conditions with the
      exception of the last one, i.e. as in 'if cond1; or cond2:

A.3 PDU specification

A.3.1 General principles

A.3.1.1 ASN.1 sections

The RRC PDU contents are formally and completely described using abstract syntax notation (ASN.1), see X.680 [13],
X.681 (02/2002) [14].

The complete ASN.1 code is divided into a number of ASN.1 sections in the specifications. In order to facilitate the
extraction of the complete ASN.1 code from the specification, each ASN.1 section begins with a text paragraph
consisting entirely of an ASN.1 start tag, which consists of a double hyphen followed by a single space and the text
string "ASN1START" (in all upper case letters). Each ASN.1 section ends with a text paragraph consisting entirely of an
ASN.1 stop tag, which consists of a double hyphen followed by a single space and the text "ASN1STOP" (in all upper
case letters):

```-- ASN1START
-- ASN1STOP```
The text paragraphs containing the ASN.1 start and stop tags should not contain any ASN.1 code significant for the complete description of the RRC PDU contents. The complete ASN.1 code may be extracted by copying all the text paragraphs between an ASN.1 start tag and the following ASN.1 stop tag in the order they appear, throughout the specification.

NOTE: A typical procedure for extraction of the complete ASN.1 code consists of a first step where the entire RRC PDU contents description (ultimately the entire specification) is saved into a plain text (ASCII) file format, followed by a second step where the actual extraction takes place, based on the occurrence of the ASN.1 start and stop tags.

A.3.1.2 ASN.1 identifier naming conventions

The naming of identifiers (i.e., the ASN.1 field and type identifiers) should be based on the following guidelines:

- Message (PDU) identifiers should be ordinary mixed case without hyphenation. These identifiers, e.g., the `RRCConnectionModificationCommand`, should be used for reference in the procedure text. Abbreviated forms of these identifiers should not be used.

- Type identifiers other than PDU identifiers should be ordinary mixed case, with hyphenation used to set off acronyms only where an adjacent letter is a capital, e.g., `EstablishmentCause`, `SelectedPLMN` (not `Selected-PLMN`, since the "d" in "Selected" is lowercase), `InitialUE-Identity` and `MeasSFN-SFN-TimeDifference`.

- Field identifiers shall start with a lowercase letter and use mixed case thereafter, e.g., `establishmentCause`. If a field identifier begins with an acronym (which would normally be in upper case), the entire acronym is lowercase (`plmn-Identity`, not `pLMN-Identity`). The acronym is set off with a hyphen (`ue-Identity`, not `ueIdentity`), in order to facilitate a consistent search pattern with corresponding type identifiers.

- Identifiers that are likely to be keywords of some language, especially widely used languages, such as C++ or Java, should be avoided to the extent possible.

- Identifiers, other than PDU identifiers, longer than 25 characters should be avoided where possible. It is recommended to use abbreviations, which should be done in a consistent manner i.e. use 'Meas' instead of 'Measurement' for all occurrences. Examples of typical abbreviations are given in table A.3.1.2.1-1 below.

- **For future extension:** When an extension is introduced a suffix is added to the identifier of the concerned ASN.1 field and/or type. A suffix of the form "-rX" is used, with X indicating the release, for ASN.1 fields or types introduced in a later release (i.e. a release later than the original/first release of the protocol) as well as for ASN.1 fields or types for which a revision is introduced in a later release replacing a previous version, e.g., `Foo-r9` for the Rel-9 version of the ASN.1 type `Foo`. A suffix of the form "-rXb" is used for the first revision of a field that it appears in the same release (X) as the original version of the field, "-rXc" for a second intra-release revision and so on. A suffix of the form "-vXYZ" is used for ASN.1 fields or types that only are an extension of a corresponding earlier field or type (see sub-clause A.4), e.g., `AnElement-v10b0` for the extension of the ASN.1 type `AnElement` introduced in version 10.11.0 of the specification. A number 0...9, 10, 11, etc. is used to represent the first part of the version number, indicating the release of the protocol. Lower case letters a, b, c, etc. are used to represent the second (and third) part of the version number if they are greater than 9. In the procedural specification, in field descriptions as well as in headings suffices are not used, unless there is a clear need to distinguish the extension from the original field.

- More generally, in case there is a need to distinguish different variants of an ASN.1 field or IE, a suffix should be added at the end of the identifiers e.g. `MeasObjectUTRA`, `ConfigCommon`. When there is no particular need to distinguish the fields (e.g. because the field is included in different IEs), a common field identifier name may be used. This may be attractive e.g. in case the procedural specification is the same for the different variants.
Table A.3.1.2-1: Examples of typical abbreviations used in ASN.1 identifiers

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Abbreviated word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comm</td>
<td>Communication</td>
</tr>
<tr>
<td>Conf</td>
<td>Confirmation</td>
</tr>
<tr>
<td>Config</td>
<td>Configuration</td>
</tr>
<tr>
<td>Disc</td>
<td>Discovery</td>
</tr>
<tr>
<td>DL</td>
<td>Downlink</td>
</tr>
<tr>
<td>Ext</td>
<td>Extension</td>
</tr>
<tr>
<td>Freq</td>
<td>Frequency</td>
</tr>
<tr>
<td>Id</td>
<td>Identity</td>
</tr>
<tr>
<td>Ind</td>
<td>Indication</td>
</tr>
<tr>
<td>Info</td>
<td>Information</td>
</tr>
<tr>
<td>Meas</td>
<td>Measurement</td>
</tr>
<tr>
<td>Neigh</td>
<td>Neighbour(ing)</td>
</tr>
<tr>
<td>Param(s)</td>
<td>Parameter(s)</td>
</tr>
<tr>
<td>Persist</td>
<td>Persistent</td>
</tr>
<tr>
<td>Phys</td>
<td>Physical</td>
</tr>
<tr>
<td>Proc</td>
<td>Process</td>
</tr>
<tr>
<td>Reestab</td>
<td>Reestablishment</td>
</tr>
<tr>
<td>Req</td>
<td>Request</td>
</tr>
<tr>
<td>Rx</td>
<td>Reception</td>
</tr>
<tr>
<td>Sched</td>
<td>Scheduling</td>
</tr>
<tr>
<td>Sync</td>
<td>Synchronisation</td>
</tr>
<tr>
<td>Thresh</td>
<td>Threshold</td>
</tr>
<tr>
<td>Tx/Transm</td>
<td>Transmission</td>
</tr>
<tr>
<td>UL</td>
<td>Uplink</td>
</tr>
</tbody>
</table>

NOTE: The table A.3.1.2.1-1 is not exhaustive. Additional abbreviations may be used in ASN.1 identifiers when needed.

A.3.1.3 Text references using ASN.1 identifiers

A text reference into the RRC PDU contents description from other parts of the specification is made using the ASN.1 field or type identifier of the referenced element. The ASN.1 field and type identifiers used in text references should be in the *italic font style*. The "do not check spelling and grammar" attribute in Word should be set. Quotation marks (i.e., "") should not be used around the ASN.1 field or type identifier.

A reference to an RRC PDU type should be made using the corresponding ASN.1 type identifier followed by the word "message", e.g., a reference to the `RRCConnectionRelease` message.

A reference to a specific part of an RRC PDU, or to a specific part of any other ASN.1 type, should be made using the corresponding ASN.1 field identifier followed by the word "field", e.g., a reference to the `prioritisedBitRate` field in the example below.

```plaintext
-- /example/ ASN1START
LogicalChannelConfig ::= SEQUENCE {
  ul-SpecificParameters SEQUENCE {
    priority Priority,
    prioritisedBitRate PrioritisedBitRate,
    bucketSizeDuration BucketSizeDuration,
    logicalChannelGroup OPTIONAL
  }
} OPTIONAL
-- ASN1STOP
```

NOTE: All the ASN.1 start tags in the ASN.1 sections, used as examples in this annex to the specification, are deliberately distorted, in order not to include them when the ASN.1 description of the RRC PDU contents is extracted from the specification.

A reference to a specific type of information element should be made using the corresponding ASN.1 type identifier preceded by the acronym "IE", e.g., a reference to the IE `LogicalChannelConfig` in the example above.
References to a specific type of information element should only be used when those are generic, i.e., without regard to the particular context wherein the specific type of information element is used. If the reference is related to a particular context, e.g., an RRC PDU type (message) wherein the information element is used, the corresponding field identifier in that context should be used in the text reference.

A reference to a specific value of an ASN.1 field should be made using the corresponding ASN.1 value without using quotation marks around the ASN.1 value, e.g., 'if the status field is set to value true'.

### A.3.2 High-level message structure

Within each logical channel type, the associated RRC PDU (message) types are alternatives within a CHOICE, as shown in the example below.

```asn1
DL-DCCH-Message ::= SEQUENCE {
    message     DL-DCCH-MessageType
}

DL-DCCH-MessageType ::= CHOICE {
    c1      CHOICE {
        dlInformationTransfer     DLInformationTransfer,
        handoverFromEUTRAPreparationRequest  HandoverFromEUTRAPreparationRequest,
        mobilityFromEUTRACommand    MobilityFromEUTRACommand,
        rrcConnectionReconfiguration   RRCConnectionReconfiguration,
        rrcConnectionRelease     RRCConnectionRelease,
        securityModeCommand      SecurityModeCommand,
        ueCapabilityEnquiry      UECapabilityEnquiry,
        spare1 NULL
    },
    messageClassExtension SEQUENCE {}
}
```

A nested two-level CHOICE structure is used, where the alternative PDU types are alternatives within the inner level `c1` CHOICE.

Spare alternatives (i.e., `spare1` in this case) may be included within the `c1` CHOICE to facilitate future extension. The number of such spare alternatives should not extend the total number of alternatives beyond an integer-power-of-two number of alternatives (i.e., eight in this case).

Further extension of the number of alternative PDU types is facilitated using the `messageClassExtension` alternative in the outer level CHOICE.

### A.3.3 Message definition

Each PDU (message) type is specified in an ASN.1 section similar to the one shown in the example below.

```asn1
RRCConnectionReconfiguration ::= SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        c1         CHOICE{
            rrcConnectionReconfiguration-r8  RRCConnectionReconfiguration-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    },
    criticalExtensionsFuture     SEQUENCE {}
}
```

Hooks for critical and non-critical extension should normally be included in the PDU type specification. How these hooks are used is further described in sub-clause A.4.
Critical extensions are characterised by a redefinition of the PDU contents and need to be governed by a mechanism for protocol version agreement between the encoder and the decoder of the PDU, such that the encoder is prevented from sending a critically extended version of the PDU type, which is not comprehended by the decoder.

Critical extension of a PDU type is facilitated by a two-level CHOICE structure, where the alternative PDU contents are alternatives within the inner level \texttt{c1 CHOICE}. Spare alternatives (i.e., \texttt{spare3 down to spare1} in this case) may be included within the \texttt{c1 CHOICE}. The number of spare alternatives to be included in the original PDU specification should be decided case by case, based on the expected rate of critical extension in the future releases of the protocol.

Further critical extension, when the spare alternatives from the original specifications are used up, is facilitated using the \texttt{criticalExtensionsFuture} in the outer level CHOICE.

In PDU types where critical extension is not expected in the future releases of the protocol, the inner level \texttt{c1 CHOICE} and the spare alternatives may be excluded, as shown in the example below.

