LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
Radio Resource Control (RRC);
Protocol specification
(3GPP TS 36.331 version 10.2.0 Release 10)
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Foreword

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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-A v3.0: "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 v2.0: "Interoperability Specification (IOS) for High Rate Packet Data (HRPD) Radio Access Network Interfaces with Session Control in the Access Network"

[34] 3GPP2 C.S0004-A v6.0: "Signaling Link Access Control (LAC) Standard for cdma2000 Spread Spectrum Systems – Addendum 2"

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

3GPP TS 23.038: "Alphabets and Language".

3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access (E-UTRAN); S1 Application Protocol (S1 AP)".

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


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

3GPP TS 44.005: "Data Link (DL) Layer General Aspects".


Editor's note: The above document cannot be formally referenced until it is published by 3GPP2, at which time it will be designated as C.S0087-A v1.0 rather than C.P0087-A.

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

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

3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer - Measurements".

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

3GPP TS 45.010: "Radio subsystem synchronization".

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

3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

3GPP2 C.S0097-0 v1.0: "E-UTRAN - cdma2000 1x Connectivity and Interworking Air Interface Specification".

3GPP TS 36.355: "LTE Positioning Protocol (LPP)".

3GPP TS 36.216: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer for relaying operation".

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

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

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

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

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".

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

**Information element:** A structural element containing a single or multiple fields is referred as information element.

**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 value.

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

**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.

**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.

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

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] 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].

1xRTT CDMA2000 1x Radio Transmission Technology
AM Acknowledged Mode
ASN.1 Abstract Syntax Notation One
ARQ Automatic Repeat Request
AS Access Stratum
BCCH Broadcast Control Channel
BCD Binary Coded Decimal
BCH Broadcast Channel
CA Carrier Aggregation
CCCH Common Control Channel
CCO Cell Change Order
CMAS Commercial Mobile Alert Service
CP Control Plane
C-RNTI Cell RNTI
CSFB CS fallback
CSG Closed Subscriber Group
DCCH Dedicated Control Channel
DRB (user) Data Radio Bearer
DRX Discontinuous Reception
DTCH Dedicated Traffic Channel
DL Downlink
DL-SCH Downlink Shared Channel
ETWS Earthquake and Tsunami Warning System
E-UTRA Evolved Universal Terrestrial Radio Access
E-UTRAN Evolved Universal Terrestrial Radio Access Network
ENB Evolved Node B
EPC Enhanced Packet Core
EHPLMN Equivalent Home Public Land Mobile Network
3GPP TS 36.331 version 10.2.0 Release 10

EPS
FDD
FDD
GERAN
GSM
HARQ
HPLMN
HRPD
IE
IMEI
IMSI
kB
L1
L2
L3
MAC
MBMS
MBSFN
MDT
MIB
MO
MT
MRB
MSI
N/A
NACC
NAS
PCCH
PCell
PDU
PDCP
PLMN
QoS
RACH
RAT
RB
RLC
RN
RNTI
RPLMN
RRC
RSCP
RSRP
RSSI
SAE
SAP
SCell
SFN
SI
SIB
SI-RNTI
SPS
SRB
SSAC
S-TMSI
TA
TDD
TM
TPC-RNTI
UE
UICC
UL

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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 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. 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.
  - UE controlled mobility;
  - The UE:
    - Monitors a Paging channel to detect incoming calls, 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_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;
  - Network controlled mobility, i.e. handover and cell change order with optional network assistance (NACC) to GERAN;
  - 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;
    - Monitors control channels associated with the shared data channel to determine if data is scheduled for it;
    - Provides channel quality and feedback information;
    - Performs neighbouring cell measurements and measurement reporting;
    - Acquires system information.

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

![Figure 4.2.1-1: E-UTRA states and inter RAT mobility procedures, 3GPP](image-url)

The following figure illustrates the mobility support between E-UTRAN, CDMA2000 1xRTT and CDMA2000 HRPD. The details of the CDMA2000 state models are out of the scope of this specification.
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 three 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;
- 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.

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: 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 and SRB2, 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.
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;
- Notification of UEs in RRC_IDLE, 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;
- RRC connection control:
  - Paging;
  - Establishment/ modification/ release of RRC connection, including e.g. assignment/ modification of UE identity (C-RNTI), establishment/ modification/ release of SRB1 and SRB2, 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;
  - 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 and addition/ modification/ release of SCell(s);
- 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;
- Recovery from radio link failure;
- Inter-RAT mobility including e.g. security activation, transfer of RRC context information;
- Measurement configuration and reporting:
  - 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;
- Support of measurement logging and reporting for network performance optimisation [60];

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

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 and sub-clause 5.9 specifies relays.

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 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;

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.

### 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). 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 are carried in SystemInformation (SI) messages and mapping of SIBs to SI messages is flexibly configurable by schedulingInfoList included in SystemInformationBlockType1, with restrictions that: each SIB is contained only in a single SI message, only SIBs having the same scheduling requirement (periodicity) can be mapped to the same SI message, and 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.

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].

The UE applies the system information acquisition and change monitoring procedures for the PCell only. For an SCell, E-UTRAN provides, via dedicated signalling, all system information relevant for operation in RRC_CONNECTED when adding the SCell. 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.

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

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.

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.

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]).

A single SI-RNTI is used to address SystemInformationBlockType1 as well as all SI messages.

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

5.2.1.3 System information validity and notification of changes

Change of system information (other than for ETWS and CMAS) 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.

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 acquires the new system information immediately from the start of the next modification period. The UE applies the previously acquired system information until the UE acquires the new system information.

![Figure 5.2.1.3-1: Change of system Information](image)

The Paging message is used to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change. If the UE receives a Paging message including the systemInfoModification, it knows that the system information will change at the next modification 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.

SystemInformationBlockType1 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. Additionally, the UE considers stored system information to be invalid after 3 hours from the moment it was successfully confirmed as valid, unless specified otherwise.

E-UTRAN may not update systemInfoValueTag upon change of some system information e.g. ETWS information, CMAS information, regularly changing parameters like CDMA2000 system time (see 6.3). Similarly, E-UTRAN may not include the systemInfoModification within the Paging message upon change of some system information.
The UE verifies that stored system information remains valid by either checking \textit{systemInfoValueTag} in \textit{SystemInformationBlockType1} after the modification period boundary, or attempting to find the \textit{systemInfoModification} indication at least \textit{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 \textit{systemInfoModification} whether a change of system information other than ETWS and CMAS information will occur in the next modification period or not.

ETWS and/or CMAS capable UEs in RRC\_CONNECTED shall attempt to read paging at least once every \textit{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 \textit{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 \textit{Paging} message including the \textit{etws-Indication}, it shall start receiving the ETWS primary notification and/ or ETWS secondary notification according to \textit{schedulingInfoList} contained in \textit{SystemInformationBlockType1}.

ETWS primary notification is contained in \textit{SystemInformationBlockType10} and ETWS secondary notification is contained in \textit{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 \textit{messageIdentifier}, \textit{serialNumber} and \textit{warningMessageSegmentNumber}). An ETWS secondary notification corresponds to a single \textit{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 \textit{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 \textit{Paging} message including the \textit{cmas-Indication}, it shall start receiving the CMAS notifications according to \textit{schedulingInfoList} contained in \textit{SystemInformationBlockType1}.

CMAS notification is contained in \textit{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 \textit{messageIdentifier}, \textit{serialNumber} and \textit{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 \textit{CB data} IE as defined according to TS 23.041 [37].

5.2.2 System information acquisition

5.2.2.1 General

![System information acquisition diagram]

\textbf{Figure 5.2.2.1-1: System information acquisition, normal}

The UE applies the system information acquisition procedure to acquire the AS- and NAS- system information that is broadcasted by the E-UTRAN. The procedure applies to UEs in RRC\_IDLE and UEs in RRC\_CONNECTED.

ETSI
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 request from CDMA2000 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.

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

2> if in RRC_CONNECTED:
   3> the MasterInformationBlock, SystemInformationBlockType1 and SystemInformationBlockType2 as well as SystemInformationBlockType8, depending on support of CDMA2000;

1> delete any stored system information after 3 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 and SystemInformationBlockType12 to be invalid if systemInfoValueTag included in the SystemInformationBlockType1 is different from the one of the stored system information;

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;

1> if the procedure is triggered by a system information change notification:
   2> 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 procedure nor initiate transmission of the
 RRCConnectionReestabilishmentRequest message until the UE has a valid version of the
 MasterInformationBlock and SystemInformationBlockType1 messages as well as SystemInformationBlockType2;

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> 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; and

1> if schedulingInfoList indicates that SystemInformationBlockType13 is present and the UE does not have stored a
valid version of this system information block:
2> acquire SystemInformationBlockType13;

The UE may apply the received SIBs immediately, i.e. the UE does not need to delay using a SIB 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 4: While attempting to acquire a particular SIB, if the UE detects from schedulingInfoList that it is no longer
present, the UE should stop trying to acquire the particular SIB.

5.2.2.5 Essential system information missing

The UE shall
1> if in RRC_IDLE or in RRC_CONNECTED while T311 is running:
2> if the UE is unable to acquire the MasterInformationBlock or the SystemInformationBlockType1:
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 if the UE is unable to acquire the SystemInformationBlockType2:
3> 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;

5.2.2.7 Actions upon reception of the SystemInformationBlockType1 message

Upon receiving the SystemInformationBlockType1 message the UE shall:

1> if the frequency band indicated in the freqBandIndicator is not part of the frequency bands supported by the UE:
2> consider the cell as barred in accordance with TS 36.304 [4] and;
2> perform barring as if intraFreqReselection is set to notAllowed, and as if the csg-Indication is set to FALSE;
1> else:
2> forward the cellIdentity to upper layers;
2> forward the trackingAreaCode to upper layers;

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 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 timer and constants values received within rlfTimersAndConstants:

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

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.

5.2.2.11 Actions upon reception of SystemInformationBlockType4

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.

5.2.2.12 Actions upon reception of SystemInformationBlockType5

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.

5.2.2.13 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 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;
2> else
3> forward csfb-SupportForDualRxUEs, with its value set to FALSE, to the CDMA2000 upper layers;
2> forward the ac-BarringConfig1XRTT to CDMA2000 upper layers, if included;
2> if the csfb-DualRxTxSupport is included:
3> forward csfb-DualRxTxSupport to the CDMA2000 upper layers;
2> else
3> forward csfb-DualRxTxSupport, with its value set to FALSE, to the CDMA2000 upper layers;

5.2.2.16 Actions upon reception of SystemInformationBlockType9
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, warningSecurityInfo (if present), 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 \texttt{warningMessageSegment};
3> continue reception of \texttt{SystemInformationBlockType11};

1> else if all segments of a warning message have been received:
2> assemble the warning message from the received \texttt{warningMessageSegment};
2> forward the received complete warning message, \texttt{messageIdentifier}, \texttt{serialNumber} and \texttt{dataCodingScheme} to upper layers;
2> stop reception of \texttt{SystemInformationBlockType11};
2> discard the current values of \texttt{messageIdentifier} and \texttt{serialNumber} for \texttt{SystemInformationBlockType11};
1> else:
2> store the received \texttt{warningMessageSegment};
2> continue reception of \texttt{SystemInformationBlockType11};

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

5.2.2.19 Actions upon reception of \texttt{SystemInformationBlockType12}

Upon receiving \texttt{SystemInformationBlockType12}, the UE shall:
1> if the \texttt{SystemInformationBlockType12} contains a complete warning message:
2> forward the received warning message, \texttt{messageIdentifier}, \texttt{serialNumber} and \texttt{dataCodingScheme} to upper layers;
2> continue reception of \texttt{SystemInformationBlockType12};
1> else:
2> if the received values of \texttt{messageIdentifier} and \texttt{serialNumber} are the same (each value is the same) as a pair for which a warning message is currently being assembled:
3> store the received \texttt{warningMessageSegment};
3> if all segments of a warning message have been received:
4> assemble the warning message from the received \texttt{warningMessageSegment};
4> forward the received warning message, \texttt{messageIdentifier}, \texttt{serialNumber} and \texttt{dataCodingScheme} to upper layers;
4> stop assembling a warning message for this \texttt{messageIdentifier} and \texttt{serialNumber} and delete all stored information held for it;
3> continue reception of \texttt{SystemInformationBlockType12};
2> else if the received values of \texttt{messageIdentifier} and/or \texttt{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 \texttt{messageIdentifier} and \texttt{serialNumber} pair;
3> store the received \texttt{warningMessageSegment};
3> continue reception of \texttt{SystemInformationBlockType12};

The UE should discard \texttt{warningMessageSegment} and the associated values of \texttt{messageIdentifier} and \texttt{serialNumber} for \texttt{SystemInformationBlockType12} if the complete warning message has 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.

5.2.3 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 list of SI messages configured by schedulingInfoList in SystemInformationBlockType1;
2> determine the integer value \( x = (n - 1) \times w \), where \( w \) is the \( \text{si-WindowLength} \);
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 \( \text{si-Periodicity} \) 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 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 \( \text{si-WindowLength} \), or until the SI message was received, excluding the following subframes:
2> subframe #5 in radio frames for which 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;

5.3 Connection control

5.3.1 Introduction

5.3.1.1 RRC connection control

RRC connection establishment involves the establishment of SRB1. 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. However, the UE only accepts a handover message when security has been activated.

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.

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.

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.

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 and/or connection re-establishment.

The integrity protection algorithm is common for signalling radio bearers SRB1 and SRB2. The ciphering algorithm is common for all radio bearers (i.e. SRB1, SRB2 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 (ee0).

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 (K_{RRCint}), one for the ciphering of RRC signalling (K_{RRCenc}) and one for the ciphering of user data (K_{UPenc}). All three AS keys are derived from the K_{eNB} key. The K_{eNB} is based on the K_{ASME} key, 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_{eNB}, K_{RRCint}, K_{RRCenc} and K_{UPenc}) change upon every handover and connection re-establishment. The keyChangeIndicator is used upon handover and indicates whether the UE should use the keys associated with the latest available K_{ASME} key. The nextHopChainingCount parameter is used upon handover and connection re-establishment by the UE when deriving the new K_{eNB} that is used to generate K_{RRCint}, K_{RRCenc} 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]) 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. In order to limit the signalling overhead, individual messages/packets include a short sequence number (PDCP SN, as specified in TS 36.323 [8]). In addition, an overflow counter mechanism is used: the hyper frame number (TX_HFN and RX_HFN, as specified in TS 36.323 [8]). 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_{eNB}, 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 an RRC_CONNECTED to RRC_IDLE to RRC_CONNECTED transition.

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.

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 $K_{UP, int}$ key is derived from the $K_{eNB}$ key as described in TS33.401 [32]. The same integrity protection algorithm used for SRBs also applies to the DRBs. The $K_{UP, int}$ changes at every handover and RRC connection re-establishment and is based on an updated $K_{eNB}$ 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. 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.

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. 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. 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.

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, 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. cell global identity, CSG identity, CSG membership status.

NOTE 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).