```asn1
-- /example/ ASN1START
RRCConnectionReconfigurationComplete ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    rrcConnectionReconfigurationComplete-r8
    RRCConnectionReconfigurationComplete-r8-IEs,
    criticalExtensionsFuture   SEQUENCE {}    
  }
}
RRCConnectionReconfigurationComplete-r8-IEs ::= SEQUENCE {
  -- Enter the IEs here. --              -- Cond condTag
  ...}
-- ASN1STOP
```

Non-critical extensions are characterised by the addition of new information to the original specification of the PDU type. If not comprehended, a non-critical extension may be skipped by the decoder, whilst the decoder is still able to complete the decoding of the comprehended parts of the PDU contents.

Non-critical extensions at locations other than the end of the message or other than at the end of a field contained in a BIT or OCTET STRING are facilitated by use of the ASN.1 extension marker "...". The original specification of a PDU type should normally include the extension marker at the end of the sequence of information elements contained.

Non-critical extensions at the end of the message or at the end of a field that is contained in a BIT or OCTET STRING are facilitated by use of an empty sequence that is marked OPTIONAL e.g. as shown in the following example:

```asn1
-- /example/ ASN1START
RRCMessage-r8-IEs ::=     SEQUENCE {
  field1         InformationElement1,
  field2         InformationElement2,
  nonCriticalExtension     SEQUENCE {}      OPTIONAL
}
-- ASN1STOP
```

The ASN.1 section specifying the contents of a PDU type may be followed by a \textit{field description} table where a further description of, e.g., the semantic properties of the fields may be included. The general format of this table is shown in the example below. The field description table is absent in case there are no fields for which further description needs to be provided e.g. because the PDU does not include any fields, or because an IE is defined for each field while there is nothing specific regarding the use of this IE that needs to be specified.

<table>
<thead>
<tr>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field description</td>
</tr>
</tbody>
</table>

The field description table has one column. The header row shall contain the ASN.1 type identifier of the PDU type.
A.3.4 Information elements

Each IE (information element) type is specified in an ASN.1 section similar to the one shown in the example below.

```
-- /example/ ASN1START

PRACH-ConfigSIB ::= SEQUENCE {
    rootSequenceIndex     INTEGER (0..1023),
    prach-ConfigInfo     PRACH-ConfigInfo
}

PRACH-Config ::= SEQUENCE {
    rootSequenceIndex     INTEGER (0..1023),
    prach-ConfigInfo     PRACH-ConfigInfo     OPTIONAL -- Need ON
}

PRACH-ConfigInfo ::= SEQUENCE {
    prach-ConfigIndex     ENUMERATED {ffs},
    highSpeedFlag      ENUMERATED {ffs},
    zeroCorrelationZoneConfig   ENUMERATED {ffs}
}

-- ASN1STOP
```

IEs should be introduced whenever there are multiple fields for which the same set of values apply. IEs may also be defined for other reasons e.g. to break down a ASN.1 definition in to smaller pieces.

A group of closely related IE type definitions, like the IEs PRACH-ConfigSIB and PRACH-Config in this example, are preferably placed together in a common ASN.1 section. The IE type identifiers should in this case have a common base, defined as the generic type identifier. It may be complemented by a suffix to distinguish the different variants. The "PRACH-Config" is the generic type identifier in this example, and the "SIB" suffix is added to distinguish the variant. The sub-clause heading and generic references to a group of closely related IEs defined in this way should use the generic type identifier.

The same principle should apply if a new version, or an extension version, of an existing IE is created for critical or non-critical extension of the protocol (see sub-clause A.4). The new version, or the extension version, of the IE is included in the same ASN.1 section defining the original. A suffix is added to the type identifier, using the naming conventions defined in sub-clause A.3.1.2, indicating the release or version of the where the new version, or extension version, was introduced.

Local IE type definitions, like the IE PRACH-ConfigInfo in the example above, may be included in the ASN.1 section and be referenced in the other IE types defined in the same ASN.1 section. The use of locally defined IE types should be encouraged, as a tool to break up large and complex IE type definitions. It can improve the readability of the code. There may also be a benefit for the software implementation of the protocol end-points, as these IE types are typically provided by the ASN.1 compiler as independent data elements, to be used in the software implementation.

An IE type defined in a local context, like the IE PRACH-ConfigInfo, should not be referenced directly from other ASN.1 sections in the RRC specification. An IE type which is referenced in more than one ASN.1 section should be defined in a separate sub-clause, with a separate heading and a separate ASN.1 section (possibly as one in a set of closely related IE types, like the IEs PRACH-ConfigSIB and PRACH-Config in the example above). Such IE types are also referred to as 'global IEs'.

NOTE: Referring to an IE type, that is defined as a local IE type in the context of another ASN.1 section, does not generate an ASN.1 compilation error. Nevertheless, using a locally defined IE type in that way makes the IE type definition difficult to find, as it would not be visible at an outline level of the specification. It should be avoided.

The ASN.1 section specifying the contents of one or more IE types, like in the example above, may be followed by a field description table, where a further description of, e.g., the semantic properties of the fields of the information elements may be included. This table may be absent, similar as indicated in sub-clause A.3.3 for the specification of the
PDU type. The general format of the field description table is the same as shown in sub-clause A.3.3 for the specification of the PDU type.

## A.3.5 Fields with optional presence

A field with optional presence may be declared with the keyword DEFAULT. It identifies a default value to be assumed, if the sender does not include a value for that field in the encoding:

```asciidoc
PreambleInfo ::=     SEQUENCE {
    numberOfRA-Preambles    INTEGER (1..64)      DEFAULT 1,
    ...
}
```

Alternatively, a field with optional presence may be declared with the keyword OPTIONAL. It identifies a field for which a value can be omitted. The omission carries semantics, which is different from any normal value of the field:

```asciidoc
PRACH-Config ::=    SEQUENCE {
    rootSequenceIndex     INTEGER (0..1023),
    prach-ConfigInfo     PRACH-ConfigInfo     OPTIONAL -- Need ON
}
```

The semantics of an optionally present field, in the case it is omitted, should be indicated at the end of the paragraph including the keyword OPTIONAL, using a short comment text with a need statement. The need statement includes the keyword "Need", followed by one of the predefined semantics tags (OP, ON or OR) defined in sub-clause 6.1. If the semantics tag OP is used, the semantics of the absent field are further specified either in the field description table following the ASN.1 section, or in procedure text.

The addition of OPTIONAL keywords for capability groups is based on the following guideline. If there is more than one field in the lower level IE, then OPTIONAL keyword is added at the group level. If there is only one field in the lower level IE, OPTIONAL keyword is not added at the group level.

## A.3.6 Fields with conditional presence

A field with conditional presence is declared with the keyword OPTIONAL. In addition, a short comment text shall be included at the end of the paragraph including the keyword OPTIONAL. The comment text includes the keyword "Cond", followed by a condition tag associated with the field ("UL" in this example):

```asciidoc
LogicalChannelConfig ::=   SEQUENCE {
    ul-SpecificParameters    SEQUENCE {
            priority       INTEGER (0),
            ...
    }  OPTIONAL                 -- Cond UL
}
```

When conditionally present fields are included in an ASN.1 section, the field description table after the ASN.1 section shall be followed by a conditional presence table. The conditional presence table specifies the conditions for including the fields with conditional presence in the particular ASN.1 section.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL</td>
<td>Specification of the conditions for including the field associated with the condition tag = &quot;UL&quot;. Semantics in case of optional presence under certain conditions may also be specified.</td>
</tr>
</tbody>
</table>
The conditional presence table has two columns. The first column (heading: "Conditional presence") contains the condition tag (in italic font style), which links the fields with a condition tag in the ASN.1 section to an entry in the table. The second column (heading: "Explanation") contains a text specification of the conditions and requirements for the presence of the field. The second column may also include semantics, in case of an optional presence of the field, under certain conditions i.e. using the same predefined tags as defined for optional fields in A.3.5.

Conditional presence should primarily be used when presence of a field depends on the presence and/or value of other fields within the same message. If the presence of a field depends on whether another feature/ function has been configured, while this function can be configured independently e.g. by another message and/or at another point in time, the relation is best reflected by means of a statement in the field description table.

If the ASN.1 section does not include any fields with conditional presence, the conditional presence table shall not be included.

Whenever a field is only applicable in specific cases e.g. TDD, use of conditional presence should be considered.

A.3.7 Guidelines on use of lists with elements of SEQUENCE type

Where an information element has the form of a list (the SEQUENCE OF construct in ASN.1) with the type of the list elements being a SEQUENCE data type, an information element shall be defined for the list elements even if it would not otherwise be needed.

For example, a list of PLMN identities with reservation flags is defined as in the following example:

```ASN1
PLMN-IdentityInfoList ::= SEQUENCE (SIZE (1..6)) OF PLMN-IdentityInfo
PLMN-IdentityInfo ::= SEQUENCE {
  plmn-Identity PLMN-Identity,
  cellReservedForoperatorUse ENUMERATED {reserved, notReserved}
}
```

This is preferable to the following (bad) example, which may cause generated code to contain types with unpredictable names:

```ASN1
PLMN-IdentityList ::= SEQUENCE (SIZE (1..6)) OF SEQUENCE {
  plmn-Identity PLMN-Identity,
  cellReservedForoperatorUse ENUMERATED {reserved, notReserved}
}
```

A.4 Extension of the PDU specifications

A.4.1 General principles to ensure compatibility

It is essential that extension of the protocol does not affect interoperability i.e. it is essential that implementations based on different versions of the RRC protocol are able to interoperate. In particular, this requirement applies for the following kind of protocol extensions:

- Introduction of new PDU types (i.e. these should not cause unexpected behaviour or damage).
- Introduction of additional fields in an extensible PDUs (i.e. it should be possible to ignore uncomprehended extensions without affecting the handling of the other parts of the message).
- Introduction of additional values of an extensible field of PDUs. If used, the behaviour upon reception of an uncomprehended value should be defined.

It should be noted that the PDU extension mechanism may depend on the logical channel used to transfer the message e.g. for some PDUs an implementation may be aware of the protocol version of the peer in which case selective ignoring of extensions may not be required.
The non-critical extension mechanism is the primary mechanism for introducing protocol extensions i.e. the critical extension mechanism is used merely when there is a need to introduce a 'clean' message version. Such a need appears when the last message version includes a large number of non-critical extensions, which results in issues like readability, overhead associated with the extension markers. The critical extension mechanism may also be considered when it is complicated to accommodate the extensions by means of non-critical extension mechanisms.

### A.4.2 Critical extension of messages and fields

The mechanisms to critically extend a message are defined in A.3.3. There are both "outer branch" and "inner branch" mechanisms available. The "outer branch" consists of a CHOICE having the name criticalExtensions, with two values, c1 and criticalExtensionsFuture. The criticalExtensionsFuture branch consists of an empty SEQUENCE, while the c1 branch contains the "inner branch" mechanism.

The "inner branch" structure is a CHOICE with values of the form "MessageName-rX-IEs" (e.g., "RRCConnectionReconfiguration-r8-IEs") or "spareX", with the spare values having type NULL. The "-rX-IEs" structures contain the complete structure of the message IEs for the appropriate release; i.e., the critical extension branch for the Rel-10 version of a message includes all Rel-8 and Rel-9 fields (that are not obviated in the later version), rather than containing only the additional Rel-10 fields.

The following guidelines may be used when deciding which mechanism to introduce for a particular message, i.e. only an 'outer branch', or an 'outer branch' in combination with an 'inner branch' including a certain number of spares:

- For certain messages, e.g. initial uplink messages, messages transmitted on a broadcast channel, critical extension may not be applicable.
- An outer branch may be sufficient for messages not including any fields.
- The number of spares within inner branch should reflect the likelihood that the message will be critically extended in future releases (since each release with a critical extension for the message consumes one of the spare values). The estimation of the critical extension likelyhood may be based on the number, size and changeability of the fields included in the message.
- In messages where an inner branch extension mechanism is available, all spare values of the inner branch should be used before any critical extensions are added using the outer branch.

The following example illustrates the use of the critical extension mechanism by showing the ASN.1 of the original and of a later release

```asciidoc
-- /example/ ASN1START     -- Original release
RRCMessage ::=       SEQUENCE {
    rrc-TransactionIdentifier    RRC-TransactionIdentifier,  
    criticalExtensions     CHOICE {
        c1         CHOICE{
            rrcMessage-r8      RRCMessage-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}
-- /example/ ASN1END

-- /example/ ASN1START     -- Later release
RRCMessage ::=       SEQUENCE {
    rrc-TransactionIdentifier    RRC-TransactionIdentifier,  
    criticalExtensions     CHOICE {
        c1         CHOICE{
            rrcMessage-r8      RRCMessage-r8-IEs,  
            rrcMessage-r10     RRCMessage-r10-IEs,  
            rrcMessage-r11     RRCMessage-r11-IEs,  
            rrcMessage-r14     RRCMessage-r14-IEs
        },
        later       CHOICE {
            c2         CHOICE{
                rrcMessage-r16     RRCMessage-r16-IEs,  
                spare7 NULL, spare6 NULL, spare5 NULL, spare4 NULL,  
                spare3 NULL, spare2 NULL, spare1 NULL
            }
        }
    }
}
-- /example/ ASN1END
```
It is important to note that critical extensions may also be used at the level of individual fields i.e. a field may be replaced by a critically extended version. When sending the extended version, the original version may also be included (e.g. original field is mandatory, EUTRAN is unaware if UE supports the extended version). In such cases, a UE supporting both versions may be required to ignore the original field. The following example illustrates the use of the critical extension mechanism by showing the ASN.1 of the original and of a later release.

```
-- /example/ ASN1START
-- Original release

RRCMessage ::= SEQUENCE {
    rrc-TransactionIdentifier    RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        c1                     CHOICE{
            rrcMessage-r8      RRCMessage-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}
    }
}

RRCMessage-rN-IEs ::= SEQUENCE {
    field1-rN       ENUMERATED {
        value1, value2, value3, value4} OPTIONAL, -- Need ON
    field2-rN       InformationElement2-rN    OPTIONAL, -- Need ON
    nonCriticalExtension    RRCConnectionReconfiguration-vMxy-IEs OPTIONAL
}

RRCConnectionReconfiguration-vMxy-IEs ::= SEQUENCE {
    field2-rM       InformationElement2-rM   OPTIONAL, -- Cond NoField2rN
    nonCriticalExtension    SEQUENCE {}      OPTIONAL
}

-- /example/ ASN1STOP
```

### Conditional presence

<table>
<thead>
<tr>
<th>NoField2rN</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The field is optionally present, need ON, if field2-rN is absent. Otherwise the field is not present</td>
</tr>
</tbody>
</table>

Finally, it is noted that a critical extension may be introduced in the same release as the one in which the original field was introduced e.g. to correct an essential ASN.1 error. In such cases a UE capability may be introduced, to assist E-UTRAN in deciding whether or not to use the critically extension.

## A.4.3 Non-critical extension of messages

### A.4.3.1 General principles

The mechanisms to extend a message in a non-critical manner are defined in A.3.3. W.r.t. the use of extension markers, the following additional guidelines apply:

- When further non-critical extensions are added to a message that has been critically extended, the inclusion of these non-critical extensions in earlier critical branches of the message should be avoided when possible.

- The extension marker ("...") is the primary non-critical extension mechanism that is used unless a length determinant is not required. Examples of cases where a length determinant is not required:
  - at the end of a message,
  - at the end of a structure contained in a BIT STRING or OCTET STRING
- When an extension marker is available, non-critical extensions are preferably placed at the location (e.g. the IE) where the concerned parameter belongs from a logical/functional perspective (referred to as the 'default extension location').

- It is desirable to aggregate extensions of the same release or version of the specification into a group, which should be placed at the lowest possible level.

- In specific cases it may be preferable to place extensions elsewhere (referred to as the 'actual extension location') e.g. when it is possible to aggregate several extensions in a group. In such a case, the group should be placed at the lowest suitable level in the message. <TBD: ref to separate example>

- In case placement at the default extension location affects earlier critical branches of the message, locating the extension at a following higher level in the message should be considered.

- In case an extension is not placed at the default extension location, an IE should be defined. The IE's ASN.1 definition should be placed in the same ASN.1 section as the default extension location. In case there are intermediate levels in-between the actual and the default extension location, an IE may be defined for each level. Intermediate levels are primarily introduced for readability and overview. Hence intermediate levels need not always be introduced e.g. they may not be needed when the default and the actual extension location are within the same ASN.1 section. <TBD: ref to separate example>

A.4.3.2 Further guidelines

Further to the general principles defined in the previous section, the following additional guidelines apply regarding the use of extension markers:

- Extension markers within SEQUENCE
  - Extension markers are primarily, but not exclusively, introduced at the higher nesting levels
  - Extension markers are introduced for a SEQUENCE comprising several fields as well as for information elements whose extension would result in complex structures without it (e.g. re-introducing another list)
  - Extension markers are introduced to make it possible to maintain important information structures e.g. parameters relevant for one particular RAT
  - Extension markers are also used for size critical messages (i.e. messages on BCCH, BR-BCCH, PCCH and CCCH), although introduced somewhat more carefully
  - The extension fields introduced (or frozen) in a specific version of the specification are grouped together using double brackets.

- Extension markers within ENUMERATED
  - Spare values are used until the number of values reaches the next power of 2, while the extension marker caters for extension beyond that limit
  - A suffix of the form "vXYZ" is used for the identifier of each new value, e.g. "value-vXYZ".

- Extension markers within CHOICE:
  - Extension markers are introduced when extension is foreseen and when comprehension is not required by the receiver i.e. behaviour is defined for the case where the receiver cannot comprehend the extended value (e.g. ignoring an optional CHOICE field). It should be noted that defining the behaviour of a receiver upon receiving a not comprehended choice value is not required if the sender is aware whether or not the receiver supports the extended value.
  - A suffix of the form "vXYZ" is used for the identifier of each new choice value, e.g. "choice-vXYZ".

Non-critical extensions at the end of a message/field contained in an OCTET or BIT STRING:

- When a nonCriticalExtension is actually used, a "Need" statement should not be provided for the field, which always is a group including at least one extension and a field facilitating further possible extensions. For simplicity, it is recommended not to provide a "Need" statement when the field is not actually used either.

Further, more general, guidelines:
In case a need statement is not provided for a group, a "Need" statement is provided for all individual extension fields within the group i.e. including for fields that are not marked as OPTIONAL. The latter is to clarify the action upon absence of the whole group.

A.4.3.3 Typical example of evolution of IE with local extensions

The following example illustrates the use of the extension marker for a number of elementary cases (sequence, enumerated, choice). The example also illustrates how the IE may be revised in case the critical extension mechanism is used.

NOTE In case there is a need to support further extensions of release n while the ASN.1 of release (n+1) has been frozen, without requiring the release n receiver to support decoding of release (n+1) extensions, more advanced mechanisms are needed e.g. including multiple extension markers.

```
-- /example/ ASN1START

InformationElement1 ::= SEQUENCE {
    field1        ENUMERATED {
      value1, value2, value3, value4-v880,
      ..., value5-v960 },
    field2        CHOICE {
      field2a        BOOLEAN,
      field2b        InformationElement2b,
      ...,
      field2c-v960  InformationElement2c-r9
    },
    ...,
    [[ field3-r9  InformationElement3-r9 OPTIONAL  -- Need OR
     ]],
    [[ field3-v9a0 InformationElement3-v9a0 OPTIONAL,  -- Need OR
      InformationElement4 OPTIONAL  -- Need OR
    ]]
}

InformationElement1-r10 ::= SEQUENCE {
    field1        ENUMERATED {
      value1, value2, value3, value4-v880,
      value5-v960, value6-v1170, spare2, spare1, ... },
    field2        CHOICE {
      field2a        BOOLEAN,
      field2b        InformationElement2b,
      field2c-v960  InformationElement2c-r9,
      ...,
      field2d-v12b0 INTEGER (0..63)
    },
    field3-r9    InformationElement3-r10 OPTIONAL, -- Need OR
    field4-r9    InformationElement4 OPTIONAL, -- Need OR
    field5-r10   BOOLEAN,
    field6-r10   InformationElement6-r10 OPTIONAL, -- Need OR
    ...,
    [[ field3-v1170 InformationElement3-v1170 OPTIONAL -- Need OR
     ]]
}
-- ASN1STOP
```

Some remarks regarding the extensions of InformationElement1 as shown in the above example:

- The InformationElement1 is initially extended with a number of non-critical extensions. In release 10 however, a critical extension is introduced for the message using this IE. Consequently, a new version of the IE InformationElement1 (i.e. InformationElement1-r10) is defined in which the earlier non-critical extensions are incorporated by means of a revision of the original field.

- The value4-v880 is replacing a spare value defined in the original protocol version for field1. Likewise value6-v1170 replaces spare3 that was originally defined in the r10 version of field1.

- Within the critically extended release 10 version of InformationElement1, the names of the original fields/ IEs are not changed, unless there is a real need to distinguish them from other fields/ IEs. E.g. the field1 and InformationElement4 were defined in the original protocol version (release 8) and hence not tagged. Moreover, the field3-r9 is introduced in release 9 and not re-tagged; although, the InformationElement3 is also critically extended and therefore tagged InformationElement3-r10 in the release 10 version of InformationElement1.
A.4.3.4 Typical examples of non critical extension at the end of a message

The following example illustrates the use of non-critical extensions at the end of the message or at the end of a field that is contained in a BIT or OCTET STRING i.e. when an empty sequence is used.

```
-- /example/ ASN1START
RRCMessage-r8-IEs ::= SEQUENCE {
  field1       InformationElement1,
  field2       InformationElement2,
  field3       InformationElement3     OPTIONAL, -- Need ON
  nonCriticalExtension   RRCMessage-v860-IEs     OPTIONAL
}
RRCMessage-v860-IEs ::= SEQUENCE {
  field4-v860      InformationElement4     OPTIONAL, -- Need OP
  field5-v860      BOOLEAN        OPTIONAL, -- Cond C54
  nonCriticalExtension   RRCMessage-v940-IEs     OPTIONAL
}
RRCMessage-v940-IEs ::= SEQUENCE {
  field6-v940      InformationElement6-r9     OPTIONAL, -- Need OR
  nonCriticalExtensions   SEQUENCE {}        OPTIONAL
}
-- ASN1STOP
```

Some remarks regarding the extensions shown in the above example:

– The InformationElement4 is introduced in the original version of the protocol (release 8) and hence no suffix is used.

A.4.3.5 Examples of non-critical extensions not placed at the default extension location

The following example illustrates the use of non-critical extensions in case an extension is not placed at the default extension location.

– ParentIE-WithEM

The IE ParentIE-WithEM is an example of a high level IE including the extension marker (EM). The root encoding of this IE includes two lower level IEs ChildIE1-WithoutEM and ChildIE2-WithoutEM which not include the extension marker. Consequently, non-critical extensions of the Child-IEs have to be included at the level of the Parent-IE.

The example illustrates how the two extension IEs ChildIE1-WithoutEM-vNx0 and ChildIE2-WithoutEM-vNx0 (both in release N) are used to connect non-critical extensions with a default extension location in the lower level IEs to the actual extension location in this IE.