5.3.2 Paging

5.3.2.1 General

The purpose of this procedure is:
- to transmit paging information to a UE in RRC_IDLE and/or;
- to inform UEs in RRC_IDLE and UEs in RRC_CONNECTED about a system information change and/or;
- to inform about an ETWS primary notification and/or ETWS secondary notification and/or;
- to inform about a CMAS notification.

The paging information 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 and the cn-Domain to the upper layers;

1> if the systemInfoModification 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;

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;

5.3.3 RRC connection establishment

5.3.3.1 General

![Diagram of RRC connection establishment, successful](image1)

**Figure 5.3.3.1-1: RRC connection establishment, successful**

![Diagram of RRC connection establishment, network reject](image2)

**Figure 5.3.3.1-2: RRC connection establishment, network reject**
The purpose of this procedure is to establish an RRC connection. RRC connection establishment involves SRB1 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:
- to establish SRB1 only.

5.3.3.2 Initiation

The UE initiates the procedure when upper layers request establishment of an RRC connection while the UE is in RRC_IDLE.

Upon initiation of the procedure, the UE shall:

1> 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 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, 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 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 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";

2> if access to the cell is barred:

3> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating signalling is applicable, upon which the procedure ends;

1> else (the UE is establishing the RRC connection for mobile originating CS fallback):

2> if *SystemInformationBlockType2* includes *ac-BarringForCSFB*:

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

3> if access to the cell is barred:

4> inform upper layers about the failure to establish the RRC connection and that access barring for mobile originating CS fallback is applicable, due to *ac-BarringForCSFB*, upon which the procedure ends;

2> else:

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

3> if access to the cell is barred:

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

4> inform upper layers about the failure to establish the RRC connection 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;

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> 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. However, the UE needs to perform system information acquisition upon cell re-selection.

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

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.

### 5.3.3.4 Reception of the **RRCConnectionSetup** by the UE

NOTE: 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. draw a random value in the range 0 .. \(2^{40}-1\) and set the **ue-Identity** to this value;

NOTE: The UE shall set the **establishmentCause** in accordance with the information received from upper layers;

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. perform the actions as specified in 5.3.3.7;
1. stop timer T320, if running;
1. enter RRC_CONNECTED;
1. consider the current cell to be the PCell;
1. set the content of **RRCConnectionSetupComplete** 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. 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;

2. if connecting as an RN:

3. include the **rn-SubframeConfigReq**;

2. set the dedicatedInfoNAS to include the information received from upper layers;
2> if the UE has radio link failure or handover failure information available in VarRLF-Report and *plmn-Identity* stored in *VarRLF-Report* is equal to the RPLMN:
   3> include *rlf-InfoAvailable*;

2> if the UE has logged measurements available for E-UTRA and *plmn-Identity* stored in *VarLogMeasReport* is equal to the RPLMN:
   3> include *logMeasAvailable*;

2> submit the **RRCConnectionSetupComplete** message to lower layers for transmission, upon which the procedure ends;

### 5.3.3.5 Cell re-selection while T300, T302, T303, T305 or T306 is running

The UE shall:

1> if cell reselection occurs while T300, T302, T303, T305 or T306 is running:
   2> if timer T302, T303, T305 and/or T306 is running:
      3> stop timer T302, T303, T305 and T306, whichever ones were running;
      3> perform the actions as specified in 5.3.3.7;
   2> if timer T300 is running:
      3> stop timer T300;
      3> 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;

### 5.3.3.6 T300 expiry

The UE shall:

1> if timer T300 expires:
   2> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;
   2> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

### 5.3.3.7 T302, T303, T305 or T306 expiry or stop

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;
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;

5.3.3.8 Reception of the RRCConnectionReject by the UE

The UE shall:
1> stop timer T300;
1> reset MAC and release the MAC configuration;
1> start timer T302, with the timer value set to the waitTime;
1> if the extendedWaitTime is present and the UE supports delay tolerant access:
2> forward the extendedWaitTime to upper layers;
1> 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 mobile originating CS fallback is applicable, upon which the procedure ends;

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_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;

5.3.3.10 Handling of SSAC related parameters

Upon request from the upper layers, the UE shall:
1> set the local variables BarringFactorForMMTEL-Voice and BarringTimeForMMTEL-Voice as follows:
2> if the UE is in RRC_IDLE and 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 \textit{BarringFactorForMMTEL-Video} and \textit{BarringTimeForMMTEL-Video} as follows:

2> if the UE is in RRC\_IDLE and \textit{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 \cite{10} and TS 23.122 \cite{11}, and

3> if, for at least one of these Access Classes, the corresponding bit in the \textit{ac-BarringForSpecialAC} contained in \textit{ssac-BarringForMMTEL-Video} is set to zero:

4> set \textit{BarringFactorForMMTEL-Video} to one and \textit{BarringTimeForMMTEL-Video} to zero;

3> else:

4> set \textit{BarringFactorForMMTEL-Video} and \textit{BarringTimeForMMTEL-Video} to the value of \textit{ac-BarringFactor} and \textit{ac-BarringTime} included in \textit{ssac-BarringForMMTEL-Video}, respectively;

2> else set \textit{BarringFactorForMMTEL-Video} to one and \textit{BarringTimeForMMTEL-Video} to zero;

1> forward the variables \textit{BarringFactorForMMTEL-Voice}, \textit{BarringTimeForMMTEL-Voice}, \textit{BarringFactorForMMTEL-Video} and \textit{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 \textit{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 \cite{10} and TS 23.122 \cite{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 \textit{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 \textit{rand} uniformly distributed in the range: \(0 \leq \textit{rand} < 1\);

3> if \textit{rand} is lower than the value indicated by \textit{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 \textit{rand} that is uniformly distributed in the range \(0 \leq \textit{rand} < 1\);

2> start timer "Tbarring" with the timer value calculated as follows, using the \textit{ac-BarringTime} included in "AC barring parameter":

\[
\text{"Tbarring"} = (0.7 + 0.6 \cdot \textit{rand}) \cdot \textit{ac-BarringTime}.
\]
5.3.4 Initial security activation

5.3.4.1 General

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 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 $K_{\text{eNB}}$ key, as specified in TS 33.401 [32];

1> derive the $K_{\text{RRCint}}$ key associated with the integrityProtAlgorithm indicated in the SecurityModeCommand message, as specified in TS 33.401 [32];

1> 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 $K_{\text{RRCint}}$ key;

1> if the SecurityModeCommand message passes the integrity protection check:

2> derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the cipheringAlgorithm indicated in the SecurityModeCommand message, as specified in TS 33.401 [32];

2> if connected as an RN:
3> derive the KUPint 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;

2> configure lower layers to apply ciphering using the indicated algorithm, the K RRCenc key and the KUPenc 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;

2> if connected as an RN:

3> configure lower layers to apply integrity protection using the indicated algorithm and the KUPInt key, for DRBs that are subsequently configured to apply integrity protection, if any;

2> consider AS security to be activated;

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

The purpose of this procedure is to modify an RRC connection, e.g. to establish/ modify/ release RBs, to perform handover, to setup/ modify/ release measurements, to add/ modify/ release SCells. As part of the procedure, NAS dedicated information may be transferred from E-UTRAN to the UE.
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 and for all DRBs that are established, if any;
   2> re-establish RLC for SRB2 and for all DRBs that are established, if any;
   2> if the RRCConnectionReconfiguration message includes the fullConfig:
      3> perform the radio configuration procedure as specified in section 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;
   2> resume SRB2 and all DRBs that are suspended, if any;

NOTE 1: 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].

1> else:
   2> if the RRCConnectionReconfiguration message includes the radioResourceConfigDedicated:
      3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 2: 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 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;
if the \textit{RRCConnectionReconfiguration} message includes the \textit{reportProximityConfig}:

2> perform the proximity indication in accordance with the received \textit{reportProximityConfig};

1> submit the \textit{RRCConnectionReconfigurationComplete} message to lower layers for transmission using the new configuration, upon which the procedure ends;

5.3.5.4 Reception of an \textit{RRCConnectionReconfiguration} including the \textit{mobilityControlInfo} by the UE (handover)

If the \textit{RRCConnectionReconfiguration} message includes the \textit{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> start timer T304 with the timer value set to \textit{t304}, as included in the \textit{mobilityControlInfo};

1> if the \textit{carrierFreq} is included:

2> consider the target PCell to be one on the frequency indicated by the \textit{carrierFreq} with a physical cell identity indicated by the \textit{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 \textit{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> reset MAC;

1> re-establish PDCP for all RBs 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].

1> re-establish RLC for all RBs that are established;

1> configure lower layers to consider the SCell(s), if configured, to be in deactivated state;

1> apply the value of the \textit{newUE-Identity} as the C-RNTI;

1> if the \textit{RRCConnectionReconfiguration} message includes the \textit{fullConfig}:

2> perform the radio configuration procedure as specified in section 5.3.5.8;

1> configure lower layers in accordance with the received \textit{radioResourceConfigCommon};

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received \textit{mobilityControlInfo};

1> if the \textit{RRCConnectionReconfiguration} message includes the \textit{radioResourceConfigDedicated}:

2> perform the radio resource configuration procedure as specified in 5.3.10;

1> if the \textit{keyChangeIndicator} received in the \textit{securityConfigHO} is set to \textit{TRUE}:

2> update the K_{NB} key based on the fresh K_{ASME} key taken into use with the previous successful NAS SMC procedure, as specified in TS 33.401 [32];

1> else:
update the $K_{\text{NB}}$ key based on the current $K_{\text{NB}}$ or the NH, using the $\text{nextHopChainingCount}$ value indicated in the securityConfigHO, as specified in TS 33.401 [32];

store the $\text{nextHopChainingCount}$ value;

if the $\text{securityAlgorithmConfig}$ is included in the securityConfigHO:

derive the $K_{\text{RRCint}}$ key associated with the integrityProtAlgorithm, as specified in TS 33.401 [32];

if connected as an RN:

derive the $K_{\text{UPint}}$ key associated with the integrityProtAlgorithm, as specified in TS 33.401 [32];

derive the $K_{\text{RRCenc}}$ key and the $K_{\text{UPenc}}$ key associated with the cipheringAlgorithm, as specified in TS 33.401 [32];

else:

derive the $K_{\text{RRCint}}$ key associated with the current integrity algorithm, as specified in TS 33.401 [32];

if connected as an RN:

derive the $K_{\text{UPint}}$ key associated with the current integrity algorithm, as specified in TS 33.401 [32];

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];

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;

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;

if connected as an RN:

configure lower layers to apply the integrity protection algorithm and the $K_{\text{UPint}}$ key, for current or subsequently established DRBs that are configured to apply integrity protection, if any;

if the received $\text{RRCConnectionReconfiguration}$ includes the sCellToReleaseList:

perform SCell release as specified in 5.3.10.3a;

if the received $\text{RRCConnectionReconfiguration}$ includes the sCellToAddModList:

perform SCell addition or modification as specified in 5.3.10.3b;

perform the measurement related actions as specified in 5.5.6.1;

if the $\text{RRCConnectionReconfiguration}$ message includes the measConfig:

perform the measurement configuration procedure as specified in 5.5.2;

release reportProximityConfig and clear any associated proximity status reporting timer;

if the $\text{RRCConnectionReconfiguration}$ message includes the reportProximityConfig:

perform the proximity indication in accordance with the received reportProximityConfig;

set the content of $\text{RRCConnectionReconfigurationComplete}$ message as follows:

if the UE has radio link failure or handover failure information available in $\text{VarRLF-Report}$ and $\text{plmn-Identity}$ stored in $\text{VarRLF-Report}$ is equal to the RPLMN:

include $\text{rlf-InfoAvailable}$;
2> if the UE has logged measurements available for E-UTRA and plmn-Identity stored in VarLogMeasReport is equal to the RPLMN:
   3> include the logMeasAvailable;

1> submit the RRCConnectionReconfigurationComplete message to lower layers for transmission;

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 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> 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.

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.

5.3.5.6 T304 expiry (handover failure)

The UE shall:

1> if T304 expires (handover failure):

NOTE: 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;

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;
> set the plmn-Identity to the RPLMN;

> 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 handover failure;

> 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 handover failure, and set its fields as follows;

> if the UE was configured to perform measurements for one or more EUTRA frequencies, include the measResultListEUTRA;

> if the UE was configured to perform measurement reporting for one or more neighbouring UTRA frequencies, include the measResultListUTRA;

> if the UE was configured to perform measurement reporting for one or more neighbouring GERAN frequencies, include the measResultListGERAN;

> if the UE was configured to perform measurement reporting for one or more neighbouring CDMA2000 frequencies, include the measResultsCDMA2000;

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.

> 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 target PCell of the failed handover;

> include 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 the mobilityControlInfo;

> set the connectionFailureType to 'hof';

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.

NOTE 2: 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

5.3.5.8 Radio Configuration involving full configuration option

The UE shall:

1> release/ clear all current dedicated radio configurations except the C-RNTI, the security configuration and the PDCP, RLC, logical channel configurations for the RBs and the logged measurement configuration;

NOTE 1: Radio configuration is not just the resource configuration but includes other configurations like MeasConfig and OtherConfig.

1> if the RRCConnectionReconfiguration message includes the mobilityControlInfo:
2> release/clear all current common radio configurations;
2> use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;
1> else:
2> use values for timers T301, T310, T311 and constants N310, N311, as included in ue-TimersAndConstants
     received in SystemInformationBlockType2;
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> for each srb-Identity value included in the srb-ToAddModList (SRB reconfiguration):
   2> apply the specified configuration defined in 9.1.2 for the corresponding SRB;
   2> 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;
   2> 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;
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.
1> for each eps-BearerIdentity value included in the drb-ToAddModList that is part of the current UE configuration:
   2> release the PDCP entity;
   2> release the RLC entity or entities;
   2> release the DTCH logical channel;
   2> 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.
1> for each eps-BearerIdentity value that is part of the current UE configuration but not part of the drb-
   ToAddModList:
   2> perform DRB release as specified in 5.3.10.2;

5.3.6  Counter check

5.3.6.1  General

Figure 5.3.6.1-1: Counter check procedure
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> if the drb-Identity is not included 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;

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

![Figure 5.3.7.1-1: RRC connection re-establishment, successful](image-url)
The purpose of this procedure is to re-establish the RRC connection, which involves the resumption of SRB1 operation, the re-activation of security and the configuration of only the PCell.

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.

E-UTRAN applies the procedure as follows:
- to reconfigure SRB1 and to resume data transfer only for this RB;
- to re-activate AS security without changing algorithms.

### 5.3.7.2 Initiation

The UE shall only initiate the procedure when AS security has been activated. 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; or
5. upon an RRC connection reconfiguration failure, in accordance with 5.3.5.5;

Upon initiation of the procedure, the UE shall:
1. stop timer T310, if running;
2. start timer T311;
3. suspend all RBs except SRB0;
4. reset MAC;
5. release the SCell(s), if configured, in accordance with 5.3.10.3a;
6. apply the default physical channel configuration as specified in 9.2.4;
7. apply the default semi-persistent scheduling configuration as specified in 9.2.3;
8. apply the default MAC main configuration as specified in 9.2.2;
9. release reportProximityConfig and clear any associated proximity status reporting timer;
10. release measSubframePatternPCell, if configured;
11. release csi-SubframePatternConfig, if configured;
1> if connected as an RN and configured with an RN subframe configuration:
   2> release the RN subframe configuration;
1> perform cell selection in accordance with the cell selection process as specified in TS 36.304 [4];

5.3.7.3 Actions following cell selection while T311 is running

Upon selecting a suitable E-UTRA cell, the UE shall:

1> stop timer T311;
1> start timer T301;
1> apply the timeAlignmentTimerCommon included in SystemInformationBlockType2;
1> 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> 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

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> 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;
      3> with the $K_{RRCCnt}$ 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> 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`;

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

5.3.7.5 Reception of the `RRCConnectionReestablishment` by the UE

**NOTE:** 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> re-establish PDCP for SRB1;

1> re-establish RLC for SRB1;

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

1> resume SRB1;

1> update the `K_{enb}` key based on the `K_{asme}` key to which the current `K_{enb}` is associated, using the `nextHopChainingCount` value indicated in the `RRCConnectionReestablishment` message, as specified in TS 33.401 [32];

1> store the `nextHopChainingCount` value;

1> derive the `K_{rcch}` key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32];

1> derive the `K_{rcch}` key and the `K_{upenc}` key associated with the previously configured ciphering algorithm, as specified in TS 33.401 [32];

1> if connected as an RN:

2> derive the `K_{upint}` key associated with the previously configured integrity algorithm, as specified in TS 33.401 [32];

1> configure lower layers to activate integrity protection using the previously configured algorithm and the `K_{rcch}` 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;

1> if connected as an RN:

2> configure lower layers to apply integrity protection using the previously configured algorithm and the `K_{upint}` key, for subsequently resumed or subsequently established DRBs that are configured to apply integrity protection, if any;

1> configure lower layers to apply ciphering using the previously configured algorithm, the `K_{rcch}` key and the `K_{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;

1> set the content of `RRCConnectionReestablishmentComplete` message as follows:

2> if the UE has radio link failure or handover failure information available in `VarRLF-Report` and `plmn-Identity` stored in `VarRLF-Report` is equal to the RPLMN:

3> include the `rlf-InfoAvailable`;

2> if the UE has logged measurements available for E-UTRA and `plmn-Identity` stored in `VarLogMeasReport` is equal to the RPLMN:

3> include the `logMeasAvailable`;

1> perform the measurement related actions as specified in 5.5.6.1;
1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;
1> submit the \textit{RRCConnectionReestablishmentComplete} message to lower layers for transmission, upon which 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 \textit{RRCConnectionReestablishmentReject} by the UE

Upon receiving the \textit{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.

5.3.8.2 Initiation

E-UTRAN initiates the RRC connection release procedure to a UE in RRC\_CONNECTED.

5.3.8.3 Reception of the \textit{RRCConnectionRelease} by the UE

The UE shall:

1> delay the following actions defined in this sub-clause 60 ms from the moment the \textit{RRCConnectionRelease} message was received or optionally when lower layers indicate that the receipt of the \textit{RRCConnectionRelease} message has been successfully acknowledged, whichever is earlier;
1> if the \textit{RRCConnectionRelease} message includes the \textit{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 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 the UE supports delay tolerant access:
3> forward the extendedWaitTime to upper layers;
2> perform the actions upon leaving RRC_CONNECTED 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;

5.3.9 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;

5.3.10.1  SRB addition/ modification

The UE shall:

1> for each srb-Identity value included in the srb-ToAddModList that is not part of the current UE configuration (SRB establishment):
   2> apply the specified configuration defined in 9.1.2 for the corresponding SRB;
   2> establish a PDCP entity and configure it with the current security configuration, if applicable;
   2> establish an RLC entity in accordance with the received rlc-Config;
   2> establish a DCCH logical channel in accordance with the received logicalChannelConfig and with the logical channel identity set in accordance with 9.1.2;

1> for each srb-Identity value included in the srb-ToAddModList that is part of the current UE configuration (SRB reconfiguration):
   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> release the PDCP entity;
2> release the RLC entity or entities;
2> release the DTCH logical channel;

1> if the procedure was triggered due to handover:

2> indicate the release of the DRB(s) and the **eps-BearerIdentity** of the released DRB(s) to upper layers after successful handover;

1> else:

2> indicate the release of the DRB(s) and the **eps-BearerIdentity** of the released DRB(s) to upper layers immediately.

**NOTE:** 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.

### 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> establish a PDCP entity and configure it with the current security configuration and in accordance with the received **pdcp-Config**;
2> establish an RLC entity or entities in accordance with the received **rlc-Config**;
2> establish a DTCH logical channel in accordance with the received **logicalChannelIdentity** and the received **logicalChannelConfig**;

1> if the **RRCConnectionReconfiguration** message includes the **fullConfig** IE:

2> associate the established DRB with corresponding included **eps-BearerIdentity**;

1> else:

2> 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 **pdcp-Config** is included:

3> reconfigure the PDCP entity in accordance with the received **pdcp-Config**;

2> if the **rlc-Config** is included:

3> reconfigure the RLC entity or entities in accordance with the received **rlc-Config**;

2> if the **logicalChannelConfig** is included:

3> reconfigure the DTCH logical channel in accordance with the received **logicalChannelConfig**;

**NOTE:** Removal and addition of the same **drb-Identity** in single radioResourceConfiguration is not supported.
5.3.10.3a SCell release

The UE shall:

1> if the release is triggered by reception of the sCellToReleaseList:

2> for each sCellIndex value included in the sCellToReleaseList:

3> if the current UE configuration includes an SCell with value 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 sCellIndex value included in the sCellToAddModList that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the cellIdentification, in accordance with the received radioResourceConfigCommonSCell and radioResourceConfigDedicatedSCell;

2> configure lower layers to consider the SCell to be in deactivated state;

1> for each sCellIndex value included in the sCellToAddModList that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the received radioResourceConfigDedicatedSCell;

5.3.10.4 MAC main reconfiguration

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

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 section 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 not tm3 or tm4 or tm8 or tm9; 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;

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;
1> else:
   2> reconfigure the value of timers and constants in accordance with received rlf-TimersAndConstants;

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 measSubframePattern;

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;

NOTE: Physical layer monitoring and related autonomous actions do not apply to SCells.

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;
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.

5.3.11.3 Detection of radio link failure

The UE shall:
1> upon T310 expiry; or
1> upon random access problem indication from MAC while neither T300, T301, T304 nor T311 is running; or
1> upon indication from RLC that the maximum number of retransmissions has been reached:
2> consider radio link failure to be detected;
2> 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-Identity to 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;

NOTE: 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 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 PCell where radio link failure is detected;
3> if an RRCConnectionReconfiguration message including the mobilityControlInfo was received before the connection failure:
4> include previousPCellId and set it to the global cell identity of the PCell where the last RRCConnectionReconfiguration including the mobilityControlInfo message was received;
4> set the timeConnFailure to the elapsed time since reception of the last RRCConnectionReconfiguration message including the mobilityControlInfo;
3> set the connectionFailureType to rlf;
2> if AS 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;

The UE may discard the radio link failure information, i.e. release the UE variable \textit{VarRLF-Report} 48 hours after the radio link failure is detected.

5.3.12 UE actions upon leaving RRC_CONNECTED

Upon leaving RRC_CONNECTED, the UE shall:

1> reset MAC;
1> stop all timers that are running except T320 and T330;
1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity for all established RBs;
1> indicate the release of the RRC connection to upper layers together with the release cause;
1> if leaving RRC_CONNECTED was triggered neither by reception of the \textit{MobilityFromEUTRACommand} message nor by selecting an inter-RAT cell while T311 was running:
2> enter RRC_IDLE and perform procedures as specified in TS 36.304 [4, 5.2.7];

5.3.13 UE actions upon PUCCH/ SRS release request

Upon receiving a PUCCH/ SRS release request from lower layers, the UE shall:

1> apply the default physical channel configuration for \textit{CQI-ReportConfig} and \textit{cqi-Mask} if configured as specified in 9.2.4;
1> apply the default physical channel configuration for \textit{soundingRS-UL-ConfigDedicated} as specified in 9.2.4;
1> apply the default physical channel configuration for \textit{schedulingRequestConfig} as specified in 9.2.4;

\textbf{NOTE:} Upon PUCCH/ SRS release request, the UE does not modify the \textit{soundingRS-UL-ConfigDedicated}/\textit{Aperiodic} i.e. it does not apply the default for this field (release).

5.3.14 Proximity indication

5.3.14.1 General

![Diagram of RRC connection reconfiguration](image-url)

\textbf{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 cells whose CSG IDs are in the UE’s CSG whitelist. 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 cell(s), whose CSG IDs are in the UE’s CSG whitelist, on an E-UTRA frequency while proximity indication is enabled for such E-UTRA cells; or

2. if the UE enters the proximity of one or more cell(s), whose CSG IDs are in the UE’s CSG whitelist, on a UTRA frequency while proximity indication is enabled for such UTRA cells; or

3. if the UE leaves the proximity of all cell(s), whose CSG IDs are in the UE’s CSG whitelist, on an E-UTRA frequency while proximity indication is enabled for such E-UTRA cells; or

4. if the UE leaves the proximity of all cell(s), whose CSG IDs are in the UE’s CSG whitelist, 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 cells whose CSG IDs are in the CSG whitelist” 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 cell(s) whose CSG IDs are in the UE’s CSG whitelist:

   2. set type to entering;

1. else if the UE applies the procedure to report leaving the proximity of cell(s) whose CSG IDs are in the UE’s CSG whitelist:

   2. set type to leaving;

1. if the proximity indication was triggered for one or more cell(s), whose CSG IDs are in the UE’s CSG whitelist, 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 cell(s), whose CSG IDs are in the UE’s CSG whitelist, 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.
5.4 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 or UTRAN) to E-UTRAN.

The handover to E-UTRA procedure applies when SRBs, possibly in combination with DRBs, are established in another RAT. 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 initiates the Handover to E-UTRA procedure, in accordance with the specifications applicable for the other RAT, 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;
- to establish SRB1, SRB2 and one or more DRBs, i.e. at least the DRB associated with the default EPS bearer is established;

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. apply the default physical channel configuration as specified in 9.2.4;
2. apply the default semi-persistent scheduling configuration as specified in 9.2.3;
3. apply the default MAC main configuration as specified in 9.2.2;
4. start timer T304 with the timer value set to t304, as included in the mobilityControlInfo;
1> consider the target PCell to be one on the frequency indicated by the \textit{carrierFreq} with a physical cell identity indicated by the \textit{targetPhysCellId};

1> start synchronising to the DL of the target PCell;

1> set the C-RNTI to the value of the \textit{newUE-Identity};

1> for the target PCell, apply the downlink bandwidth indicated by the \textit{dl-Bandwidth};

1> for the target PCell, apply the uplink bandwidth indicated by (the absence or presence of) the \textit{ul-Bandwidth};

1> configure lower layers in accordance with the received \textit{radioResourceConfigCommon};

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received \textit{mobilityControlInfo};

1> perform the radio resource configuration procedure as specified in 5.3.10;

1> forward the \textit{nas-SecurityParamToEUTRA} to the upper layers;

1> derive the \textit{K_{NB}} key, as specified in TS 33.401 [32];

1> derive the \textit{K_{RRC}key} associated with the \textit{integrityProtAlgorithm}, as specified in TS 33.401 [32];

1> derive the \textit{K_{RRC}key} and the \textit{K_{UP}} key associated with the \textit{cipheringAlgorithm}, as specified in TS 33.401 [32];

1> configure lower layers to apply the indicated integrity protection algorithm and the \textit{K_{RRC}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;

1> configure lower layers to apply the indicated ciphering algorithm, the \textit{K_{RRC}key} and the \textit{K_{UP}} 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 \textit{RRCConnectionReconfiguration} includes the \textit{sCellToAddModList}:

2> perform SCell addition as specified in 5.3.10.3b;

1> if the \textit{RRCConnectionReconfiguration} message includes the \textit{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 \textit{RRCConnectionReconfiguration} message includes the \textit{reportProximityConfig}:

2> perform the proximity indication configuration in accordance with the received \textit{reportProximityConfig};

1> set the content of \textit{RRCConnectionReconfigurationComplete} message as follows:

2> if the UE has radio link failure or handover failure information available in \textit{VarRLF-Report} and \textit{plmn-Identity} stored in \textit{VarRLF-Report} is equal to the RPLMN:

3> include \textit{rlf-InfoAvailable};

2> if the UE has logged measurements available for E-UTRA and \textit{plmn-Identity} stored in \textit{VarLogMeasReport} is equal to the RPLMN:

3> include the \textit{logMeasAvailable};

1> submit the \textit{RRCConnectionReconfigurationComplete} message to lower layers for transmission using the new configuration;

1> if the \textit{RRCConnectionReconfiguration} message does not include \textit{rlf-TimersAndConstants} set to \textit{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:

1> if the UE is unable to comply with (part of) the configuration included in the RRCConnectionReconfiguration message:

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

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.

5.4.2.5 T304 expiry (handover to E-UTRA failure)

The UE shall:

1> upon T304 expiry (handover to E-UTRA failure):

2> reset MAC;

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT;

5.4.3 Mobility from E-UTRA

5.4.3.1 General

![Figure 5.4.3.1-1: Mobility from E-UTRA, successful]
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 or CDMA2000 systems. 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> 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 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 geman:
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;

NOTE 3: The systemInformation is constructed in the same way as in 2G to 2G NACC, i.e. the PSI messages are encoded as such, whereas the SI messages exclude 2 octets of headers, see TS 44.060[36].
2> establish the connection to the target cell indicated in the CellChangeOrder;

NOTE 4: 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 redirectedCarrierInfoCDMA2000-HRPD to the CDMA2000 upper layers;

NOTE 5: 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.

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> 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:

1> if T304 expires (mobility from E-UTRA failure); or
1> if the UE does not succeed in establishing the connection to the target radio access technology; or
1> if the UE is unable to comply with (part of) the configuration included in the MobilityFromEUTRACCommand message; or
1> if there is a protocol error in the inter RAT information included in the MobilityFromEUTRACCommand message, causing the UE to fail the procedure according to the specifications applicable for the target RAT:

2> stop T304, if running;
2> if the cs-FallbackIndicator in the MobilityFromEUTRACCommand message was set to TRUE:
3> indicate to upper layers that the CS Fallback procedure has failed;
2> revert back to the configuration used in the source PCell, excluding the configuration configured by the physicalConfigDedicated, mac-MainConfig and sps-Config;
2> 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 type1XRTT:

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 \textit{RRCConnectionReconfiguration} 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 UTRA frequencies.
- Inter-RAT measurements of GERAN frequencies.
- Inter-RAT measurements of CDMA2000 HRPD or CDMA2000 1xRTT frequencies.

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 and 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.

   \textbf{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.

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.

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, 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.
2. Listed cells - these are cells listed within the measurement object(s).
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).

For E-UTRA, the UE measures and reports on the serving cell(s), listed cells and detected cells. 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.

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 serving frequency;
- to configure at most one measurement identity using a reporting configuration with the purpose set to $reportCGI$;

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:
   2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

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;

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:
      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 and A6.