```
ParentIE-WithEM information element

-- /example/ ASN1START
ParentIE-WithEM ::=     SEQUENCE {
  -- Root encoding, including:
  childIE1-WithoutEM     ChildIE1-WithoutEM    OPTIONAL,  -- Need ON
  childIE2-WithoutEM     ChildIE2-WithoutEM    OPTIONAL,  -- Need ON
  ...;
  [ [ childIE1-WithoutEM-vNx0     ChildIE1-WithoutEM-vNx0     OPTIONAL,  -- Need ON
    childIE2-WithoutEM-vNx0     ChildIE2-WithoutEM-vNx0     OPTIONAL,  -- Need ON
    ] ]
}
-- ASN1STOP
```

Some remarks regarding the extensions shown in the above example:

– The fields childIEx-WithoutEM-vNx0 may not really need to be optional (depends on what is defined at the next lower level).
In general, especially when there are several nesting levels, fields should be marked as optional only when there is a clear reason.

--- ChildIE1-WithoutEM

The IE ChildIE1-WithoutEM is an example of a lower level IE, used to control certain radio configurations including a configurable feature which can be setup or released using the local IE ChIE1-ConfigurableFeature. The example illustrates how the new field chIE1-NewField is added in release N to the configuration of the configurable feature. The example is based on the following assumptions:

- when initially configuring as well as when modifying the new field, the original fields of the configurable feature have to be provided also i.e. as if the extended ones were present within the setup branch of this feature.
- when the configurable feature is released, the new field should be released also.
- when omitting the original fields of the configurable feature the UE continues using the existing values (which is used to optimise the signalling for features that typically continue unchanged upon handover).
- when omitting the new field of the configurable feature the UE releases the existing values and discontinues the associated functionality (which may be used to support release of unsupported functionality upon handover to an eNB supporting an earlier protocol version).

The above assumptions, which affect the use of conditions and need codes, may not always apply. Hence, the example should not be re-used blindly.

**ChildIE1-WithoutEM information elements**

```asn1
ChildIE1-WithoutEM ::= SEQUENCE {
  -- Root encoding, including:
  ChIE1-ConfigurableFeature OPTIONAL -- Need ON
}

ChildIE1-WithoutEM-vNx0 ::= SEQUENCE {
  chIE1-ConfigurableFeature-vNx0 ChIE1-ConfigurableFeature-vNx0 OPTIONAL -- Cond ConfigF
}

ChIE1-ConfigurableFeature ::= CHOICE {
  release        NULL,
  setup        SEQUENCE {
    -- Root encoding
  }
}

ChIE1-ConfigurableFeature-vNx0 ::= SEQUENCE {
  chIE1-NewField-rN     INTEGER (0..31)
}
```

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ConfigF</td>
<td>The field is optional present, need OR, in case of chIE1-ConfigurableFeature is included and set to &quot;setup&quot;; otherwise the field is not present and the UE shall delete any existing value for this field.</td>
</tr>
</tbody>
</table>

--- ChildIE2-WithoutEM

The IE ChildIE2-WithoutEM is an example of a lower level IE, typically used to control certain radio configurations. The example illustrates how the new field chIE1-NewField is added in release N to the configuration of the configurable feature.

**ChildIE2-WithoutEM information element**