NOTE 2: When performed during re-establishment, the UE is only configured with a primary frequency (i.e. the SCell(s) 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> 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> 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;

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;
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 measObjectToRemoveList includes any 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> replace the entry with the value received for this measObject, except for the fields cellsToAddModList, blackCellsToAddModList, cellsToRemoveList, blackCellsToRemoveList and measSubframePatternConfigNeigh;

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;

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 measSubframePatternConfigNeigh:

4> set measSubframePatternConfigNeigh within the VarMeasConfig to the value of the received field

3> for each measId associated with this measObjectId in the measIdList within the VarMeasConfig, if any:

4> remove the measurement reporting entry for this measId from the 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 measObject to the measObjectList within VarMeasConfig;

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. replace 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:
if measGapConfig is set to setup:

2> if a measurement gap configuration is already setup, release the measurement gap configuration;

2> setup the measurement gap configuration indicated by the measGapConfig in accordance with the received gapOffset, i.e., each gap starts at an SFN and subframe meeting the following condition:

\[
\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10);
\]

\[
\text{subframe } = \text{gapOffset} \mod 10;
\]

with \( T = \text{MGRP}/10 \) as defined in TS 36.133 [16];

else:

2> release the measurement gap configuration;

### 5.5.3 Performing measurements

#### 5.5.3.1 General

For all measurements 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.

The UE shall:

1> whenever the UE has a measConfig, perform RSRP and RSRQ measurements for each serving cell, applying for the PCell the time domain measurement resource restriction in accordance with measSubframePatternPCell, if configured;

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 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> if si-RequestForHO is not configured for the associated reportConfig:

5> 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;

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;
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:
5> perform the corresponding measurements of neighbouring cells on the frequencies and RATs indicated in the concerned `measObject`, applying for neighbouring cells on the primary frequency the time domain measurement resource restriction in accordance with `measSubframePatternConfigNeigh`, 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;
2> perform the evaluation of reporting criteria as specified in 5.5.4;

NOTE 3: The `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 `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].

### 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:

NOTE 1: This does not include quantities configured solely for UE Rx-Tx time difference measurements i.e. for those type of measurements the UE ignores the `triggerQuantity` and `reportQuantity`.

2> filter the measured result, before using for evaluation of reporting criteria or for measurement reporting, by the following formula:

\[
F_n = (1 - a) \cdot F_{n-1} + a \cdot M_n
\]

where

\(M_n\) is the latest received measurement result from the physical layer;
$F_n$ is the updated filtered measurement result, that is used for evaluation of reporting criteria or for measurement reporting;

$F_{n-1}$ is the old filtered measurement result, where $F_0$ is set to $M_1$ when the first measurement result from the physical layer is received; and

$a = \frac{1}{2^k}$, where $k$ is the filterCoefficient for the corresponding measurement quantity received by the quantityConfig;

2> adapt the filter such that the time characteristics of the filter are preserved at different input rates, observing that the filterCoefficient $k$ assumes a sample rate equal to 200 ms;

NOTE 2: If $k$ is set to 0, no layer 3 filtering is applicable.

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.

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].

5.5.4 Measurement report triggering

5.5.4.1 General

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:

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 eventA1 or eventA2 is configured in the corresponding reportConfig:

5> consider only the serving cell to be applicable;

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;

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;

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);
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;

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 cells for all measurements after layer 3 filtering 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 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> 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 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> 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 cells included in the cellsTriggeredList 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 cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> if reportOnLeave is set to TRUE for the corresponding reporting configuration or if a6-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 cellsTriggeredList 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 purpose is included and set to reportStrongestCells or to reportStrongestCellsForSON and if a (first) measurement result is available for one or more applicable cells:

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 1: If the purpose is set to reportStrongestCells, the UE initiates a first measurement report immediately after the quantity to be reported becomes available for at least either all serving cells or one of the applicable cells. If the purpose is set to reportStrongestCellsForSON, the UE initiates a first measurement report 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.

\( Hys \) is expressed in dB.
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)

\[ M_s + H_s < Thresh \]

Inequality A2-2 (Leaving condition)

\[ M_s - H_s > Thresh \]

The variables in the formula are defined as follows:

\( M_s \) is the measurement result of the serving cell, not taking into account any offsets.

\( H_s \) 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).

\( M_s \) is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

\( H_s \) is expressed in dB.

\( Thresh \) is expressed in the same unit as \( M_s \).

5.5.4.4 Event A3 (Neighbour becomes offset better than PCell)

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;

NOTE The cell(s) that triggers the event is on the frequency indicated in the associated measObject which may be different from the (primary) frequency used by the PCell.

Inequality A3-1 (Entering condition)

\[ M_n + O_{fn} + O_{cn} - H_s > M_p + O_{fp} + O_{cp} + Off \]

Inequality A3-2 (Leaving condition)

\[ M_n + O_{fn} + O_{cn} + H_s < M_p + O_{fp} + O_{cp} + Off \]

The variables in the formula are defined as follows:

\( M_n \) is the measurement result of the neighbouring cell, not taking into account any offsets.

\( O_{fn} \) 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).

\( O_{cn} \) 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.

\( M_p \) is the measurement result of the PCell, not taking into account any offsets.
**Ofp** is the frequency specific offset of the primary frequency (i.e. `offsetFreq` as defined within `measObjectEUTRA` corresponding to the primary frequency).

**Ocp** is the cell specific offset of the PCell (i.e. `cellIndividualOffset` as defined within `measObjectEUTRA` corresponding to the primary frequency), and is set to zero if not configured for the PCell.

**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.

**Ofn, Ocn, Ofp, 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;
2. consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled;

Inequality A4-1 (Entering condition)

\[ Mn + Ofn + Ocn - Hys > Thresh \]

Inequality A4-2 (Leaving condition)

\[ Mn + Ofn + Ocn + Hys < Thresh \]

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.

**Ofn, Ocn, Hys** are expressed in dB.

**Thresh** is expressed in the same unit as **Ms**.

### 5.5.4.6 Event A5 (PCell 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;
2. 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;

**NOTE:** The cell(s) that triggers the event is on the frequency indicated in the associated `measObject` which may be different from the (primary) frequency used by the PCell.

Inequality A5-1 (Entering condition 1)
ThreshHysMp <\(+\) Inequality A5-2 (Entering condition 2)  
\(Mn + Ofn + Ocn – Hys > Thresh2\)  
Inequality A5-3 (Leaving condition 1)  
\(Mp – Hys > Thresh1\)  
Inequality A5-4 (Leaving condition 2)  
\(Mn + Ofn + Ocn + Hys < Thresh2\)

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 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).

**Mp, Mn** are expressed in dBm in case of RSRP, or in dB in case of RSRQ.  
**Ofn, Ocn, Hys** are expressed in dB.  
**Thresh1** is expressed in the same unit as **Mp**.  
**Thresh2** is expressed in the same unit as **Mn**.

**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)  
\(Mn + Ocn – Hys > Mx + Ocs + Off\)  
Inequality A6-2 (Leaving condition)  
\(Mn + Ocn + Hys < Mx + Ocs + Off\)

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.

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;
1> consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;
1> consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

\[ Mn + Ofn - Hys > Thresh \]

Inequality B1-2 (Leaving condition)

\[ Mn + Ofn + Hys < Thresh \]

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)

\[ Mp + Hys < \text{Thresh} \]

Inequality B2-2 (Entering condition 2)

\[ Mn + Ofn - Hys > \text{Thresh} \]

Inequality B2-3 (Leaving condition 1)

\[ Mp - Hys > \text{Thresh} \]

Inequality B2-4 (Leaving condition 2)

\[ Mn + Ofn + Hys < \text{Thresh} \]

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, 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 inter-RAT neighbour cell).
- **Hys** is the hysteresis parameter for this event (i.e. hysteresis as defined within reportConfigInterRAT for this event).
- **Thresh1** is the threshold parameter for this event (i.e. b2-Threshold1 as defined within reportConfigInterRAT for this event).
- **Thresh2** is the threshold parameter for this event (i.e. b2-Threshold2 as defined within reportConfigInterRAT for this event). For CDMA2000, 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.

**Thresh1** is expressed in the same unit as **Mp**.

**Thresh2** is expressed in the same unit as **Mn**.

### 5.5.5 Measurement reporting

![Measurement reporting](figure.png)

**Figure 5.5.5-1: Measurement reporting**

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN.

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;

1. set the *measResultPCell* to include the quantities of the PCell;
1> set the measResultServFreqList to include for each SCell that is configured, if any, within measResultSCell the quantities of the concerned SCell;

1> if the reportConfig associated with the measId that triggered the measurement reporting includes reportAddNeighMeas:

2> for each 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 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: 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 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:

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 cell broadcasts a CSG identity:
6> include the csg-Identity;
6> include the csg-MemberStatus and set it to member if the CSG identity is included in the UE’s CSG whitelist;
5> if the si-RequestForHO is configured within the reportConfig associated with this measId:
6> include the cgi-Info containing all the fields that have been successfully acquired, except for the plmn-IdentityList;
5> else:
6> include the cgi-Info containing all the fields that have been successfully acquired;
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 includeLocationInfo is configured in the corresponding reportConfig for this measId 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;
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> submit the MeasurementReport message to lower layers for transmission, upon which the procedure ends;

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;

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 \textit{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;

The UE shall:

1> for each \textit{measId} included in the \textit{measIdList} within \textit{VarMeasConfig}:
   
   2> if the \textit{triggerType} is set to \textit{periodical}:
      
      3> remove this \textit{measId} from the \textit{measIdList} within \textit{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 \textit{measId} values in the \textit{measIdList} within \textit{VarMeasConfig} as follows:

2> if a \textit{measObjectId} value corresponding to the target primary frequency exists in the \textit{measObjectList} within \textit{VarMeasConfig}:

3> for each \textit{measId} value in the \textit{measIdList}:

   4> if the \textit{measId} value is linked to the \textit{measObjectId} value corresponding to the source primary frequency:
      
      5> link this \textit{measId} value to the \textit{measObjectId} value corresponding to the target primary frequency;

   4> else if the \textit{measId} value is linked to the \textit{measObjectId} value corresponding to the target primary frequency:
      
      5> link this \textit{measId} value to the \textit{measObjectId} value corresponding to the source primary frequency;

2> else:

3> remove all \textit{measId} values that are linked to the \textit{measObjectId} value corresponding to the source primary frequency;

1> remove all measurement reporting entries within \textit{VarMeasReportList};

1> stop the periodical reporting timer or timer T321, whichever one is running, as well as associated information (e.g. \textit{timeToTrigger}) for all \textit{measId};

1> release the measurement gaps, if activated;

\textbf{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.

\subsection*{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: \textit{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 \textit{speedStatePars} within \textit{VarMeasConfig};

1> if high mobility state is detected:
   
   2> use the \textit{timeToTrigger} value multiplied by \textit{sf-High} within \textit{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].

**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. Also if at a later point in time the measurement gaps become insufficient, the UE does not initiate the procedure unless it receives a new indication from upper layers.

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> set the rstd-InterFreqIndication as follows:
2> if the procedure is initiated to indicate start of inter-frequency RSTD measurements:
   3> set the rstd-InterFreqInfoList according to the information received from upper layers;
2> else if the procedure is initiated to indicate stop of inter-frequency RSTD measurements:
   3> 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

5.6.1 DL information transfer

5.6.1.1 General

![Diagram 5.6.1.1-1: DL information transfer](image)

The purpose of this procedure is to transfer NAS or (tunnelled) non-3GPP dedicated 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 or non-3GPP dedicated 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 dedicatedInfoType is set to dedicatedInfoNAS:
   2> forward the dedicatedInfoNAS to the NAS upper layers.

1> if the dedicatedInfoType is set to dedicatedInfoCDMA2000-1XRTT or to dedicatedInfoCDMA2000-HRPD:
   2> forward the dedicatedInfoCDMA2000 to the CDMA2000 upper layers;

5.6.2 UL information transfer

5.6.2.1 General

![Diagram 5.6.2.1-1: UL information transfer](image)

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 in which case the NAS information is piggybacked to the RRCConnectionSetupComplete message. 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> 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> 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 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;

5.6.3 UE capability transfer

5.6.3.1 General

![UE Capability Transfer Diagram](image)

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> set the contents of **UECapabilityInformation** message as follows:

2> if the *ue-CapabilityRequest* includes *utra*:

3> include the **UE-EUTRA-Capability** within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *utra*;

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*;

1> submit the **UECapabilityInformation** message to lower layers for transmission, upon which the procedure ends;

5.6.4 CSFB to 1x Parameter transfer

5.6.4.1 General

![Figure 5.6.4.1-1: CSFB to 1x Parameter transfer](image)

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 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.

5.6.5.3 Reception of the UEInformationRequest message

Upon receiving the UEInformationRequest message, the UE shall:

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;

2> 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 plmn-Identity stored in VarRLF-Report is equal to the RPLMN, set the rlf-Report in the UEInformationResponse message to the value of rlf-Report in VarRLF-Report;

1> if the rlf-Report is included in UEInformationResponse:

2> discard the rlf-Report from VarRLF-Report upon successful delivery of the UEInformationResponse message confirmed by lower layers.

1> if the logMeasReportReq is present and the plmn-Identity stored in VarLogMeasReport is equal to the RPLMN:

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 absTimeInfo 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;

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

![LoggedMeasurementConfiguration](image)
The purpose of this procedure is to configure the UE to perform logging of measurement results while in RRC_IDLE. 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 \textit{LoggedMeasurementConfiguration} message.

5.6.6.3 Reception of the \textit{LoggedMeasurementConfiguration} by the UE

Upon receiving the \textit{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 \textit{loggingDuration}, \textit{loggingInterval} and \textit{areaConfiguration}, if included, in \textit{VarLogMeasConfig};
1. store the RPLMN as \textit{plmn-Identity} in \textit{VarLogMeasReport};
1. store the received \textit{absoluteTimeInfo}, \textit{traceReference}, \textit{traceRecordingSessionRef} and \textit{tce-Id} in \textit{VarLogMeasReport};
1. start timer T330 with the timer value set to the \textit{loggingDuration};

5.6.6.4 T330 expiry

Upon expiry of T330 the UE shall:

1. release \textit{VarLogMeasConfig};

The UE is allowed to discard stored logged measurements, i.e. to release \textit{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;
1. if stored, discard the logged measurement configuration as well as the logged measurement information, i.e. release the UE variables \textit{VarLogMeasConfig} and \textit{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.
5.6.8.2 Initiation

While T330 is running, the UE shall:

1> perform the logging in accordance with the following:

2> if the UE is camping normally on an E-UTRA cell and the RPLMN of the UE is the same as the plmn-Identity 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> 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> set the servCellIdentity to indicate global cell identity of the cell the UE is camping on;

3> set the measResultServCell to include the quantities of the cell the UE is camping on;

3> if available, set the measResultNeighCells, in order of decreasing ranking-criterion as used for cell reselection, 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;

NOTE: 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].

2> 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;

5.7 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, PCCH, CCCH, or MCCH 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.

```
-- example/ ASN1START
-- Example with extension addition group
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
     ]
}
-- Example with traditional non-critical extension (empty sequence)
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
}
-- ASN1STOP
```

The UE shall, apply the following principles regarding the levels applicable in case of nested error handling:

- an extension addition 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 addition 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 \textit{MBSFNAreaConfiguration} message, which indicates the MBMS sessions that are ongoing as well as the (corresponding) radio resource configuration. The MCCH may also carry the \textit{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 \textit{SystemInformationBlock: SystemInformationBlockType13}. An MBSFN area is identified solely by the \textit{mbsfn-AreaId} in \textit{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 \textit{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 \textit{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 \text{mod} m = 0, where \textit{m} is the number of radio frames comprising the modification period. The modification period is configured by means of \textit{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)

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 \textit{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. These MCCH information change notification occasions are common for all MCCHs that are configured, and configurable by parameters included in \textit{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.

\textbf{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 shall acquire the MCCH information from the start of each modification period. A UE that is not receiving an MBMS service but potentially interested to receive other services not started yet in another MBSFN area, shall verify that the stored MCCH information remains valid by attempting to find the MCCH information change notification at least \textit{notificationRepetitionCoeff} times during the modification period of the applicable MCCH(s), if no MCCH information change notification is received.

\textbf{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.

\section*{5.8.2 MCCH information acquisition}

\subsection*{5.8.2.1 General}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure5.8.2.1-1.png}
\caption{MCCH information acquisition}
\end{figure}

The UE applies the MCCH information acquisition procedure to acquire the MBMS control information that is broadcasted by the E-UTRAN. The procedure applies to MBMS capable UEs that are in RRC_IDLE or in RRC_CONNECTED.

\subsection*{5.8.2.2 Initiation}

A UE interested to receive MBMS services shall apply the MCCH information acquisition procedure upon entering the corresponding MBSFN area (e.g. upon power on, following UE mobility) and upon receiving a notification that the MCCH information has changed. A UE that is receiving an MBMS service shall apply the MCCH information acquisition procedure to acquire the MCCH, that corresponds with the service that is being received, at the start of each modification period.

Unless explicitly stated otherwise in the procedural specification, the MCCH information acquisition procedure overwrites any stored MCCH information, i.e. delta configuration is not applicable for MCCH information and the UE discontinues using a field if it is absent in MCCH information unless explicitly specified otherwise.

\subsection*{5.8.2.3 MCCH information acquisition by the UE}

An MBMS capable UE shall:

1. if the procedure is triggered by an MCCH information change notification:
2> start acquiring the \textit{MBSFNAreaConfiguration} message and the \textit{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 \textit{MBSFNAreaConfiguration} message and the \textit{MBMSCountingRequest} message if present, at the next repetition period;

1> if the UE is receiving an MBMS service:

2> start acquiring the \textit{MBSFNAreaConfiguration} message and the \textit{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 \textit{MBSFNAreaConfiguration} message

No UE requirements related to the contents of this \textit{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 \textit{MBMSCountingRequest} message

Upon receiving \textit{MBMSCountingRequest} message, the UE shall perform the MBMS Counting procedure as specified in section 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 \textit{logicalChannelIdentity}, applicable for the MRB, as included in the \textit{MBSFNAreaConfiguration} message;

1> configure the physical layer in accordance with the \textit{pmch-Config}, applicable for the MRB, as included in the \textit{MBSFNAreaConfiguration} message;
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 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 SystemInformationBlockType13:

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:** 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.

### 5.9 RN procedures

#### 5.9.1 RN reconfiguration

##### 5.9.1.1 General

![Figure 5.9.1.1-1: RN reconfiguration](image)

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:
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 information elements 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 information elements 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 information elements to be present

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cond conditionTag</td>
<td>Conditionally present</td>
</tr>
<tr>
<td>(Used in downlink only)</td>
<td>An information element 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 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>An information element that is optional to signal. For downlink messages, the UE is not required to take any special action on absence of the IE 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>An information element that is optional to signal. If the message is received by the UE, and in case the information element 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>An information element that is optional to signal. If the message is received by the UE, and in case the information element is absent, the UE shall discontinue/ stop using/ delete any existing value (and/ or the associated functionality).</td>
</tr>
</tbody>
</table>

Any IE with Need ON in system information shall be interpreted as Need OR.

Need codes may not be specified for a group, used in downlink, which includes one or more extensions. Upon absence of such a field, the UE shall:

- For each individual extension, 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 extensions included directly within the optional field, but also for extensions defined at further nesting levels;

NOTE: The above applies for groups of non critical extensions using double brackets, 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.
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-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 {
  c1          CHOICE {
    systemInformation       SystemInformation,
    systemInformationBlockType1 SystemInformationBlockType1
  },
  messageClassExtension    SEQUENCE {}
}
-- ASN1STOP
```

– **MCCH-Message**

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.

```
-- ASN1START
MCCH-Message ::= SEQUENCE {
  message      MCCH-MessageType
}
-- ASN1STOP
```
MCCH-MessageType ::= CHOICE {
  c1     CHOICE {
    mbsfnAreaConfiguration-r9 MBSFNAreaConfiguration-r9
  },
  later  CHOICE {
    c2     CHOICE{
      mbmsCountingRequest-r10 MBMSCountingRequest-r10
    },
    messageClassExtension SEQUENCE {}
  }
}
-- ASN1STOP

–

**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.

```
-- ASN1START
PCCH-Message ::= SEQUENCE {
  message     PCCH-MessageType
}

PCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    paging         Paging
  },
  messageClassExtension SEQUENCE {}
}
-- ASN1STOP

–

**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.

```
-- ASN1START
DL-CCCH-Message ::= SEQUENCE {
  message     DL-CCCH-MessageType
}

DL-CCCH-MessageType ::= CHOICE {
  c1      CHOICE {
    rrcConnectionReestablishment   RRCConnectionReestablishment,
    rrcConnectionReestablishmentReject   RRCConnectionReestablishmentReject,
    rrcConnectionReject      RRCConnectionReject,
    rrcConnectionSetup      RRCConnectionSetup
  },
  messageClassExtension SEQUENCE {}
}
-- ASN1STOP

–

**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.

```
-- ASN1START
DL-DCCH-Message ::= SEQUENCE {
  message     DL-DCCH-MessageType
}
```
DL-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,
    rnReconfiguration-r10            RNReconfiguration-r10,
    spare4 NULL, spare3 NULL, spare2 NULL, spare1 NULL
  },
  messageClassExtension  SEQUENCE {}
}

-- ASN1STOP

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  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,
    rrcConnectionReestablishmentComplete  RRCConnectionReestablishmentComplete,
    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
}
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**

```
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**

```

```

---

**CounterCheck field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>count-MSB-Uplink</td>
<td>Indicates the value of 25 MSBs from uplink COUNT associated to this DRB.</td>
</tr>
<tr>
<td>count-MSB-Downlink</td>
<td>Indicates the value of 25 MSBs from downlink COUNT associated to this DRB.</td>
</tr>
<tr>
<td>drb-CountMSB-InfoList</td>
<td>Indicates the MSBs of the COUNT values of the DRBs.</td>
</tr>
</tbody>
</table>

---

```

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

```asn1
CounterCheckResponse ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    counterCheckResponse-r8    CounterCheckResponse-r8-IEs,
    criticalExtensionsFuture   SEQUENCE {}
  }
}

CounterCheckResponse-r8-IEs ::= SEQUENCE {
  drb-CountInfoList     DRB-CountInfoList,
  nonCriticalExtension    CounterCheckResponse-v8a0-IEs
}

CounterCheckResponse-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

DRB-CountInfoList ::= SEQUENCE (SIZE (0..maxDRB)) OF DRB-CountInfo

DRB-CountInfo ::= SEQUENCE {
  drb-Identity     DRB-Identity,
  count-Uplink     INTEGER(0..4294967295),
  count-Downlink     INTEGER(0..4294967295)
}
```

CounterCheckResponse field descriptions

- **count-Uplink**: Indicates the value of uplink COUNT associated to this DRB.
- **count-Downlink**: Indicates the value of downlink 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.
### CSFBParametersRequestCDMA2000 message

```asn1
CSFBParametersRequestCDMA2000 ::= SEQUENCE {
    criticalExtensions CHOICE {
        csfbParametersRequestCDMA2000-r8 CSFBParametersRequestCDMA2000-r8-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}

CSFBParametersRequestCDMA2000-r8-IEs ::= SEQUENCE {
    nonCriticalExtension CSFBParametersRequestCDMA2000-v8a0-IEs OPTIONAL
}

CSFBParametersRequestCDMA2000-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL,
    nonCriticalExtension SEQUENCE {} OPTIONAL
}
```

### CSFBParametersResponseCDMA2000 message

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

```asn1
CSFBParametersResponseCDMA2000 ::= SEQUENCE {
    rrc-TransactionIdentifier RRC-TransactionIdentifier,
    criticalExtensions CHOICE {
        csfbParametersResponseCDMA2000-r8 CSFBParametersResponseCDMA2000-r8-IEs,
        criticalExtensionsFuture SEQUENCE {}
    }
}

CSFBParametersResponseCDMA2000-r8-IEs ::= SEQUENCE {
    rand RAND-CDMA2000,
    mobilityParameters MobilityParametersCDMA2000,
    nonCriticalExtension CSFBParametersResponseCDMA2000-v8a0-IEs OPTIONAL
}

CSFBParametersResponseCDMA2000-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OP
    nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}
```

---
The **DLInformationTransfer** message is used for the downlink transfer of NAS or non-3GPP dedicated information.

Signalling radio bearer: SRB2 or SRB1 (only if SRB2 not established yet. 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**

```asn1
DLInformationTransfer ::= SEQUENCE {
  rrc-TransactionIdentifier     RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1     CHOICE {
      dlInformationTransfer-r8     DLInformationTransfer-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
DLInformationTransfer-r8-IEs ::= SEQUENCE {
  dedicatedInfoType     CHOICE {
    dedicatedInfoNAS     DedicatedInfoNAS,
    dedicatedInfoCDMA2000-1XRTT   DedicatedInfoCDMA2000,
    dedicatedInfoCDMA2000-HRPD     DedicatedInfoCDMA2000
  },
  nonCriticalExtension    DLInformationTransfer-v8a0-IEs      OPTIONAL
}
DLInformationTransfer-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
```

---

**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

---

**HandoverFromEUTRAPreparationRequest message**

```asn1
HandoverFromEUTRAPreparationRequest ::= SEQUENCE {
  rrc-TransactionIdentifier     RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1     CHOICE {
      handoverFromEUTRAPreparationRequest-r8     HandoverFromEUTRAPreparationRequest-r8-IEs,
    }
  }
}
HandoverFromEUTRAPreparationRequest-r8-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
```

---
HandoverFromEUTRAPreparationRequest-r8-IEs ::= SEQUENCE {
  cdma2000-Type CDMA2000-Type, OPTIONAL, -- Cond 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, -- Need OP
  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-Type
  redirectCarrierCDMA2000-1XRTT-r10 CarrierFreqCDMA2000 OPTIONAL, -- Cond dualRxTxRedirect
  nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}

-- ASN1STOP

**HandoverFromEUTRAPreparationRequest 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.

---

**Conditional presence**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>cdma2000-1XRTT</td>
<td>The field is optionally present, need ON, if the <code>cdma2000-Type = type1XRTT</code>; otherwise it is not present.</td>
</tr>
<tr>
<td>cdma2000-Type</td>
<td>The field is mandatory present if the <code>cdma2000-Type = type1XRTT</code>; otherwise it is not present.</td>
</tr>
<tr>
<td>dualRxTxRedirect</td>
<td>The field is optionally present, need ON, if <code>dualRxTxRedirectIndicator</code> is present; otherwise it is not present.</td>
</tr>
</tbody>
</table>

---

**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].

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

---

**InterFreqRSTDMeasurementIndication message**

-- ASN1START

InterFreqRSTDMeasurementIndication-r10 ::= SEQUENCE {
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.

**measPRS-Offset**
Indicates the smallest offset of the PRS positioning occasions in the carrier frequency carrierFreq for which the UE needs to perform the inter-frequency RSTD measurements. The PRS positioning occasion information is received from upper layers. The value of measPRS-Offset is obtained by mapping the starting subframe of the PRS positioning occasion in the measured cell to the corresponding subframe in the serving cell and is calculated as the serving cell’s subframe number mod 40ms.

**rstd-InterFreqIndication**
Indicates the inter-frequency RSTD measurement action, i.e. the UE is going to start or stop inter-frequency RSTD measurement.

---

LoggedMeasurementConfiguration

The LoggedMeasurementConfiguration message is used by E-UTRAN to configure the UE to perform logging of measurement results while in RRC_IDLE. 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

Direction: E-UTRAN to UE

---

LoggedMeasurementConfiguration message
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   SEQUENCE {}     OPTIONAL -- Need OP
}

--- ASN1STOP

LoggedMeasurementConfiguration field descriptions

absoluteTimeInfo
Indicates the absolute time in the current cell.

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

--- ASN1START

MasterInformationBlock ::=   SEQUENCE {
   dl-Bandwidth      ENUMERATED {
     n6, n15, n25, n50, n75, n100},
   phich-Config      PHICH-Config,
   systemFrameNumber     BIT STRING (SIZE (8)),
   spare        BIT STRING (SIZE (10))
}

--- ASN1STOP

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.

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 (the associated functionality is common i.e. not performed independently for each cell).
--- 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**

```asn1
-- ASN1START

MBMSCountingRequest-r10 ::= SEQUENCE {
  countingRequestList-r10  CountingRequestList-r10, OPTIONAL, -- Need OP
  lateNonCriticalExtension OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension   SEQUENCE {}       OPTIONAL -- Need OP
}

CountingRequestList-r10 ::= SEQUENCE (SIZE (1..maxServiceCount)) OF CountingRequestInfo-r10

CountingRequestInfo-r10 ::=  SEQUENCE {
  tmgi-r10       TMGI-r9,
  ...
}

-- ASN1STOP
---

--- MBMSCountingResponse

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
-- ASN1START

MBMSCountingResponse-r10 ::= SEQUENCE {
  criticalExtensions     CHOICE {
    c1         CHOICE {
      countingResponse-r10    MBMSCountingResponse-r10-IEs,
      sparse3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  },
  nonCriticalExtension   SEQUENCE {}       OPTIONAL
}

MBMSCountingResponse-r10-IEs ::= SEQUENCE {
  mbsfn-AreaIndex-r10    INTEGER (0..maxMBSFN-Area-1)       OPTIONAL,
  countingResponseList-r10  CountingResponseList-r10          OPTIONAL,
  lateNonCriticalExtension OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension   SEQUENCE {}       OPTIONAL
}

CountingResponseList-r10 ::= SEQUENCE (SIZE (1..maxServiceCount)) OF CountingResponseInfo-r10

CountingResponseInfo-r10 ::=  SEQUENCE {
  countingResponseService-r10 INTEGER (0..maxServiceCount-1),
  ...
}

-- ASN1STOP
---
**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.

---

**MBSFNAreaConfiguration**

The MBSFNAreaConfiguration message contains the MBMS control information applicable for an MBSFN area. E-UTRAN configures an MCCH for each MBSFN area i.e. the MCCH identifies the MBSFN area.