```asn1
ChildIE2-WithoutEM ::= SEQUENCE {
  -- Root encoding
}
```
A.5 Guidelines regarding inclusion of transaction identifiers in RRC messages

The following rules provide guidance on which messages should include a Transaction identifier:

1: DL messages on CCCH that move UE to RRC-Idle should not include the RRC transaction identifier.
2: All network initiated DL messages by default should include the RRC transaction identifier.
3: All UL messages that are direct response to a DL message with an RRC Transaction identifier should include the RRC Transaction identifier.
4: All UL messages that require a direct DL response message should include an RRC transaction identifier.
5: All UL messages that are not in response to a DL message nor require a corresponding response from the network should not include the RRC Transaction identifier.

A.6 Protection of RRC messages (informative)

The following list provides information which messages can be sent (unprotected) prior to security activation and which messages can be sent unprotected after security activation. Those messages indicated "-" in "P" column should never be sent unprotected by eNB or UE. Further requirements are defined in the procedural text.

P…Messages that can be sent (unprotected) prior to security activation
A - I…Messages that can be sent without integrity protection after security activation
A - C…Messages that can be sent unciphered after security activation
NA… Message can never be sent after security activation
<table>
<thead>
<tr>
<th>Message</th>
<th>P</th>
<th>A-I</th>
<th>A-C</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSFBParametersRequestCDMA2000</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CSFBParametersResponseCDMA2000</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CounterCheck</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>CounterCheckResponse</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>DelayBudgetReport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>DLInformationTransfer</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>HandoverFromEUTRAPreparationRequest(CDMA2000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>lnDeviceCoexIndication</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>InterFreqRSTDMeasurementIndication</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>LoggedMeasurementsConfiguration</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>MasterInformationBlock</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>MBMSCountingRequest</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>MBMSCountingResponse</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>MBMSInterestsIndication</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>MBSFNAreaConfiguration</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>MeasurementReport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Measurement configuration may be sent prior to security activation. But: In order to protect privacy of UEs, MEASUREMENT REPORT is only sent from the UE after successful security activation.</td>
</tr>
<tr>
<td>MobilityFromEUTRACommand</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Paging</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>ProximityIndication</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RNReconfiguration</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RNReconfigurationComplete</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionReconfiguration</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>The message shall not be sent unprotected before security activation if it is used to perform handover or to establish SRB2, SRB4 and DRBs</td>
</tr>
<tr>
<td>RRCConnectionReconfigurationComplete</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Unprotected, if sent as response to RRCConnectionReconfiguration which was sent before security activation</td>
</tr>
<tr>
<td>RRCConnectionReestablishment</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>This message is not protected by PDCP operation.</td>
</tr>
<tr>
<td>RRCConnectionReestablishmentComplete</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionReestablishmentReject</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>One reason to send this may be that the security context has been lost, therefore sent as unprotected.</td>
</tr>
<tr>
<td>RRCConnectionReestablishmentRequest</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>This message is not protected by PDCP operation. However, a short MAC-I is included.</td>
</tr>
<tr>
<td>RRCConnectionReject</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td>Justification for P: If the RRC connection only for signalling not requiring DRBs or ciphered messages, or the signalling connection has to be released prematurely, this message is sent as unprotected. For UP-EDT, the message is only sent after successful security activation. If redirectedCarrierInfo is set geran, the message is only sent after successful security activation when UE is connected to 5GC.</td>
</tr>
<tr>
<td>RRCConnectionRequest</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionRelease</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Message</td>
<td>P</td>
<td>A-I</td>
<td>A-C</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---</td>
<td>-----</td>
<td>-----</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>RRCConnectionResume</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>When this message is transmitted, security is activated but suspended. Integrity verification is done after the message received by RRC. For UP-EDT, the message is only sent after successful security activation. For RRC_INACTIVE state, the message is protected with both integrity and ciphering.</td>
</tr>
<tr>
<td>RRCConnectionResumeRequest</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>This message is not protected by PDCP operation. However, a short MAC-I is included.</td>
</tr>
<tr>
<td>RRCConnectionResumeComplete</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionSetup</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRCConnectionSetupComplete</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RCCEarlyDataRequest</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RCCEarlyDataComplete</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>SCGFailureInformation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SCGFailureInformationNR</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SCPTMConfiguration</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>SecurityModeCommand</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td>Integrity protection applied, but no ciphering (integrity verification done after the message received by RRC)</td>
</tr>
<tr>
<td>SecurityModeComplete</td>
<td>-</td>
<td>NA</td>
<td>NA</td>
<td>Integrity protection applied, but no ciphering. Ciphering is applied after completing the procedure.</td>
</tr>
<tr>
<td>SecurityModeFailure</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td>Neither integrity protection nor ciphering applied.</td>
</tr>
<tr>
<td>SidelinkUEInformation</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>SystemInformation</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>SystemInformationBlockType1</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>UEAssistanceInformation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UECapabilityEnquiry</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UECapabilityInformation</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UEInformationRequest</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>UEInformationResponse</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>In order to protect privacy of UEs, UEInformationResponse is only sent from the UE after successful security activation</td>
</tr>
<tr>
<td>ULHandoverPreparationTransfer (CDMA2000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>This message should follow HandoverFromEUTRANPreparationRequest</td>
</tr>
<tr>
<td>ULInformationTransfer</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>ULInformationTransferMRDC</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>WLANConnectionStatusReport</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

A.7 Miscellaneous

The following miscellaneous conventions should be used:

- References: Whenever another specification is referenced, the specification number and optionally the relevant subclause, table or figure, should be indicated in addition to the pointer to the References section e.g. as follows: 'see TS 36.212 [22, 5.3.3.1.6].'

- UE capabilities: TS 36.306 [5] specifies that E-UTRAN should in general respect the UE's capabilities. Hence there is no need to include statement clarifying that E-UTRAN, when setting the value of a certain configuration field, shall respect the related UE capabilities unless there is a particular need e.g. particularly complicated cases.
Annex B (normative):
Release 8 and 9 AS feature handling

B.1 Feature group indicators

This annex contains the definitions of the bits in fields featureGroupIndicators (in Table B.1-1) and featureGroupIndRel9Add (in Table B.1-1a).

In this release of the protocol, the UE shall include the fields featureGroupIndicators in the IE UE-EUTRA-Capability and featureGroupIndRel9Add in the IE UE-EUTRA-Capability-v9a0. All the functionalities defined within the field featureGroupIndicators defined in Table B.1-1 or Table B.1-1a are mandatory for the UE (with exceptions for category M1 and M2 UEs), if the related capability (frequency band, RAT, SR-VCC or Inter-RAT ANR) is also supported. For a specific indicator, if all functionalities for a feature group listed in Table B.1-1 have been implemented and tested, the UE shall set the indicator as one (1), else (i.e. if any one of the functionalities in a feature group listed in Table B.1-1 or Table B.1-1a, which have not been implemented or tested), the UE shall set the indicator as zero (0).

The UE shall set all indicators that correspond to RATs not supported by the UE as zero (0).

The UE shall set all indicators, which do not have a definition in Table B.1-1 or Table B.1-1a, as zero (0).

If the optional fields featureGroupIndicators or featureGroupIndRel9Add are not included by a UE of a future release, the network may assume that all features pertaining to the RATs supported by the UE, respectively listed in Table B.1-1 or Table B.1-1a and deployed in the network, have been implemented and tested by the UE.

In Table B.1-1, a 'VoLTE capable UE' corresponds to a UE which is IMS voice capable and a 'MCPTT capable UE' corresponds to a UE which supports MCPTT voice application as defined in TS 23.179 [73].

The indexing in Table B.1-1a starts from index 33, which is the leftmost bit in the field featureGroupIndRel9Add.

<table>
<thead>
<tr>
<th>Index of indicator (bit number)</th>
<th>Definition (description of the supported functionality, if indicator set to one)</th>
<th>Notes</th>
<th>If indicated &quot;Yes&quot; the feature shall be implemented and successfully tested for this version of the specification</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
</table>
| 1                               | - Intra-subframe frequency hopping for PUSCH scheduled by UL grant
- DCI format 3a (TPC commands for PUCCH and PUSCH with single bit power adjustments)
- Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI
- Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-2 – UE selected subband CQI with multiple PMI | - set to 1 by category M1 and M2 UEs that have implemented and successfully tested "Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI" |
|                                 |                                                                                 |       | Yes                                                                                                              |              |
| 2                               | - Simultaneous CQI and ACK/NACK on PUCCH, i.e. PUCCH format 2a and 2b
- Absolute TPC command for PUSCH
- Resource allocation type 1 for PDSCH
- Periodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI
- Periodic CQI/PMI/RI reporting on PUSCH: Mode 2-1 – UE selected subband CQI with single PMI | - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. |
|                                 |                                                                                 |       | Yes                                                                                                              |              |
| 3                               | - 5bit RLC UM SN
- 7bit PDCP SN | - can only be set to 1 if the UE has set bit number 7 to 1. | Yes, if UE supports VoLTE, MCPTT, or both. | No  |
<p>| | | Yes, if UE supports SRVCC to EUTRAN from GERAN. |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>- Short DRX cycle</td>
<td>- can only be set to 1 if the UE has set bit number 5 to 1.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- not supported by category M1 or M2 UE</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>- Long DRX cycle</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>- DRX command MAC control element</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>- Prioritised bit rate</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>- RLC UM</td>
<td>- can only be set to 0 if the UE does neither support VoLTE nor MCPTT</td>
<td>Yes, if UE supports VoLTE, MCPTT, or both.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- if the UE supports both UTRAN FDD and UTRAN TDD</td>
<td>Yes, if UE supports SRVCC to EUTRAN from GERAN.</td>
</tr>
<tr>
<td>8</td>
<td>- EUTRA RRC_CONNECTED to UTRA FDD or UTRA TDD CELL_DCH PS handover, if the UE supports either only UTRAN FDD or only UTRAN TDD</td>
<td>- can only be set to 1 if the UE has set bit number 22 to 1</td>
<td>Yes (except for category M1 and M2 UEs) for FDD, if UE supports UTRA FDD.</td>
</tr>
<tr>
<td></td>
<td>- EUTRA RRC_CONNECTED to UTRA FDD CELL_DCH PS handover, if the UE supports both UTRAN FDD and UTRAN TDD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>- EUTRA RRC_CONNECTED to GERAN GSM_Dedicated handover</td>
<td>- related to SR-VCC</td>
<td>Yes (except for category M1 and M2 UEs), if UE supports SRVCC to EUTRAN from GERAN.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 23 to 1</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>- EUTRA RRC_CONNECTED to GERAN (Packet) Idle by Cell Change Order</td>
<td>- related to SR-VCC</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- EUTRA RRC_CONNECTED to GERAN (Packet) Idle by Cell Change Order with NACC (Network Assisted Cell Change)</td>
<td>- can only be set to 1 if the UE has set bit number 24 to 1</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>- EUTRA RRC_CONNECTED to CDMA2000 1xRTT CS Active handover</td>
<td>- related to SR-VCC</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 26 to 1</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>- EUTRA RRC_CONNECTED to CDMA2000 HRPD Active handover</td>
<td>- related to SR-VCC</td>
<td>Yes</td>
</tr>
<tr>
<td>13</td>
<td>- Inter-frequency handover (within FDD or TDD)</td>
<td>- can only be set to 1 if the UE has set bit number 25 to 1</td>
<td>Yes (except for category M1 and M2 UEs), unless UE only supports band 13</td>
</tr>
<tr>
<td>14</td>
<td>- Measurement reporting event: Event A4 – Neighbour &gt; threshold</td>
<td>- Measurement reporting event: Event A5 – Serving &lt; threshold1 &amp; Neighbour &gt; threshold2</td>
<td>Yes (except for category M1 and M2 UEs)</td>
</tr>
<tr>
<td></td>
<td>- Measurement reporting event: Event B1 – Neighbour &gt; threshold for UTRAN FDD or UTRAN TDD, if the UE supports either only UTRAN FDD or only UTRAN TDD and has set bit number 22 to 1</td>
<td>- can only be set to 1 if the UE has set at least one of the bit number 22, 23, 24, 26 or 39 to 1. - even if the UE sets bits 41, it shall still set bit 15 to 1 if measurement reporting event B1 is tested for all RATs supported by UE - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.</td>
<td>Yes for FDD, if UE supports only UTRAN FDD and does not support UTRAN TDD or GERAN or 1xRTT or HRPD</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>- Measurement reporting event: Event B1 – Neighbour &gt; threshold for GERAN, 1xRTT or HRPD, if the UE has set bit number 23, 24 or 26 to 1, respectively</td>
<td></td>
</tr>
</tbody>
</table>
### 16 Intra-frequency ANR features including:

- Intra-frequency periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells`
- Inter-frequency periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells`, if the UE has set bit number 25 to 1
- Inter-RAT periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells` for UTRAN FDD or UTRAN TDD, if the UE supports either only UTRAN FDD or only UTRAN TDD and has set bit number 22 to 1
- Inter-RAT periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells` for UTRAN FDD or UTRAN TDD, if the UE supports both UTRAN FDD and UTRAN TDD and has set bit number 22 or 39 to 1, respectively
- Inter-RAT periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells` for GERAN, 1xRTT or HRPD, if the UE has set bit number 23, 24 or 26 to 1, respectively.