Signalling radio bearer: N/A

RLC-SAP: UM

Logical channel: MCCH

Direction: E-UTRAN to UE

---

**MBSFNAreaConfiguration message**

```
-- ASN1START
MBSFNAreaConfiguration-r9 ::= SEQUENCE {
  commonSF-Alloc-r9     CommonSF-AllocPatternList-r9,
  commonSF-AllocPeriod-r9    ENUMERATED {
    rf4, rf8, rf16, rf32, rf64, rf128, rf256},
  pmch-InfoList-r9     PMCH-InfoList-r9,
  nonCriticalExtension    MBSFNAreaConfiguration-v930-IEs   OPTIONAL
}
MBSFNAreaConfiguration-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
  nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}
CommonSF-AllocPatternList-r9 ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig
-- ASN1STOP
```

**MBSFNAreaConfiguration field descriptions**

**commonSF-Alloc**
Indicates the subframes allocated to the MBSFN area

**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.

---

**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

-- ASN1START
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
}

-- ASN1STOP

MobilityFromEUTRACCommand message

-- ASN1START
MobilityFromEUTRACCommand ::= SEQUENCE {
rrc-TransactionIdentifier RRC-TransactionIdentifier,
criticalExtensions CHOICE {
c1 CHOICE {
mobilityFromEUTRACCommand-r8 MobilityFromEUTRACCommand-r8-IEs,
mobilityFromEUTRACCommand-r9 MobilityFromEUTRACCommand-r9-IEs,
spare2 NULL, spare1 NULL
},
criticalExtensionsFuture SEQUENCE {}
}

criticalExtensionsFuture SEQUENCE {}

-- ASN1STOP

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
nonCriticalExtension MobilityFromEUTRACommand-v8a0-IEs
OPTIONAL

}  

MobilityFromEUTRACommand-v8a0-IEs ::= SEQUENCE {
lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OP
nonCriticalExtension MobilityFromEUTRACommand-v8d0-IEs OPTIONAL
}

MobilityFromEUTRACommand-v8d0-IEs ::= SEQUENCE {
bandIndicator BandIndicatorGERAN OPTIONAL, -- Cond GERAN
nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}

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, -- Need OP
nonCriticalExtension MobilityFromEUTRACommand-v960-IEs OPTIONAL
}

MobilityFromEUTRACommand-v960-IEs ::= SEQUENCE {
bandIndicator BandIndicatorGERAN OPTIONAL, -- Cond GERAN
nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}

Handover ::= SEQUENCE {
targetRAT-Type ENUMERATED {
  utra, geran, cdma2000-1XRTT, cdma2000-HRPD, 
spare4, spare3, spare2, spare1, ...},
targetRAT-MessageContainer OCTET STRING,
nas-SecurityParamFromEUTRA OCTET STRING (SIZE (1)) OPTIONAL, -- Cond UTRAGERAN
systemInformation SI-OrPSI-GERAN OPTIONAL -- Cond PSKH
}

CellChangeOrder ::= SEQUENCE {
t304 ENUMERATED {
  ms100, ms200, ms500, ms1000, 
  ms2000, ms4000, ms8000, spare1},
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 {
  si SystemInfoListGERAN,
  psi SystemInfoListGERAN
}

E-CSFB-r9 ::= SEQUENCE {
messageContCDMA2000-1XRTT-r9 OCTET STRING OPTIONAL, -- Need ON
mobilityCDMA2000-HRPD-r9 ENUMERATED {
  handover, redirection
} OPTIONAL, -- Need OP
messageContCDMA2000-HRPD-r9 OCTET STRING OPTIONAL, -- Cond concHO
redirectCarrierCDMA2000-HRPD-r9 CarrierFreqCDMA2000 OPTIONAL -- Cond concRedir
}  

-- ASN1STOP
### MobilityFromEUTRACommand field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>bandIndicator</strong></td>
<td>Indicates how to interpret the ARFCN of the BCCH carrier.</td>
</tr>
<tr>
<td><strong>carrierFreq</strong></td>
<td>contains the carrier frequency of the target GERAN cell.</td>
</tr>
<tr>
<td><strong>csFallbackIndicator</strong></td>
<td>Value true indicates that the CS Fallback procedure to UTRAN or GERAN is triggered.</td>
</tr>
<tr>
<td><strong>messageContCDMA2000-1XRTT</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>messageContCDMA2000-HRPD</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>mobilityCDMA2000-HRPD</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>nas-SecurityParamFromEUTRA</strong></td>
<td>Used to deliver the key synchronisation and Key freshness for the E-UTRAN to UTRAN handovers as specified in TS 33.401. The content of the parameter is defined in TS24.301.</td>
</tr>
<tr>
<td><strong>networkControlOrder</strong></td>
<td>Parameter NETWORK_CONTROL_ORDER in TS 44.060 [36].</td>
</tr>
<tr>
<td><strong>purpose</strong></td>
<td>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).</td>
</tr>
<tr>
<td><strong>redirectCarrierCDMA2000-HRPD</strong></td>
<td>The redirectCarrierCDMA2000-HRPD indicates a CDMA2000 carrier frequency and is used to redirect the UE to a HRPD carrier frequency.</td>
</tr>
<tr>
<td><strong>SystemInfoListGERAN</strong></td>
<td>If purpose = CellChangeOrder and if the field is not present, the UE has to acquire SI/PSI from the GERAN cell.</td>
</tr>
<tr>
<td><strong>t304</strong></td>
<td>Timer T304 as described in section 7.3. Value ms100 corresponds with 100 ms, ms200 corresponds with 200 ms and so on.</td>
</tr>
<tr>
<td><strong>targetRAT-Type</strong></td>
<td>Indicates the target RAT type.</td>
</tr>
<tr>
<td><strong>targetRAT-MessageContainer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>NOTE 1.</strong></td>
<td>A complete message is included, as specified in the other standard.</td>
</tr>
</tbody>
</table>

#### Conditional presence

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>concHO</td>
<td>The field is mandatory present if the mobilityCDMA2000-HRPD is set to “handover”; otherwise the field is optional present, need ON.</td>
</tr>
<tr>
<td>concRedir</td>
<td>The field is mandatory present if the mobilityCDMA2000-HRPD is set to “redirection”; otherwise the field is not present.</td>
</tr>
<tr>
<td>GERAN</td>
<td>The field should be present if the purpose is set to “handover” and the targetRAT-Type is set to “geran”; 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>UTRAGERAN</td>
<td>The field is mandatory present if the targetRAT-Type is set to “utra” or “geran”; 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:
### targetRAT-Type | Standard to apply | targetRAT-MessageContainer
--- | --- | ---
`cdma2000-1XRTT` | C.S0001 or later, C.S0007 or later, C.S0008 or later | HANOVER COMMAND
`cdma2000-HRPD` | C.S0024 or later | PS HANOVER COMMAND
`geran` | GSM TS 04.18, version 8.5.0 or later, or 3GPP TS 44.018 (clause 9.1.15) 3GPP TS 44.060, version 6.13.0 or later (clause 11.2.43) 3GPP TS 44.060, version 7.6.0 or later (clause 11.2.46) | DTM HANOVER COMMAND
`utra` | 3GPP TS 25.331 (clause 10.2.16a) | HANDOVER TO UTRAN COMMAND

---

### 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
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, -- Need OP
    nonCriticalExtension   Paging-v920-IEs       OPTIONAL
}

Paging-v920-IEs ::=   SEQUENCE {
    cmas-Indication-r9    ENUMERATED {true}     OPTIONAL, -- Need ON
    nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}

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,
    ...
}

IMSI ::=       SEQUENCE (SIZE (6..21)) OF IMSI-Digit

IMSI-Digit ::=      INTEGER (0..9)
```

---
**Paging field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cmas-Indication</td>
<td>If present: indication of a CMAS notification.</td>
</tr>
<tr>
<td>cn-Domain</td>
<td>Indicates the origin of paging.</td>
</tr>
<tr>
<td>etws-Indication</td>
<td>If present: indication of an ETWS primary notification and/ or ETWS secondary notification.</td>
</tr>
<tr>
<td>imsi</td>
<td>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.</td>
</tr>
<tr>
<td>systemInfoModification</td>
<td>If present: indication of a BCCH modification other than SIB10, SIB11 and SIB12.</td>
</tr>
<tr>
<td>ue-Identity</td>
<td>Provides the NAS identity of the UE that is being paged.</td>
</tr>
</tbody>
</table>

### ProximityIndication

The **ProximityIndication** message is used to indicate that the UE is entering or leaving the proximity of one or more cells whose CSG IDs are in the UEs CSG whitelist.

- Signalling radio bearer: SRB1
- RLC-SAP: AM
- Logical channel: DCCH
- Direction: UE to E-UTRAN

#### ProximityIndication message

```asn1
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,
    ...             
  },
  nonCriticalExtension    ProximityIndication-v930-IEs
    OPTIONAL
}
ProximityIndication-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}
```

---

#### ProximityIndication field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>carrierFreq</td>
<td>Indicates the RAT and frequency of the cell(s), whose CSG IDs are in the UEs CSG whitelist, for which the proximity indication is sent.</td>
</tr>
<tr>
<td>type</td>
<td>Used to indicate whether the UE is entering or leaving the proximity of cell(s) whose CSG IDs are in the UEs CSG whitelist.</td>
</tr>
</tbody>
</table>
**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**

```asn1
RNReconfiguration-r10 ::= SEQUENCE {
  rrc-TransactionIdentifier  RRC-TransactionIdentifier,
  criticalExtensions    CHOICE {
    c1          CHOICE {
      rnReconfiguration-r10  RNReconfiguration-r10-IEs,
      spare3 NULL, spare2 NULL, spare1 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, -- Need OP
  nonCriticalExtension    SEQUENCE {}      OPTIONAL -- Need OP
}

RN-SystemInfo-r10 ::=   SEQUENCE {
  systemInformationBlockType1-r10  OCTET STRING (CONTAINING SystemInformationBlockType1) OPTIONAL, -- Need ON
  systemInformationBlockType2-r10  SystemInformationBlockType2  OPTIONAL, -- Need ON
  ...
}
```

---

**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**

```asn1
RNReconfigurationComplete-r10 ::=  SEQUENCE {
  rrc-TransactionIdentifier    RRC-TransactionIdentifier,
  criticalExtensions      CHOICE {
    c1          CHOICE {
      rnReconfigurationComplete-r10  RNReconfigurationComplete-r10-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture    SEQUENCE {}
  }
}

RNReconfigurationComplete-r10-IEs ::=  SEQUENCE {
  ...
}
```
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

```
-- ASN1START

RRCConnectionReconfiguration ::= SEQUENCE {  
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,  
  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  
  nonCriticalExtension    RRCConnectionReconfiguration-v890-IEs OPTIONAL  
}  

RRCConnectionReconfiguration-v890-IEs ::= SEQUENCE {  
  lateNonCriticalExtension   OCTET STRING     OPTIONAL, -- Need OP  
  nonCriticalExtension    RRCConnectionReconfiguration-v920-IEs  OPTIONAL  
}  

RRCConnectionReconfiguration-v920-IEs ::= SEQUENCE {  
  otherConfig-r9      OtherConfig-r9     OPTIONAL, -- Need ON  
  fullConfig-r9      ENUMERATED {true}    OPTIONAL,  -- Cond HO- 
  Reestab  
  nonCriticalExtension    RRCConnectionReconfiguration-v1020-IEs  OPTIONAL  
}  

RRCConnectionReconfiguration-v1020-IEs ::= SEQUENCE {  
  sCellToReleaseList-r10    SCellToReleaseList-r10   OPTIONAL,  -- Need ON  
  sCellToAddModList-r10    SCellToAddModList-r10   OPTIONAL,  -- Need ON  
  nonCriticalExtension    SEQUENCE {}      OPTIONAL -- Need OP  
}  

SCellToAddModList-r10 ::=  SEQUENCE (SIZE (1..maxSCell-r10)) OF SCellToAddMod-r10  

SCellToAddMod-r10 ::=   SEQUENCE {  
  sCellIndex-r10      SCellIndex-r10,  
  cellIdIdentification-r10    SEQUENCE {  
    physCellId-r10      PhysCellId,  
  }  
}  

-- ASN1STOP
```
### RRCConnectionReconfiguration 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>
<tr>
<td>keyChangeIndicator</td>
<td>Indicates whether key change is to be performed. True is used only in an intra-cell handover when a K_{eNB} key is derived from a native K_{ASME} key taken into use through the successful NAS SMC, as described in TS 33.401 [32] for K_{eNB} re-keying. False is used in an intra-LTE handover when the new K_{eNB} key is obtained from the current K_{eNB} key or from the NH as described in TS 33.401 [32].</td>
</tr>
<tr>
<td>nas-securityParamToEUTRA</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 it affects activation of AS- security after inter-RAT handover to E-UTRA. The content is defined in TS 24.301.</td>
</tr>
<tr>
<td>nextHopChainingCount</td>
<td>Parameter NCC: See TS 33.401 [32].</td>
</tr>
</tbody>
</table>

### Conditional presence

<table>
<thead>
<tr>
<th>Presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<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>This field is optionally present, need ON, in case of handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment; 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>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>
The **RRCConnectionReconfigurationComplete** 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

**RRCConnectionReconfigurationComplete message**

```asn1
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    SEQUENCE {}      OPTIONAL
}
```

**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 {}
  }
}
```
RRCConnectionReestablishmentComplete

The RRCConnectionReestablishmentComplete message is used to confirm the successful completion of an RRC connection reestablishment.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to E-UTRAN

-- ASN1START

RRCConnectionReestablishmentComplete ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    rrcConnectionReestablishmentComplete-r8                  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    SEQUENCE {} OPTIONAL
}

-- ASN1STOP

RRCConnectionReestablishmentComplete field descriptions

rlf-InfoAvailable
This field is used to indicate the availability of radio link failure related measurements

--

RRCConnectionReestablishmentReject

The RRCConnectionReestablishmentReject message is used to indicate the rejection of an RRC connection reestablishment request.
Signalling radio bearer: SRB0  
RLC-SAP: TM  
Logical channel: CCCH  
Direction: E-UTRAN to UE

**RRCConnectionReestablishmentReject message**

```plaintext
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, -- Need OP
  nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}
```

**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**

```plaintext
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}
```
### RRCConnectionReestablishmentRequest field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>physCellId</code></td>
<td>The Physical Cell Identity of the PCell the UE was connected to prior to the failure.</td>
</tr>
<tr>
<td><code>reestablishmentCause</code></td>
<td>Indicates the failure cause that triggered the re-establishment procedure.</td>
</tr>
<tr>
<td><code>ue-Identity</code></td>
<td>UE identity included to retrieve UE context and to facilitate contention resolution by lower layers.</td>
</tr>
</tbody>
</table>

### RRCConnectionReject

The **RRCConnectionReject** message is used to reject the RRC connection establishment.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: E-UTRAN to UE