NOTE: Event triggered periodical reporting (i.e., with `triggerType` set to `event` and with `reportAmount > 1`) is a mandatory functionality of event triggered reporting and therefore not the subject of this bit.

- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 17 Intra-frequency ANR features including:

- Intra-frequency periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells`
- Intra-frequency periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportCGI`

- can only be set to 1 if the UE has set bit number 5 to 1.
- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 18 Inter-frequency ANR features including:

- Inter-frequency periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportStrongestCells`
- Inter-frequency periodical measurement reporting where `triggerType` is set to `periodical` and `purpose` is set to `reportCGI`

- can only be set to 1 if the UE has set bit number 5 and bit number 25 to 1.
- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.

<table>
<thead>
<tr>
<th>Yes, unless UE only supports band 13</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Inter-RAT ANR features including:</td>
</tr>
<tr>
<td>----</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportStrongestCells</code> for GERAN, if the UE has set bit number 23 to 1.</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportStrongestCellsForSON</code> for UTRAN FDD or UTRAN TDD, if the UE supports either only UTRAN FDD or only UTRAN TDD and has set bit number 22 to 1.</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportStrongestCellsForSON</code> for UTRAN FDD or UTRAN TDD, if the UE supports both UTRAN FDD and UTRAN TDD and has set bit number 22 or 39 to 1, respectively.</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportStrongestCellsForSON</code> for 1xRTT or HRPD, if the UE has set bit number 24 or 26 to 1, respectively.</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportCGI</code> for UTRAN FDD or UTRAN TDD, if the UE supports either only UTRAN FDD or only UTRAN TDD and has set bit number 22 to 1.</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportCGI</code> for UTRAN FDD or UTRAN TDD, if the UE supports both UTRAN FDD and UTRAN TDD and has set bit number 22 or 39 to 1, respectively.</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where <code>triggerType</code> is set to <code>periodical and purpose</code> is set to <code>reportCGI</code> for GERAN, 1xRTT or HRPD, if the UE has set bit number 23, 24 or 26 to 1, respectively.</td>
</tr>
</tbody>
</table>

- can only be set to 1 if the UE has set bit number 5 to 1 and the UE has set at least one of the bit number 22, 23, 24 or 26 to 1.
- even if the UE sets bits 33 to 37, it shall still set bit 19 to 1 if inter-RAT ANR features are tested for all RATs for which inter-RAT measurement reporting is indicated as tested.
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 20 | If bit number 7 is set to 0:  
- SRB1 and SRB2 for DCCH + 8x AM DRB  
If bit number 7 is set to 1:  
- SRB1 and SRB2 for DCCH + 8x AM DRB  
- SRB1 and SRB2 for DCCH + 5x AM DRB + 3x UM DRB  
NOTE: UE which indicate support for a DRB combination also support all subsets of the DRB combination. Therefore, release of DRB(s) never results in an unsupported DRB combination. | - Regardless of what bit number 7 and bit number 20 is set to, UE shall support at least SRB1 and SRB2 for DCCH + 4x AM DRB  
- Regardless of what bit number 20 is set to, if bit number 7 is set to 1, UE shall support at least SRB1 and SRB2 for DCCH + 4x AM DRB + 1x UM DRB  
- If flexibleUM-AM-Combinations is included the UE shall support any combination of RLC UM and RLC AM bearers as long as the total number of bearers is at most 8, regardless of what FGI20 indicates | Yes |
| 21 | - Predefined intra- and inter-subframe frequency hopping for PUSCH with N_{sb} > 1  
- Predefined inter-subframe frequency hopping for PUSCH with N_{sb} > 1 | - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. | No |
| 22 | - UTRAN FDD or UTRAN TDD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode, if the UE supports either only UTRAN FDD or only UTRAN TDD  
- UTRAN FDD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode, if the UE supports both UTRAN FDD and UTRAN TDD | - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. | Yes for FDD, if UE supports UTRA FDD |
| 23 | - GERAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode | - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. | Yes |
| 24 | - 1xRTT measurements, reporting and measurement reporting event B2 in E-UTRA connected mode | - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. | Yes for FDD, if UE supports enhanced 1xRTT CSFB for FDD Yes for TDD, if UE supports enhanced 1xRTT CSFB for TDD |
| 25 | - Inter-frequency measurements and reporting in E-UTRA connected mode  
NOTE: The UE setting this bit to 1 and indicating support for FDD and TDD frequency bands in the UE capability signalling implements and is tested for FDD measurements while the UE is in TDD, and for TDD measurements while the UE is in FDD. | - A category M1 or M2 UE shall set this bit to 1 only if ceMeasurements-r14 is supported. | Yes, unless UE only supports band 13 |

ETSI
<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
<th>Condition</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>HRPD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode</td>
<td>- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.</td>
<td>Yes</td>
</tr>
<tr>
<td>27</td>
<td>EUTRA RRC_CONNECTED to UTRA FDD or UTRA TDD CELL_DCH CS handover, if the UE supports either only UTRAN FDD or only UTRAN TDD</td>
<td>- related to SR-VCC - can only be set to 1 if the UE has set bit number 8 to 1 and supports SR-VCC from EUTRA defined in TS 24.008 [49] - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.</td>
<td>Yes</td>
</tr>
<tr>
<td>28</td>
<td>TTI bundling</td>
<td>- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.</td>
<td>Yes</td>
</tr>
<tr>
<td>29</td>
<td>Semi-Persistent Scheduling</td>
<td>- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.</td>
<td>Yes</td>
</tr>
<tr>
<td>30</td>
<td>Handover between FDD and TDD</td>
<td>- can only be set to 1 if the UE has set bit number 13 to 1</td>
<td>No</td>
</tr>
<tr>
<td>31</td>
<td>Indicates whether the UE supports the mechanisms defined for cells broadcasting multi band information i.e. comprehending multiBandInfoList, disregarding in RRC_CONNECTED the related system information fields and understanding the EARFCN signalling for all bands, that overlap with the bands supported by the UE, and that are defined in the earliest version of TS 36.101 [42] that includes all UE supported bands.</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>32</td>
<td>Undefined</td>
<td></td>
<td>No</td>
</tr>
</tbody>
</table>

**NOTE:** The column FDD/TDD diff indicates if the UE is allowed to signal different values for FDD and TDD.
Table B.1-1a: Definitions of feature group indicators
<table>
<thead>
<tr>
<th>Index of indicator (bit number)</th>
<th>Definition (description of the supported functionality, if indicator set to one)</th>
<th>Notes</th>
<th>If indicated &quot;Yes&quot; the feature shall be implemented and successfully tested for this version of the specification</th>
<th>FDD/ TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>33 (leftmost bit)</td>
<td>Inter-RAT ANR features for UTRAN FDD including:</td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 5 and bit number 22 to 1.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportStrongestCellsForSON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportCGI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Inter-RAT ANR features for GERAN including:</td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 5 and bit number 23 to 1.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportStrongestCells</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportCGI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Inter-RAT ANR features for 1xRTT including:</td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 5 and bit number 24 to 1.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportStrongestCellsForSON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportCGI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>Inter-RAT ANR features for HRPD including:</td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 5 and bit number 26 to 1.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportStrongestCellsForSON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportCGI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>Inter-RAT ANR features for UTRAN TDD including:</td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 5 and at least one of the bit number 22 (for UEs supporting only UTRA TDD) or the bit number 39 to 1.</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportStrongestCellsForSON</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Inter-RAT periodical measurement reporting where triggerType is set to periodical and purpose is set to reportCGI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>E-UTRA RRC_CONNECTED to UTRA TDD CELL_DCH PS handover, if the UE supports both UTRAN FDD and UTRAN TDD</td>
<td></td>
<td>- can only be set to 1 if the UE has set bit number 39 to 1</td>
<td>Yes</td>
</tr>
<tr>
<td>39</td>
<td>UTRAN TDD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode, if the UE supports both UTRAN FDD and UTRAN TDD</td>
<td></td>
<td>- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0.</td>
<td>Yes</td>
</tr>
<tr>
<td>Feature Group</td>
<td>Description</td>
<td>Setting of Feature Group Support Indicators</td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
<td>---------------------------------------------</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 40           | - EUTRA RRC_CONNECTED to UTRA TDD CELL_DCH CS handover, if the UE supports both UTRAN FDD and UTRAN TDD  
- related to SR-VCC  
- can only be set to 1 if the UE has set bit number 38 to 1 | Yes |
| 41           | Measurement reporting event: Event B1  
- Neighbour > threshold for UTRAN FDD, if the UE supports UTRAN FDD and has set bit number 22 to 1  
- If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. | Yes for FDD, unless UE has set bit number 15 to 1 |
| 42           | - DCI format 3a (TPC commands for PUCCH and PUSCH with single bit power adjustments)  
- If a category M1 or M2 UE supports this feature group, this bit shall be set to 1. For a UE of all other categories, this bit shall be set to 0. | Yes |
| 43           | Undefined |
| 44           | Undefined |
| 45           | Undefined |
| 46           | Undefined |
| 47           | Undefined |
| 48           | Undefined |
| 49           | Undefined |
| 50           | Undefined |
| 51           | Undefined |
| 52           | Undefined |
| 53           | Undefined |
| 54           | Undefined |
| 55           | Undefined |
| 56           | Undefined |
| 57           | Undefined |
| 58           | Undefined |
| 59           | Undefined |
| 60           | Undefined |
| 61           | Undefined |
| 62           | Undefined |
| 63           | Undefined |
| 64           | Undefined |

NOTE: The column FDD/ TDD diff indicates if the UE is allowed to signal different values for FDD and TDD. Annex E specifies for which TDD and FDD serving cells a UE supporting TDD/FDD CA shall support a feature for which it indicates support within the FGI signalling.

Clarification for mobility from EUTRAN and inter-frequency handover within EUTRAN

There are several feature groups related to mobility from E-UTRAN and inter-frequency handover within EUTRAN. The description of these features is based on the assumption that we have 5 main "functions" related to mobility from E-UTRAN:

A. Support of measurements and cell reselection procedure in idle mode
B. Support of RRC release with redirection procedure in connected mode
C. Support of Network Assisted Cell Change in connected mode
D. Support of measurements and reporting in connected mode
E. Support of handover procedure in connected mode

All functions can be applied for mobility to Inter-frequency to EUTRAN, GERAN, UTRAN, CDMA2000 HRPD and CDMA2000 1xRTT except for function C) which is only applicable for mobility to GERAN. Table B.1-2 below summarises the mobility functions that are supported based on the UE capability signaling (band support) and the setting of the feature group support indicators.
### Table B.1-2: Mobility from E-UTRAN

<table>
<thead>
<tr>
<th>Feature</th>
<th>GERAN</th>
<th>UTRAN</th>
<th>HRPD</th>
<th>1xRTT</th>
<th>EUTRAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Measurements and cell reselection procedure in E-UTRA idle mode</td>
<td>Supported if GERAN band support is indicated</td>
<td>Supported if UTRAN band support is indicated</td>
<td>Supported if CDMA2000 HRPD band support is indicated</td>
<td>Supported if CDMA2000 0 1xRTT band support is indicated</td>
<td>Supported for supported bands</td>
</tr>
<tr>
<td>B. RRC release with blind redirection procedure in E-UTRA connected mode</td>
<td>Supported if GERAN band support is indicated</td>
<td>Supported if UTRAN band support is indicated</td>
<td>Supported if CDMA2000 HRPD band support is indicated</td>
<td>Supported if CDMA2000 0 1xRTT band support is indicated</td>
<td>Supported for supported bands</td>
</tr>
<tr>
<td>C. Cell Change Order (with or without) Network Assisted Cell Change) in E-UTRA connected mode</td>
<td>Group 10</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>D. Inter-frequency/RAT measurements, reporting and measurement reporting event B2 (for inter-RAT) in E-UTRA connected mode</td>
<td>Group 23</td>
<td>Group 22/39</td>
<td>Group 26</td>
<td>Group 24</td>
<td>Group 25</td>
</tr>
<tr>
<td>E. Inter-frequency/RAT handover procedure in E-UTRA connected mode</td>
<td>Group 9 (GSM_connected handover) Separate UE capability bit defined in TS 36.306 [5] for PS handover</td>
<td>Group 8/38 (PS handover) or Group 27/40 (SRVCC handover)</td>
<td>Group 12</td>
<td>Group 11</td>
<td>Group 13 (within FDD or TDD) Group 30 (between FDD and TDD)</td>
</tr>
</tbody>
</table>

In case measurements and reporting function is not supported by UE, the network may still issue the mobility procedures redirection (B) and CCO (C) in a blind fashion.

### B.2 CSG support

In this release of the protocol, it is mandatory for the UE to support a minimum set of CSG functionality consisting of:

- Identifying whether a cell is CSG or not;
- Ignoring CSG cells in cell selection/reselection.

Additional CSG functionality in AS, i.e. the requirement to detect and camp on CSG cells when the "CSG whitelist" is available or when manual CSG selection is triggered by the user, are related to the corresponding NAS features. This additional AS functionality consists of:

- Manual CSG selection;
- Autonomous CSG search;
- Implicit priority handling for cell reselection with CSG cells.

It is possible that this additional CSG functionality in AS is not supported or tested in early UE implementations.

Note that since the above AS features relate to idle mode operations, the capability support is not signalled to the network. For these reasons, no "feature group indicator" is assigned to this feature to indicate early support in Rel-8.
Annex C (normative): Release 10 AS feature handling

C.1 Feature group indicators

This annex contains the definitions of the bits in field featureGroupIndRel10.

In this release of the protocol, the UE shall include the field featureGroupIndRel10 in the IE UE-EUTRA-Capability-v1020-IEs. All the functionalities defined within this field featureGroupIndRel10 defined in Table C.1-1 are mandatory for the UE, if the related capability (spatial multiplexing in UL, PDSCH transmission mode 9, carrier aggregation, handover to EUTRA, or RAT) is also supported. For a specific indicator, if all functionalities for a feature group listed in Table C.1-1 have been implemented and tested, the UE shall set the indicator as one (1), else (i.e. if any one of the functionalities in a feature group listed in Table C.1-1 have not been implemented or tested), the UE shall set the indicator as zero (0).

The UE shall set all indicators that correspond to RATs not supported by the UE as zero (0).

The UE shall set all indicators, which do not have a definition in Table C.1-1, as zero (0).

If the optional field featureGroupIndRel10 is not included by a UE of a future release, the network may assume that all features, listed in Table C.1-1 and deployed in the network, have been implemented and tested by the UE.

The indexing in Table C.1-1 starts from index 101, which is the leftmost bit in the field featureGroupIndRel10.

Table C.1-1: Definitions of feature group indicators

<table>
<thead>
<tr>
<th>Index of indicator (leftmost bit)</th>
<th>Definition (description of the supported functionality, if indicator set to one)</th>
<th>Notes</th>
<th>If indicated “Yes” the feature shall be implemented and successfully tested for this version of the specification</th>
<th>FDD/TDD diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>- DMRS with OCC (orthogonal cover code) and SGH (sequence group hopping) disabling</td>
<td>- if the UE supports two or more layers for spatial multiplexing in UL, this bit shall be set to 1.</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>- Trigger type 1 SRS (aperiodic SRS) transmission (Up to X ports)</td>
<td>NOTE: X = number of supported layers on given band</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>103</td>
<td>- PDSCH transmission mode 9 when up to 4 CSI reference signal ports are configured and when not operating in CE mode</td>
<td>- for Category 8 UEs, this bit shall be set to 1.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>- PDSCH transmission mode 9 for TDD when 8 CSI reference signal ports are configured and when not operating in CE mode</td>
<td>- if the UE does not support TDD, this bit is irrelevant (capability signalling exists for FDD for this feature), and this bit shall be set to 0.</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
| 105 | - Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-0 – UE selected subband CQI without PMI, when PDSCH transmission mode 9 is configured  
- Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-1 – UE selected subband CQI with single PMI, when PDSCH transmission mode 9 and up to 4 CSI reference signal ports are configured | - this bit can be set to 1 only if indices 2 (Table B.1-1) and 103 are set to 1.  
- For UEs capable of TDD-FDD CA, this bit can be set to 1 for both FDD and TDD if index 2 is set to 1 for both FDD and TDD, and index 103 is set to 1 for at least one of FDD and TDD duplex modes. | Yes |
| 106 | - Periodic CQI/PMI/RI/PTI reporting on PUCCH: Mode 2-1 – UE selected subband CQI with single PMI, when PDSCH transmission mode 9 and 8 CSI reference signal ports are configured | - this bit can be set to 1 only if the UE supports PDSCH transmission mode 9 with 8 CSI reference signal ports (i.e., for TDD, if index 104 is set to 1, and for FDD, if $tm9$-With-8Tx-FDD-r10 is set to 'supported') and if index 2 (Table B.1-1) is set to 1. - For UEs capable of TDD-FDD CA, this bit can be set to 1 for both FDD and TDD if at least one of index 104 and $tm9$-With-8Tx-FDD-r10 is set to 1'supported', and if index 2 is set to 1 for both FDD and TDD. | Yes |
| 107 | - Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI, when PDSCH transmission mode 9 is configured - Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-2 – UE selected subband CQI with multiple PMI, when PDSCH transmission mode 9 and up to 4 CSI reference signal ports are configured | - this bit can be set to 1 only if indices 1 (Table B.1-1) and 103 are set to 1. - For UEs capable of TDD-FDD CA, this bit can be set to 1 for both FDD and TDD if index 1 is set to 1 for both FDD and TDD, and index 103 is set to 1 for at least one of FDD and TDD duplex modes. | Yes |
| 108 | - Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-2 – UE selected subband CQI with multiple PMI, when PDSCH transmission mode 9 and 8 CSI reference signal ports are configured | - this bit can be set to 1 only if the UE supports PDSCH transmission mode 9 with 8 CSI reference signal ports (i.e., for TDD, if index 104 is set to 1, and for FDD, if $tm9$-With-8Tx-FDD-r10 is set to 'supported') and if index 1 (Table B.1-1) is set to 1. - For UEs capable of TDD-FDD CA, this bit can be set to 1 for both FDD and TDD if at least one of index 104 and $tm9$-With-8Tx-FDD-r10 is set to 1'supported', and if index 1 is set to 1 for both FDD and TDD. | Yes |
| 109 | - Periodic CQI/PMI/RI reporting on PUCCH Mode 1-1, submode 1 | - this bit can be set to 1 only if the UE supports PDSCH transmission mode 9 with 8 CSI reference signal ports (i.e., for TDD, if index 104 is set to 1, and for FDD, if $tm9$-With-8Tx-FDD-r10 is set to 'supported'). - For UEs capable of TDD-FDD CA, this bit can be set to 1 for both FDD and TDD if at least one of index 104 and $tm9$-With-8Tx-FDD-r10 is set to 1'supported'. | Yes |
| 110 | - Periodic CQI/PMI/RI reporting on PUCCH Mode 1-1, submode 2 | - this bit can be set to 1 only if the UE supports PDSCH transmission mode 9 with 8 CSI reference signal ports (i.e., for TDD, if index 104 is set to 1, and for FDD, if \(tm9-\text{With-8Tx-FDD-r10}\) is set to 'supported'). - For UEs capable of TDD-FDD CA, this bit can be set to 1 for both FDD and TDD if at least one of index 104 and \(tm9-\text{With-8Tx-FDD-r10}\) is set to 1/'supported'. | Yes |
| 111 | - Measurement reporting trigger Event A6 | - this bit can be set to 1 only if the UE supports carrier aggregation. | Yes |
| 112 | - SCell addition within the handover to EUTRA procedure | - this bit can be set to 1 only if the UE supports carrier aggregation and the handover to EUTRA procedure. | Yes |
| 113 | - Trigger type 0 SRS (periodic SRS) transmission on X Serving Cells | - this bit can be set to 1 only if the UE supports carrier aggregation in UL. | Yes |
| 114 | - Reporting of both UTRA CPICH RSCP and Ec/N0 in a Measurement Report | - this bit can be set to 1 only if index 22 (Table B.1-1) is set to 1. | No |
| 115 | - time domain ICIC RLM/RRM measurement subframe restriction for the serving cell - time domain ICIC RRM measurement subframe restriction for neighbour cells - time domain ICIC CSI measurement subframe restriction | - If a category M1 or M2 UE does not support this feature group, this bit shall be set to 0. | Yes |
| 116 | - Relative transmit phase continuity for spatial multiplexing in UL | - this bit can be set to 1 only if the UE supports two or more layers for spatial multiplexing in UL. | Yes |
| 117 | Undefined | | |
| 118 | Undefined | | |
| 119 | Undefined | | |
| 120 | Undefined | | |
| 121 | Undefined | | |
| 122 | Undefined | | |
| 123 | Undefined | | |
| 124 | Undefined | | |
| 125 | Undefined | | |
| 126 | Undefined | | |
| 127 | Undefined | | |
| 128 | Undefined | | |
| 129 | Undefined | | |
| 130 | Undefined | | |
| 131 | Undefined | | |
| 132 | Undefined | | |

**NOTE:** The column FDD/TDD diff indicates if the UE is allowed to signal different values for FDD and TDD. Annex E specifies for which TDD and FDD serving cells a UE supporting TDD/FDD CA shall support a feature for which it indicates support within the FGI signalling.
Annex D (informative):
Descriptive background information

D.1 Signalling of Multiple Frequency Band Indicators (Multiple FBI)

D.1.1 Mapping between frequency band indicator and multiple frequency band indicator

This subclause describes the use of the Multiple Frequency Band Indicator (MFBI) lists and the E-UTRA frequency bands in SystemInformationBlockType1 by means of an example as shown in Figure D.1.1-1. In this example:

- E-UTRAN cell belongs to band B90 and also bands B6, B7, B91, and B92.
- The freqBandIndicatorPriority field is not present in SystemInformationBlockType1.
- E-UTRAN uses B64 to indicate the presence of B90 in freqBandIndicator-v9e0.
- For the MFBI list of this cell, E-UTRAN uses B64 in MultiBandInfoList to indicate the position and priority of the bands in MultiBandInfoList-v9e0.
- The UE, after reading SystemInformationBlockType1, generates an MFBI list with priority of B91, B6, B92, and B7. If the UE supports the frequency band in the freqBandIndicator-v9e0 IE it applies that frequency band. Otherwise, the UE applies the first listed band in the MFBI list which it supports.

![Diagram](image)

Figure D.1.1-1: Mapping of frequency bands to MultiBandInfoList/MultiBandInfoList-v9e0

D.1.2 Mapping between inter-frequency neighbour list and multiple frequency band indicator

This subclause describes the use of the Multiple Frequency Band Indicator (MFBI) lists and the E-UTRA frequencies signalled in SystemInformationBlockType5 by means of an example as shown in Figure D.1.2-1. In this example:

- E-UTRAN includes 4 frequencies (EARFCNs): the bands associated with f1 and f4 belong to bands lower than 64; the bands associated with f2 and f3 belong to bands larger than 64. The reserved EARFCN value of 65535 is used to indicate the presence of ARFCN-ValueEUTRA-v9e0.
- The band associated with f1 has two overlapping bands, B1 and B2 (lower than 64); the band associated with f2 has one overlapping band, B91; the band associated with f3 has four overlapping bands B3, B4, B92, and B93; the band associated with f4 does not have overlapping bands.
- E-UTRAN includes 4 lists in both \textit{interFreqCarrierFreqList-v8h0} and \textit{interFreqCarrierFreqList-v9e0} and ensure the order of the lists is matching. Each list corresponds to one EARFCN and contains up to 8 bands. The first list corresponds to \( f_1 \), the second list corresponds to \( f_2 \), and so on. The grey lists mean not including \textit{MultiBandInfoList} or \textit{MultiBandInfoList-v9e0}, i.e. the corresponding EARFCN does not have any overlapping frequency bands in \textit{MultiBandInfoList} or \textit{MultiBandInfoList-v9e0}.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure.png}
\caption{Mapping of EARFCNs to MultiBandInfoList/MultiBandInfoList-v9e0}
\end{figure}

D.1.3 Mapping between UTRA FDD frequency list and multiple frequency band indicator

This subclause describes the use of the Multiple Frequency Band Indicator (MFBI) lists and the UTRA FDD frequencies signalled in \textit{SystemInformationBlockType6} by means of an example as shown in Figure D.1.3-1. In this example:

- E-UTRAN includes 4 UTRA FDD frequencies (UARFCNs).
- The bands associated with \( f_1 \) and \( f_4 \) have no overlapping bands. The band associated with \( f_2 \) has two overlapping bands, B1 and B2. The band associated with \( f_3 \) has one overlapping band, B3.
- E-UTRAN includes 4 lists in \textit{carrierFreqListUTRA-FDD-v8h0} with the first and fourth entry not including \textit{MultiBandInfoList}. 

Figure D.1.3-1: Mapping of UARFCNs to MultiBandInfoList
Annex E (normative):
TDD/FDD differentiation of FGIs/capabilities in TDD-FDD CA

Annex E specifies for which TDD and FDD serving cells a UE supporting TDD/FDD CA shall support a feature/capability for which it indicates support within the FGI/capability signalling.

A UE that indicates support for TDD/FDD CA:

- For the fields for which the UE is allowed to indicate different support for FDD and TDD, the UE shall support the feature on the PCell and/or SCell(s), as specified in tables E-1, E-2 and E-3 in accordance to the following rules:
  - PCell: the UE shall support the feature for the PCell, if the UE indicates support of the feature for the PCell duplex mode;
  - SCell: the UE shall support the feature for SCell(s), if the UE indicates support of the feature for the SCell duplex mode;
  - Per serving cell: the UE shall support the feature for a serving cell if the UE indicates support of the feature for the serving cell's duplex mode;
  - All serving cells: UE shall support the feature if the UE indicates support of the feature for both TDD and FDD duplex modes;
- For the fields where the UE is not allowed to indicate different support for FDD and TDD, the UE shall support the feature for PCell and SCell(s) if the UE indicates support of the feature via the common FGI/capability bit.

Table E-1: Rel-8/9 FGIs for which FDD/TDD differentiation is allowed (from Annex B)

<table>
<thead>
<tr>
<th>Index of indicator</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>2</td>
<td>All serving cells</td>
</tr>
<tr>
<td>4</td>
<td>All serving cells</td>
</tr>
<tr>
<td>8</td>
<td>PCell</td>
</tr>
<tr>
<td>9</td>
<td>PCell</td>
</tr>
<tr>
<td>10</td>
<td>PCell</td>
</tr>
<tr>
<td>11</td>
<td>PCell</td>
</tr>
<tr>
<td>12</td>
<td>PCell</td>
</tr>
<tr>
<td>15</td>
<td>PCell</td>
</tr>
<tr>
<td>19</td>
<td>PCell</td>
</tr>
<tr>
<td>22</td>
<td>PCell</td>
</tr>
<tr>
<td>23</td>
<td>PCell</td>
</tr>
<tr>
<td>24</td>
<td>PCell</td>
</tr>
<tr>
<td>26</td>
<td>PCell</td>
</tr>
<tr>
<td>27</td>
<td>PCell</td>
</tr>
<tr>
<td>28</td>
<td>PCell</td>
</tr>
<tr>
<td>29</td>
<td>PCell</td>
</tr>
<tr>
<td>33</td>
<td>PCell</td>
</tr>
<tr>
<td>34</td>
<td>PCell</td>
</tr>
<tr>
<td>35</td>
<td>PCell</td>
</tr>
<tr>
<td>36</td>
<td>PCell</td>
</tr>
<tr>
<td>37</td>
<td>PCell</td>
</tr>
<tr>
<td>38</td>
<td>PCell</td>
</tr>
<tr>
<td>39</td>
<td>PCell</td>
</tr>
<tr>
<td>40</td>
<td>PCell</td>
</tr>
<tr>
<td>41</td>
<td>PCell</td>
</tr>
</tbody>
</table>
Table E-2: Rel-10 FGIIs for which FDD/TDD differentiation is allowed (from Annex C)

<table>
<thead>
<tr>
<th>Index of indicator</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>102</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>103</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>105</td>
<td>All serving cells</td>
</tr>
<tr>
<td>106</td>
<td>All serving cells</td>
</tr>
<tr>
<td>107</td>
<td>All serving cells</td>
</tr>
<tr>
<td>108</td>
<td>All serving cells</td>
</tr>
<tr>
<td>109</td>
<td>All serving cells</td>
</tr>
<tr>
<td>110</td>
<td>All serving cells</td>
</tr>
<tr>
<td>111</td>
<td>SCell</td>
</tr>
<tr>
<td>112</td>
<td>PCell</td>
</tr>
<tr>
<td>113</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>115</td>
<td>PCell</td>
</tr>
<tr>
<td>116</td>
<td>Per serving cell</td>
</tr>
</tbody>
</table>

Table E-3: Rel-12 UE-EUTRA capabilities for which FDD/TDD differentiation is allowed

<table>
<thead>
<tr>
<th>UE-EUTRA-Capability</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>crossCarrierScheduling</td>
<td>All serving cells</td>
</tr>
<tr>
<td>e-CSFB-1XRTT</td>
<td>PCell</td>
</tr>
<tr>
<td>e-CSFB-ConcPS-Mob1XRTT</td>
<td>PCell</td>
</tr>
<tr>
<td>e-CSFB-dual-1XRTT</td>
<td>PCell</td>
</tr>
<tr>
<td>ePDCCH</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>e-RedirectionUTRA</td>
<td>PCell</td>
</tr>
<tr>
<td>e-RedirectionUTRA-TDD</td>
<td>PCell</td>
</tr>
<tr>
<td>inDeviceCoexInd</td>
<td>All serving cells</td>
</tr>
<tr>
<td>interFreqRSTD-Measurement</td>
<td>PCell</td>
</tr>
<tr>
<td>interFreqSI-AcquisitionForHO</td>
<td>PCell</td>
</tr>
<tr>
<td>interRAT-PS-HO-ToGERAN</td>
<td>PCell</td>
</tr>
<tr>
<td>intraFreqSI-AcquisitionForHO</td>
<td>PCell</td>
</tr>
<tr>
<td>mbms-Scell</td>
<td>SCell</td>
</tr>
<tr>
<td>mbms-NonServingCell</td>
<td>SCell</td>
</tr>
<tr>
<td>multiACK-CSIreporting</td>
<td>PCell</td>
</tr>
<tr>
<td>multiClusterPUSCH-WithinCC</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>oldoa-UE-Assisted</td>
<td>PCell</td>
</tr>
<tr>
<td>pmi-Disabling</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>rsrqMeasWideband</td>
<td>Per serving cell</td>
</tr>
<tr>
<td>simultaneousPUSCH-PUSCH</td>
<td>All serving cells</td>
</tr>
<tr>
<td>ss-CCH-InterHandl</td>
<td>PCell</td>
</tr>
<tr>
<td>txDiv-PUCCH1b-ChSelect</td>
<td>PCell</td>
</tr>
<tr>
<td>ue-TxAntennaSelectionSupported</td>
<td>All serving cells</td>
</tr>
<tr>
<td>utran-SI-AcquisitionForHO</td>
<td>PCell</td>
</tr>
</tbody>
</table>
Annex F (normative):  
UE requirements on ASN.1 comprehension

This subclause specifies UE requirements regarding the ASN.1 transfer syntax support i.e. the ASN.1 definitions to be comprehended by the UE.

A UE that indicates release X in field `accessStratumRelease` shall comprehend the entire transfer syntax (ASN.1) of release X, in particular at least the first version upon ASN.1 freeze. The UE is however not required to support dedicated signalling related transfer syntax associated with optional features it does not support.

In case a UE that indicates release X in field `accessStratumRelease` supports a feature specified in release X+ N (i.e. early UE implementation) additional requirements apply.

Cricital extensions (dedicated signaling)

If the early implemented feature involves one or more critical extensions (i.e. case of dedicated signaling), the UE shall comprehend the parts of the transfer syntax (ASN.1) of release X+ N that are related to the feature implemented early. This in particular concerns the ASN.1 parts related to configuration of the feature. The UE obviously also has to support the ASN.1 parts related to indicating support of the feature (in UE capabilities).

If configuration of an early implemented feature introduced in release X+ N involves a message or field that has been critically extended, the UE shall support configuration of all features supported by the UE that are associated with sub-fields of this critical extension. Apart from the early implemented feature(s), the UE need however not support functionality beyond what is defined in the release the UE indicates in access stratum release.

Let’s consider the example of a UE indicating value X in field `accessStratumRelease` that supports the features associated with fields A1, A3 and A5 of `InformationElementA` (see ASN.1 below). The feature implemented early is associated with field A5, and can only be configured by the –rX+N version of `InformationElementA`. In such case, the UE should support configuration of the features associated with fields A1, A3 and A5 by the –rX+N version of `InformationElementA`. If however one of the features was modified, e.g. the feature associated with field A3, E-UTRAN should assume the UE only supports the feature according to the release it indicated in field `accessStratumRelease` (X). I.e. UE is neither required to support the additional code-point (n80-vX+N0) nor the additional sub-field (fieldA3a).