#### RRCConnectionReject message

```asn1
RRCConnectionReject ::= SEQUENCE {
    criticalExtensions     CHOICE {
        c1         CHOICE {
            rrcConnectionReject-r8    RRCConnectionReject-r8-IEs,
            spare3 NULL, spare2 NULL, spare1 NULL
        },
        criticalExtensionsFuture   SEQUENCE {}  
    }
}
RRCConnectionReject-r8-IEs ::=  SEQUENCE {
    waitTime       INTEGER (1..16),
    nonCriticalExtension    RRCConnectionReject-v8a0-IEs  OPTIONAL
}
RRCConnectionReject-v8a0-IEs ::= SEQUENCE {
    lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
    nonCriticalExtension   RRCConnectionReject-v1020-IEs  OPTIONAL
}
RRCConnectionReject-v1020-IEs ::= SEQUENCE {
    extendedWaitTime-r10    INTEGER (1..1800)  OPTIONAL, -- Need ON
    nonCriticalExtension   SEQUENCE {}    OPTIONAL -- Need OP
}
```

### RRCConnectionReject field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>waitTime</code></td>
<td>Value in seconds for the wait time for Delay Tolerant access requests.</td>
</tr>
<tr>
<td><code>extendedWaitTime</code></td>
<td>Value in seconds for the wait time for Delay Tolerant access requests.</td>
</tr>
</tbody>
</table>

### RRCConnectionRelease

The **RRCConnectionRelease** message is used to command the release of an RRC connection.
Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**RRCConnectionRelease message**

```asn1
RRCConnectionRelease ::=   SEQUENCE {
    rrc-TransactionIdentifier   RRC-TransactionIdentifier,
    criticalExtensions     CHOICE {
        cl     RRCConnectionRelease-r8-IEs,
        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 OPTIONAL, -- Need OP
    nonCriticalExtension    RRCConnectionRelease-v920-IEs OPTIONAL
}

RRCConnectionRelease-v920-IEs ::= SEQUENCE {
    cellInfoList-r9     CHOICE {
        geran-r9      CellInfoListGERAN-r9,
        utra-FDD-r9    CellInfoListUTRA-FDD-r9,
        utra-TDD-r9    CellInfoListUTRA-TDD-r9,
        utra-TDD-r10   CellInfoListUTRA-TDD-r10
    } OPTIONAL, -- Cond Redirection
    nonCriticalExtension    RRCConnectionRelease-v1020-IEs OPTIONAL
}

RRCConnectionRelease-v1020-IEs ::= SEQUENCE {
    extendedWaitTime-r10    INTEGER (1..1800) OPTIONAL, -- Need ON
    nonCriticalExtension    SEQUENCE {} OPTIONAL -- Need OP
}

ReleaseCause ::=    ENUMERATED {loadBalancingTAUrequired, other, cs-FallbackHighPriority, spare1}

RedirectedCarrierInfo ::=   CHOICE {
    eutra  ARFCN-ValueEUTRA,
    geran  CarrierFreqsGERAN,
    utra-FDD  ARFCN-ValueUTRA,
    utra-TDD  ARFCN-ValueUTRA,
    cdma2000-1xRTT  CarrierFreqCDMA2000,
    cdma2000-1xRTT  CarrierFreqCDMA2000,
    ..., utra-TDD-r10  CarrierFreqListUTRA-TDD-r10
}

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
```
FreqPriorityListEUTRA ::= SEQUENCE (SIZE (1..maxFreq)) OF FreqPriorityEUTRA

FreqPriorityEUTRA ::= SEQUENCE {
  carrierFreq        ARFCN-ValueEUTRA,
  cellReselectionPriority    CellReselectionPriority
}

FreqPriorityListGERAN ::= SEQUENCE (SIZE (1..maxGNFG)) OF FreqPriorityGERAN

FreqPriorityGERAN ::= SEQUENCE {
  carrierFreqs CarrierFregsGERAN,
  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
}

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
}

FreqPriorityListUTRA-TDD ::= SEQUENCE (SIZE (1..maxUTRA-TDD-Carrier)) OF FreqPriorityUTRA-TDD

FreqPriorityUTRA-TDD ::= 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
}

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
**RRCConnectionRelease field descriptions**

**carrierFreq or bandClass**  
The carrier frequency (UTRA and E-UTRA) and band class (HRPD and 1xRTT) for which the associated cellReselectionPriority is applied.

**carrierFreqs**  
The list of GERAN carrier frequencies organised into one group of GERAN carrier frequencies.

**cellInfoList**  
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.

**extendedWaitTime**  
Value in seconds for the wait time for Delay Tolerant access requests.

**freqPriorityListX**  
Provides a cell reselection priority for each frequency, by means of separate lists for each RAT (including E-UTRA).

**idleModeMobilityControlInfo**  
Provides dedicated cell reselection priorities. Used for cell reselection as specified in TS 36.304 [4].

**redirectedCarrierInfo**  
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]. E-UTRAN only applies value utra-TDD-r10 for redirectedCarrierInfo if cellInfoList-r9 is set to utra-TDD-r10.

**releaseCause**  
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 or utra-TDD. E-UTRAN should not set the releaseCause to loadBalancingTAURequired or to cs-FallbackHighPriority if the extendedWaitTime is present.

**systemInformation**  
Container for system information of the GERAN cell. Each OCTET STRING in SystemInfoListGERAN contains one complete System Information (SI) message as defined in TS 44.018 [45, table 9.1.1].

**t320**  
Timer T320 as described in section 7.3. Value minN corresponds to N minutes.

**utra-BCCCH-Container**  
Contains System Information Container message as defined in TS 25.331 [19].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Redirection</strong></td>
<td>The field is optionally present, need ON, if the redirectedCarrierInfo is included and set to geran, utra-FDD, utra-TDD or utra-TDD-r10; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

**RRCConnectionRequest**

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**

```
-- ASN1START
RRCConnectionRequest ::= SEQUENCE {
    criticalExtensions     CHOICE {
        rrcConnectionRequest-r8    RRCConnectionRequest-r8-IEs,
        criticalExtensionsFuture   SEQUENCE {}  
    }
}
RRCConnectionRequest-r8-IEs ::= SEQUENCE {
    ue-Identity       InitialUE-Identity,
    establishmentCause EstablishmentCause, 
}
-- ASN1END
```
InitialUE-Identity ::=   CHOICE {
   s-TMSI        S-TMSI,
   randomValue       BIT STRING (SIZE (40))
}

EstablishmentCause ::=   ENUMERATED {
   emergency, highPriorityAccess, mt-Access, mo-Signalling,
   mo-Data, delayTolerantAccess-v1020, spare2, spare1

--- ASN1STOP

**RRConnectionRequest 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.’

**randomValue**
Integer value in the range 0 to $2^{40} - 1$.

**ue-Identity**
UE identity included to facilitate contention resolution by lower layers.

---

**RRConnectionSetup**
The *RRConnectionSetup* message is used to establish SRB1.

- Signalling radio bearer: SRB0
- RLC-SAP: TM
- Logical channel: CCCH
- Direction: E-UTRAN to UE

**RRConnectionSetup message**

--- ASN1START

RRConnectionSetup ::=    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 {}
   },
   nonCriticalExtension    RRCConnectionSetup-v8a0-IEs       OPTIONAL
}

RRConnectionSetup-v8a0-IEs ::= SEQUENCE {
   lateNonCriticalExtension   OCTET STRING      OPTIONAL, -- Need OP
   nonCriticalExtension    SEQUENCE {}       OPTIONAL -- Need OP
}

--- ASN1STOP
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 {
    rrcConnectionSetupComplete-r8  RRCConnectionSetupComplete-r8-IEs,
    spare3 NULL, spare2 NULL, spare1 NULL
  },
  criticalExtensionsFuture   SEQUENCE {}
}

RRCConnectionSetupComplete-r8-IEs ::= SEQUENCE {
  selectedPLMN-Identity    INTEGER (1..6),
  registeredMME      RegisteredMME      OPTIONAL,
  dedicatedInfoNAS     DedicatedInfoNAS,
  nonCriticalExtension    RRCConnectionSetupComplete-v8a0-IEs OPTIONAL
}

RRCConnectionSetupComplete-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    RRCConnectionSetupComplete-v1020-IEs OPTIONAL
}

RRCConnectionSetupComplete-v1020-IEs ::= SEQUENCE {
  gummei-Type-r10      ENUMERATED {native, mapped}   OPTIONAL,
  rlf-InfoAvailable-r10    ENUMERATED {true}     OPTIONAL,
  logMeasAvailable-r10    ENUMERATED {true}     OPTIONAL,
  rn-SubframeConfigReq-r10   ENUMERATED {required, notRequired} OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

RegisteredMME ::=     SEQUENCE {
  plmn-Identity      PLMN-Identity      OPTIONAL,
  mmegi        BIT STRING (SIZE (16)),
  mmeC        MMEC
}
```

### RRCConnectionSetupComplete field descriptions

**gummei-Type**

This field is used to indicate whether the GUMMEI included is native (assigned by EPC) or mapped (from 2G/3G identifiers).

**mmegi**

Provides the Group Identity of the registered MME within the PLMN, as provided by upper layers, see TS 23.003 [27].

**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` included in SIB1. 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.
-- 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

-- ASN1START

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, -- Need OP
  nonCriticalExtension SEQUENCE {} OPTIONAL -- Need OP
}

SecurityConfigSMC ::= SEQUENCE {
  securityAlgorithmConfig SecurityAlgorithmConfig,
  ...
}

-- ASN1STOP

-- 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

-- ASN1START

SecurityModeComplete ::= SEQUENCE {
  rrc-TransactionIdentifier RRC-TransactionIdentifier,
  criticalExtensions CHOICE {
    securityModeComplete-r8 SecurityModeComplete-r8-IEs,
    criticalExtensionsFuture SEQUENCE {}
  }
}

SecurityModeComplete-r8-IEs ::= SEQUENCE {
  nonCriticalExtension SecurityModeComplete-v8a0-IEs OPTIONAL
}

-- ASN1STOP
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

---

SystemInformation

The *SystemInformation* 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
SystemInformationBlockType1

SystemInformationBlockType1 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 message

--- ASN1START

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     INTEGER (1..64),
  schedulingInfoList     SchedulingInfoList,
  tdd-Config       TDD-Config     OPTIONAL, -- Cond TDD
  si-WindowLength      ENUMERATED {
    ms1, ms2, ms5, ms10, ms15, ms20, ms40},
  systemInfoValueTag     INTEGER (0..31),
  nonCriticalExtension    SystemInformationBlockType1-v890-IEs
},
nonCriticalExtension    SystemInformationBlockType1-v920-IEs OPTIONAL
}

SystemInformationBlockType1-v890-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING   OPTIONAL, -- Need OP
  nonCriticalExtension    SystemInformationBlockType1-v920-IEs OPTIONAL
}

SystemInformationBlockType1-v920-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING  OPTIONAL, -- Need OP
  nonCriticalExtension       SystemInformationBlockType1-v920-IEs  OPTIONAL
}
ims-EmergencySupport-r9    ENUMERATED {true}    OPTIONAL, -- Need OR
  nonCriticalExtension    SEQUENCE {}    OPTIONAL -- Need OP

PLMN-IdentityList ::=     SEQUENCE (SIZE (1..6)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::=     SEQUENCE {
  plmn-Identity       PLMN-Identity,
  cellReservedForOperatorUse    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
}

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, spare5, spare4, spare3, spare2, spare1, ...}

CellSelectionInfo-v920 ::=   SEQUENCE {
  q-QualMin-r9      Q-QualMin-r9,
  q-QualMinOffset-r9     INTEGER (1..8)      OPTIONAL -- Need OP
}

-- ASN1STOP
**SystemInformationBlockType1 field descriptions**

**cellBarred**
_barred means the cell is barred, as defined in TS 36.304 [4]._

**cellReservedForOperatorUse**
_As defined in TS 36.304 [4]._

**csg-Identity**
_Identity of the Closed Subscriber Group within the primary PLMN the cell belongs to._

**csg-Indication**
_If set to TRUE the UE is only allowed to access the cell if the CSG identity matches an entry in the CSG whitelist that the UE has stored._

**freqBandIndicator**
_Defined in TS 36.101 [42, table 5.5-1]._

**ims-EmergencySupport**
_Indicates whether the cell supports IMS emergency bearer services for UEs in limited service mode. If absent, IMS emergency call is not supported in the cell for UEs in limited service mode._

**intraFreqReselection**
_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]._

**plmn-IdentityList**
_List of PLMN identities. The first listed PLMN-Identity is the primary PLMN._

**p-Max**
_Value applicable for the cell. If absent the UE applies the maximum power according to the UE capability._

**q-QualMin**
_Parameter “Q\text{qualmin}” in TS 36.304 [4]. If cellSelectionInfo-v920 is not present, the UE applies the (default) value of negative infinity for Q\text{qualmin}._

**q-QualMinOffset**
_Parameter “Q\text{qualminoffset}” in TS 36.304 [4]. Actual value Q\text{qualminoffset} = IE 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\text{qualminoffset}. Affects the minimum required quality level in the cell._

**q-RxLevMinOffset**
_Parameter Q\text{rxlevminoffset} in TS 36.304 [4]. Actual value Q\text{rxlevminoffset} = IE value * 2 [dB]. If absent, the UE applies the (default) value of 0 dB for Q\text{rxlevminoffset}. Affects the minimum required Rx level in the cell._

**sib-MappingInfo**
_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._

**si-Periodicity**
_Periodicity of the SI-message in radio frames, such that rf8 denotes 8 radio frames, rf16 denotes 16 radio frames, and so on._

**si-WindowLength**
_Common SI scheduling window for all SIs. Unit in milliseconds, where ms1 denotes 1 millisecond, ms2 denotes 2 milliseconds and so on._

**systemInfoValueTag**
_Common for all SIBs other than MIB, SIB1, SIB10, SIB11 and SIB12. Change of MIB and SIB1 is detected by acquisition of the corresponding message._

**trackingAreaCode**
_A trackingAreaCode that is common for all the PLMNs listed._

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSRQ</td>
<td>The field is mandatory present if SIB3 is being broadcast and \text{threshServingLowQ} is present in SIB3; otherwise optionally present, Need OP.</td>
</tr>
<tr>
<td>TDD</td>
<td>This field is mandatory present for TDD; it is not present for FDD and the UE shall delete any existing value for this field.</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**

```
UECapabilityEnquiry ::=   SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      ueCapabilityEnquiry-r8    UECapabilityEnquiry-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}
```

**UECapabilityEnquiry field descriptions**

- **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.

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**

```
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
}

UECapabilityInformation-v8a0-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    SEQUENCE {}       OPTIONAL
}

-- ASN1STOP

UEInformationRequest

The **UEInformationRequest** is the command used by E-UTRAN to retrieve information from the UE.