```asn1
InformationElementA-rX ::= SEQUENCE {
    fieldA1-rX      InformationElementA1-rX    OPTIONAL, -- Need ON
    fieldA2-rX      InformationElementA2-rX    OPTIONAL, -- Need OR
    fieldA3-rX      InformationElementA3-rX    OPTIONAL -- Need OR
}

InformationElementA-rX+N ::= SEQUENCE {
    fieldA1-rX+N     InformationElementA1-rX    OPTIONAL, -- Need ON
    fieldA2-rX+N     InformationElementA2-rX    OPTIONAL, -- Need OR
    fieldA3-rX+N     InformationElementA3-rX+N   OPTIONAL, -- Need OR
    fieldA4-rX+N     InformationElementA4-rX+N   OPTIONAL, -- Need OR
    fieldA5-rX+N     InformationElementA5-rX+N   OPTIONAL -- Need OR
}

InformationElementA3-rX+N ::= SEQUENCE {
    fieldA1a-rX+N    InformationElementA1a-rX   OPTIONAL, -- Need ON
    fieldA2a-rX+N    ENUMERATED {n10, n20, n40, n80-vX+N0}   OPTIONAL, -- Need OR
    fieldA3a-rX+N    InformationElementA3a-rX+N     OPTIONAL -- Need OR
}
```

Non-critical extensions (broadcast signaling)

If the early implemented feature involves one or more non-critical extensions in broadcast signaling (i.e. system information), the UE shall comprehend the parts of the transfer syntax (ASN.1) of release X+ N that are related to the feature implemented early. The SIB(s) containing the release X+ N fields related to the early implemented features may also include other extensions concerning releases from X upto X+N. The UE shall comprehend such intermediate fields (but again is not required to support the functionality associated with these intermediate fields, in case this concerns optional features not supported by the UE).
Annex G (informative):
Change history
3GPP TS 36.331 version 15.3.0 Release 15

895

ETSI TS 136 331 V15.3.0 (2018-10)

Change history
Date

TSG # TSG Doc.

CR

Rev Cat

12/2007
03/2008
03/2008
05/2008
09/2008
12/2008
03/2009

RP-38
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RP-080693
RP-081021
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Subject/Comment
Approved at TSG-RAN #38 and placed under Change Control
CR to 36.331 with Miscellaneous corrections
CR to 36.331 to convert RRC to agreed ASN.1 format
CR to 36.331 on Miscellaneous clarifications/ corrections
CR on Miscellaneous corrections and clarifications
Miscellaneous corrections and clarifications
Correction to the Counter Check procedure
CR to 36.331-UE Actions on Receiving SIB11
Spare usage on BCCH
Issues in handling optional IE upon absence in GERAN NCL
CR to 36.331 on Removal of useless RLC re-establishment at RB release
Clarification to RRC level padding at PCCH and BCCH
Removal of Inter-RAT message
Padding of the SRB-ID for security input
Validity of ETWS SIB
Configuration of the Two-Intervals-SPS
Corrections on Scaling Factor Values of Qhyst
Optionality of srsMaxUppts
CR for discussion on field name for common and dedicated IE
Corrections to Connected mode mobility
Clarification regarding the measurement reporting procedure
Corrections on s-Measure
R1 of CR0023 (R2-091029) on combination of SPS and TTI bundling for
TDD
L3 filtering for path loss measurements
S-measure handling for reportCGI
Measurement configuration clean up
Alignment of measurement quantities for UTRA
CR to 36.331 on L1 parameters ranges alignment
Default configuration for transmissionMode
CR to 36.331 on RRC Parameters for MAC, RLC and PDCP
CR to 36.331 - Clarification on Configured PRACH Freq Offset
Clarification on TTI bundling configuration
Update of R2-091039 on Inter-RAT UE Capability
Feature Group Support Indicators
Corrections to RLF detection
Indication of Dedicated Priority
Security Clean up
Correction of TTT value range
Correction on CDMA measurement result IE
Clarification of Measurement Reporting
Spare values in DL and UL Bandwidth in MIB and SIB2
Clarifications to System Information Block Type 8
Reception of ETWS secondary notification
Validity time for ETWS message Id and Sequence No
CR for Timers and constants values used during handover to E-UTRA
Inter-RAT Security Clarification
CR to 36.331 on consistent naming of 1xRTT identifiers
Capturing RRC behavior regarding NAS local release
Report CGI before T321 expiry and UE null reporting
System Information and 3 hour validity
Inter-Node AS Signalling
Set of values for the parameter "messagePowerOffsetGroupB"
CR to paging reception for ETWS capable UEs in RRC_CONNECTED
CR for CSG related items in 36.331
SRS common configuration
RRC processing delay
CR for HNB Name
Handover to EUTRA delta configuration
Delivery of Message Identifier and Serial Number to upper layers for
ETWS
Clarification on the maximum size of cell lists
Missing RRC messages in 'Protection of RRC messages'
Clarification on NAS Security Container
Extension of range of CQI/PMI configuration index
Access barring alleviation in RRC connection establishment
Corrections to feature group support indicators
CR from email discussion to capture DRX and TTT handling
Need Code handling on BCCH messages
Unification of T300 and T301 and removal of miscallaneous FFSs

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- Clarification of FGI settings non ANR periodical measurement reporting
- CR to 36.331 on MDT neighbour cell measurements logging
- Correction of use of RRCConnectionReestablishment message for contention resolution
- Introduction of OTDOA inter-freq RSTD measurement indication procedure
- Correction to the reference of ETWS
- Further correction to combined measurement report of UTRAN
- Miscellaneous corrections to CA
- CR to 36.331 adding UE capability indicator for dual Rx/Tx e1xCSFB
- Update of R2-110821 on RRM/RLM resource restriction for time domain ICIC
- Note for Dedicated SIB for RNs
- Updates of L1 parameters for CA and UL/DL MIMO
- Signalling aspects of existing LTE-A parameters
- Removal of MDT configuration at T330 expiry
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- 36331_CRXxxx Support of Delay Tolerant access requests
- Update of R2-110807 on CSI measurement resource restriction for time domain ICIC
- Update of R2-110821 on RRM/RLM resource restriction for time domain ICIC
- Corrections to the presence of IE regarding DRX and CQI
- The field descriptions of MeasObjectEUTRA
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Replace the tables with exception list in 10.5 AS-Config
Corrections in RRC
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| 12/2017 | RP-78 | RP-172614 | 3115 | 3 | B | Introducing support for NR, changes relevant for NSA | 15.0.0 |

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- Removed ASN.1 errors to make it pass the syntax check | 15.0.1 |

03/2018
| RP-79 | RP-180491 | 3208 | 2 | F | Miscellaneous corrections from review in preparation for ASN.1 freeze | 15.1.0 |
| RP-79 | RP-180443 | 3217 | - | A | Correction on SRS carrier switching | 15.1.0 |
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| RP-79 | RP-180445 | 3224 | 1 | A | Correction to RRCConnectionReestablishment message in 36.331 | 15.1.0 |
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| RP-79 | RP-180441 | 3306 | - | A | RRC Corrections for RRC Resume | 15.1.0 |
| 06/2018 | RP-80 | RP-181230 | 3293 | 2 | A | Removal of the FDD/TDD diff restriction for cs-InterfHandl IE | 15.2.0 |
| RP-80 | RP-181171 | 3303 | 2 | A | Qualcomm Incorporated: Gemalto N1 | 15.2.0 |
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| RP-80 | RP-181234 | 3312 | 2 | A | Correction on SPS assistance information in TS 36.331 | 15.2.0 |
| RP-80 | RP-181233 | 3324 | 1 | F | Successful acknowledgement of RRCConnectionRelease for BL and CE UE | 15.2.0 |
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| RP-80 | RP-181216 | 3386 | 3 | F | Miscellaneous EN-DC related corrections | 15.2.0 |
| RP-80 | RP-181229 | 3394 | 1 | F | Handling of Pmax for PC2 and uplink intra-band contiguous CA capable UEs | 15.2.0 |
| RP-80 | RP-181236 | 3396 | 1 | A | Correction for support of alternative TBS indices | 15.2.0 |
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| RP-80 | RP-181233 | 3427 | - | A | Correction on extended RSRP measurement reporting for BL UE or UE in CE | 15.2.0 |
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| RP-80 | RP-181236 | 3439 | 2 | A | Introduction of DL Channel Quality reporting | 15.2.0 |
| RP-80 | RP-181235 | 3441 | 1 | A | Introduction of serving cell idle mode measurements reporting in 36.331 | 15.2.0 |
| RP-80 | RP-181235 | 3442 | 1 | A | Correction to T310 timer description and editorials | 15.2.0 |
Correction to CBR Measurement Report Triggering
Introduce the short value of sc-mcch repetition period and sc-mcch modification period out of "br-BCCH-Config-r14".
Merged CR: UE capabilities for handling of multiple numerologies in FeMBMS, SRS carrier switching, and advanced CSI in FD-MIMO
Corrections to additional SpectrumEmission extension
Added <CR> to UE-EUTRA-Capability-v1520-IEs ASN.1 structure to make it pass the syntax
Corrects ASN.1 consistency problems between releases 13, 14 and 15.
Introduction of QoE Measurement Collection for LTE
Introduce assistance information for local cache 36.331 CR
Introducing support for NR, changes only relevant for SA
Introduction of shortened TTI and processing time for LTE
Introduction of DEFLATE based UDC Solution
Enhancement of SRS antenna switching in TS 36.331
Support of 1024QAM in TS 36.331
Introduction of further enhancements to CoMP
Introduction of further NB-IoT enhancements other than EDT in TS 36.331
Introduction of time reference provision
Introduction of Bluetooth and WLAN measurement collection in MDT
Running 36.331 CR for HSDN
Introduction of eMTC and NB-IoT enhancements
Support of 1024QAM in TS 36.331
Introduction of Bluetooth and WLAN measurement collection in MDT
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Introduction of further enhancements to CoMP
Introduction of DEFLATE based UDC Solution
Introduction of shortened TTI and processing time for LTE
Introduction of additional SpectrumEmission extension
FeMBMS, SRS carrier switching, and advanced CSI in FD-MIMO
Correction on CR on clarification of codebookConfigNx for Rel-15
Correction on delta-RxLevMinCE1
Introduction of eV2X in TS 36.331
Correction on the field description of enable256QAM
Introduction of Release-15 Aerial functionality
Clariﬁcation to Security mode failure in NB-IoT
Introduction of Release-15 eMTC enhancements (other than EDT)
Introduction of Release-15 eMTC enhancements (other than EDT)
Avoiding FGI20 limitation
Implementing network-based CRS interference mitigation
Introduction of vE2X in TS 36.331
Correction on the description of enable256QAM
Clariﬁcation to Security mode failure in NB-IoT
Introduction of increased number of E-UTRAN data bearers
Addition of broadcast of positioning assistance data
Control Plane latency reduction
Introduce feLAA in TS 36.331
Introduction of Ultra Reliable Low Latency Communication for LTE
Capture NR agreements into 36.331 for E-UTRA connected to 5GC
Miscellaneous EN-DC related corrections
Correcting a typo in aperiodicCSI-Trigger
Correcting inconsistent ASN.1 for NB-IoT
Correction to RRC Connection Re-establishment for the control plane
Introduction of modulation enhancements
Radio resource conﬁguration handling when resuming a suspended RRC connection
Correction to the description of UE capability for V2X sidelink communication
Correction on the description of CR on duplex mode conﬁguration for Rx pool
Introduction of Geofencing information in CMAS
Correction on V2X TX pool selection
Correction on clarification of codebookConfigNx for Rel-15
Clariﬁcation for the asynchronous HARQ with the LTE mobility enhancements
Correction for Zoning
UE UL categories for 1024QAM
## History

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