Signalling radio bearer: SRB1

RLC-SAP: AM

Logical channel: DCCH

Direction: E-UTRAN to UE

**UEInformationRequest message**

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)
**UEInformationResponse message**

```asn1
type UEInformationResponse-r9 ::= SEQUENCE {
  rrc-TransactionIdentifier   RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1        CHOICE {
      ueInformationResponse-r9    UEInformationResponse-r9-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture    SEQUENCE {} }
}

UEInformationResponse-r9-IEs ::=  SEQUENCE {
  rach-Report-r9       SEQUENCE {
    numberOfPreamblesSent-r9    INTEGER (1..200),
    contentionDetected-r9     BOOLEAN
  }                OPTIONAL,
  rlf-Report-r9       RLF-Report-r9   OPTIONAL,
  nonCriticalExtension     UEInformationResponse-v930-IEs    OPTIONAL
}

UEInformationResponse-v930-IEs ::= SEQUENCE {
  lateNonCriticalExtension   OCTET STRING      OPTIONAL,
  nonCriticalExtension    UEInformationResponse-v1020-IEs  OPTIONAL
}

UEInformationResponse-v1020-IEs ::= SEQUENCE {
  logMeasReport-r10     LogMeasReport-r10    OPTIONAL,
  nonCriticalExtension    SEQUENCE {}      OPTIONAL
}

RLF-Report-r9 ::=      SEQUENCE {
  measResultLastServCell-r9    SEQUENCE {
    rach-Report-r9       SEQUENCE {
      rachResult-r9       RSRP-Range,
      rachResult-r9       RSEQ-Range
    }                OPTIONAL,
    rlf-Report-r9       RLF-Report-r9   OPTIONAL,
    nonCriticalExtension     UEInformationResponse-v1020-IEs  OPTIONAL
  },
  measResultNeighborCells-r9    SEQUENCE {
    measResultList2EUTRA-r9    MeasResultList2EUTRA-r9  OPTIONAL,
    measResultList2UTRA-r9    MeasResultList2UTRA-r9  OPTIONAL,
    measResultListGERAN-r9    MeasResultListGERAN  OPTIONAL,
    measResultListCDMA2000-r9    MeasResultList2CDMA2000-r9  OPTIONAL
  } OPTIONAL,
  ...,
  locationInfo-r10    LocationInfo-r10  OPTIONAL,
  failedPCellId-r10    CHOICE {
    cellGlobalId-r10       CellGlobalIdEUTRA,
    pcl-arfcn-r10       SEQUENCE {
      physCellId-r10       PhysCellId,
      carrierFreq-r10      ARFCN-ValueEUTRA
    }                OPTIONAL,
    reestablishmentCellId-r10    CellGlobalIdEUTRA  OPTIONAL,
    timeConnFailure-r10    INTEGER (0..1023)    OPTIONAL,
    connectionFailureType-r10  ENUMERATED {rlf, hof}   OPTIONAL,
    previousPCellId-r10    CellGlobalIdEUTRA  OPTIONAL
  }],
  reestablishmentCellId-r10    CellGlobalIdEUTRA  OPTIONAL,
  timeConnFailure-r10    INTEGER (0..1023)    OPTIONAL,
  connectionFailureType-r10  ENUMERATED {rlf, hof}   OPTIONAL,
  previousPCellId-r10    CellGlobalIdEUTRA  OPTIONAL
}

MeasResultList2EUTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2EUTRA-r9

MeasResult2EUTRA-r9 ::= SEQUENCE {
  carrierFreq-r9    ARFCN-ValueEUTRA,
  measResultList-r9    MeasResultListEUTRA
}

MeasResultList2UTRA-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2UTRA-r9

MeasResult2UTRA-r9 ::= SEQUENCE {
  ...,
  failedPCellId-r10    CHOICE {
    cellGlobalId-r10       CellGlobalIdEUTRA,
    pcl-arfcn-r10       SEQUENCE {
      physCellId-r10       PhysCellId,
      carrierFreq-r10      ARFCN-ValueEUTRA
    }                OPTIONAL,
    reestablishmentCellId-r10    CellGlobalIdEUTRA  OPTIONAL,
    timeConnFailure-r10    INTEGER (0..1023)    OPTIONAL,
    connectionFailureType-r10  ENUMERATED {rlf, hof}   OPTIONAL,
    previousPCellId-r10    CellGlobalIdEUTRA  OPTIONAL
  }],
  reestablishmentCellId-r10    CellGlobalIdEUTRA  OPTIONAL,
  timeConnFailure-r10    INTEGER (0..1023)    OPTIONAL,
  connectionFailureType-r10  ENUMERATED {rlf, hof}   OPTIONAL,
  previousPCellId-r10    CellGlobalIdEUTRA  OPTIONAL
}
```

---
carrierFreq-r9         ARFCN-ValueUTRA,
measResultList-r9     MeasResultUTRA
}

MeasResultList2CDMA2000-r9 ::= SEQUENCE (SIZE (1..maxFreq)) OF MeasResult2CDMA2000-r9

MeasResult2CDMA2000-r9 ::= SEQUENCE {
carrierFreq-r9         CarrierFreqCDMA2000,
measResultList-r9     MeasResultsCDMA2000
}

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,
...}

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
  },
  measResultNeighborCells-r10  SEQUENCE {
    measResultListEUTRA-r10     MeasResultList2EUTRA-r9  OPTIONAL,
    measResultListUTRA-r10     MeasResultList2UTRA-r9  OPTIONAL,
    measResultListGERAN-r10    MeasResultList2GERAN-r10 OPTIONAL,
    measResultListCDMA2000-r10  MeasResultList2CDMA2000-r9 OPTIONAL
  } OPTIONAL,
...}

MeasResultList2GERAN-r10 ::= SEQUENCE (SIZE (1..maxCellListGERAN)) OF MeasResultListGERAN

-- ASN1STOP
UEInformationResponse field descriptions

**absoluteTimeStamp**
Indicates the absolute time when the logged measurement configuration logging is provided, as indicated by E-UTRAN within absoluteTimeInfo.

**connectionFailureType**
This field is used to indicate whether the connection failure is due to radio link failure or handover failure.

**contentionDetected**
This field is used to indicate that contention was detected for at least one of the transmitted preambles, see also [6].

**failedPCellId**
This field is used to indicate the PCell in which RLF is detected or the target PCell of the failed handover.

**measResultLastServCell**
This field refers to the last measurement results taken in the PCell, where radio link failure happened.

**numberOfPreamblesSent**
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].

**previousPCellId**
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).

**reestablishmentCellId**
This field is used to indicate the cell in which the re-establishment attempt was made after connection failure.

**relativeTimeStamp**
Indicates the time of logging measurement results, measured relative to the absoluteTimeStamp. Value in seconds.

**tce-Id**
Parameter Trace Collection Entity Id: See TS 32.422 [58].

**timeConnFailure**
This field is used to indicate the time elapsed since the last HO initialization until connection failure. Actual value = IE value * 100ms. The maximum value 1023 means 102.3s or longer.

**traceRecordingSessionRef**
Parameter Trace Recording Session Reference: See TS 32.422 [58].

---

**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
}
```
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

6.3 RRC information elements

6.3.1 System information blocks

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,  OPTIONAL,  -- Need OP
    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-ValueUTRA,  OPTIONAL,  -- Need OP
    ul-Bandwidth     ENUMERATED {n6, n15, n25, n50, n75, n100},  OPTIONAL,  -- Need OP
    additionalSpectrumEmission     AdditionalSpectrumEmission
  },
  mbsfn-SubframeConfigList     MBSFN-SubframeConfigList,  OPTIONAL,  -- Need OR
  timeAlignmentTimerCommon     TimeAlignmentTimer,
  ...,
  lateNonCriticalExtension    OCTET STRING,  OPTIONAL,  -- Need OP
  [[
    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-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(5))
}

MBSFN-SubframeConfigList ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-
SubframeConfig

-- ASN1STOP
SystemInformationBlockType2 field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac-BarringFactor</td>
<td>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.</td>
</tr>
<tr>
<td>ac-BarringForCSFB</td>
<td>Access class barring for mobile originating CS fallback.</td>
</tr>
<tr>
<td>ac-BarringForEmergency</td>
<td>Access class barring for AC 10.</td>
</tr>
<tr>
<td>ac-BarringForMO-Data</td>
<td>Access class barring for mobile originating calls.</td>
</tr>
<tr>
<td>ac-BarringForMO-Signalling</td>
<td>Access class barring for mobile originating signalling.</td>
</tr>
<tr>
<td>ac-BarringForSpecialAC</td>
<td>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.</td>
</tr>
<tr>
<td>ac-BarringTime</td>
<td>Mean access barring time value in seconds.</td>
</tr>
<tr>
<td>mbsfn-SubframeConfigList</td>
<td>Defines the subframes that are reserved for MBSFN in downlink.</td>
</tr>
<tr>
<td>ssac-BarringForMMTEL-Video</td>
<td>Service specific access class barring for MMTEL video originating calls.</td>
</tr>
<tr>
<td>ssac-BarringForMMTEL-Voice</td>
<td>Service specific access class barring for MMTEL voice originating calls.</td>
</tr>
<tr>
<td>ul-Bandwidth</td>
<td>Parameter: transmission bandwidth configuration, NRB, 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.</td>
</tr>
<tr>
<td>ul-CarrierFreq</td>
<td>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.</td>
</tr>
</tbody>
</table>

SystemInformationBlockType3

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

```asn1
SystemInformationBlockType3 ::= SEQUENCE {
  cellReselectionInfoCommon
    SEQUENCE {
      q-Hyst
        ENUMERATED { db0, db1, db2, db3, db4, db5, db6, db8, db10, db12, db14, db16, db18, db20, db22, db24},
      speedStateReselectionPars
        SEQUENCE {
          mobilityStateParameters
            MobilityStateParameters,
          q-HystSF
            SEQUENCE {
              sf-Medium
                ENUMERATED { db-6, db-4, db-2, db0},
              sf-High
                ENUMERATED { db-6, db-4, db-2, db0}
            },
          OPTIONAL -- Need OP
        },
      cellReselectionServingFreqInfo
        SEQUENCE {
          s-NonIntraSearch
            ReselectionThreshold OPTIONAL, -- Need OP
          threshServingLow
            ReselectionThreshold,
          cellReselectionPriority
            CellReselectionPriority
        },
      intraFreqCellReselectionInfo
        SEQUENCE {
          q-RxLevMin
            Q-RxLevMin,
          p-Max
            P-Max OPTIONAL, -- Need OP
          s-IntraSearch
            ReselectionThreshold OPTIONAL, -- Need OP
          allowedMeasBandwidth
            AllowedMeasBandwidth OPTIONAL, -- Need OP
          presenceAntennaPort1
            PresenceAntennaPort1
        }
    } OPTIONAL -- Need OP
}
```
neighCellConfig NeighCellConfig,
t-ReselectionEUTRA T-Reselection,
t-ReselectionEUTRA-SF SpeedStateScaleFactors OPTIONAL -- Need OP
}
...
lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OP
[[ s-IntraSearch-v920 SEQUENCE {
s-IntraSearchP-r9 ReselectionThreshold,
s-IntraSearchQ-r9 ReselectionThresholdQ-r9
} OPTIONAL, -- Need OP
s-NonIntraSearch-v920 SEQUENCE {
s-NonIntraSearchP-r9 ReselectionThreshold,
s-NonIntraSearchQ-r9 ReselectionThresholdQ-r9
} OPTIONAL, -- Need OP
q-QualMin-r9 Q-QualMin-r9 OPTIONAL, -- Need OP
threshServingLowQ-r9 ReselectionThresholdQ-r9 OPTIONAL -- Need OP
]]
-- ASN1STOP
SystemInformationBlockType3 field descriptions

allowedMeasBandwidth
If absent, the value corresponding to the downlink bandwidth indicated by the dl-Bandwidth included in MasterInformationBlock applies.

cellReselectionInfoCommon
Cell re-selection information common for cells.

cellReselectionServingFreqInfo
Information common for Cell re-selection to inter-frequency and inter-RAT cells.
intraFreqCellReselectionInfo
Cell re-selection information common for intra-frequency cells.

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 \( Q_{\text{hyst}} \) in 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 \( Q_{\text{hyst}} \)” 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 \( Q_{\text{hyst}} \) 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 “\( Q_{\text{qualmin}} \)” 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 \( Q_{\text{qualmin}} \).

q-RxLevMin
Parameter “\( Q_{\text{rxlevmin}} \)” in TS 36.304 [4], applicable for intra-frequency neighbour cells.

s-IntraSearch
Parameter “s-IntraSearchP” 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 0 dB for s-IntraSearchQ.

s-IntraSearchQ

s-IntraSearchO
Parameter “s-IntraSearchO” in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of 0 dB for SnonIntraSearchQ.

s-NonIntraSearch
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 0 dB for s-NonIntraSearchQ.

s-NonIntraSearchQ
Parameter “s-NonIntraSearchQ” in TS 36.304 [4]. If the field is not present, the UE applies the (default) value of 0 dB for SnonIntraSearchQ.

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].

threshServingLow
Parameter “ThreshServing, LowP” in TS 36.304 [4].

threshServingLowQ
Parameter “ThreshServing, LowQ” in TS 36.304 [4].

i-ReselectionEUTRA
Parameter “TreselectionEUTRA” in TS 36.304 [4].

i-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].

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 information element

```asn1
SystemInformationBlockType4 ::= SEQUENCE {
intraFreqNeighCellList          IntraFreqNeighCellList  OPTIONAL,    -- Need OR
}
```
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---

**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 it was received in the same primary PLMN. The 3 hour validity restriction (section 5.2.1.3) does not apply to this field.

- **intraFreqBlackCellList**
  List of blacklisted intra-frequency neighbouring cells.

- **intraFreqNeighCellList**
  List of intra-frequency neighbouring cells with specific cell re-selection parameters.

- **q-OffsetCell**
  Parameter “Qoffset_{s,n}” in TS 36.304 [4].

---

**Conditional presence | Explanation**

| CSG | This field is optional, need OP, for non-CSG cells, and mandatory for CSG cells.

---

**– 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**

---

```
interFreqCarrierFreqList := SEQUENCE (SIZE (1..maxFreq)) OF InterFreqCarrierFreqInfo

InterFreqCarrierFreqInfo ::= SEQUENCE {
  dl-CarrierFreq      ARFCN-ValueEUTRA,
  q-RxLevMin       Q-RxLevMin,
  p-Max        P-Max       OPTIONAL,  -- Need OP
  t-ReselectionEUTRA     T-Reselection,
  t-ReselectionEUTRA-SF    SpeedStateScaleFactors  OPTIONAL,  -- Need OP
  threshX-High      ReselectionThreshold,
  threshX-Low       ReselectionThreshold,
  allowedMeasBandwidth    AllowedMeasBandwidth,
  presenceAntennaPort1    PresenceAntennaPort1,
  cellReselectionPriority    CellReselectionPriority OPTIONAL,  -- Need OP
  neighCellConfig      NeighCellConfig,
  q-OffsetFreq      Q-OffsetRange     DEFAULT dB0,
  interFreqNeighCellList    InterFreqNeighCellList   OPTIONAL,   -- Need OR
  interFreqBlackCellList    InterFreqBlackCellList   OPTIONAL,   -- Need OR
  ...,
  [ q-QualMin-r9     Q-QualMin-r9     OPTIONAL,  -- Need OP
    threshX-Q-r9     SEQUENCE {
      threshX-HighQ-r9    ReselectionThresholdQ-r9,
    }
  ],
}
```
SystemInformationBlockType5 field descriptions

interFreqBlackCellList
List of blacklisted inter-frequency neighbouring cells.

interFreqNeighCellList
List of inter-frequency neighbouring cells with specific cell re-selection parameters.

p-Max
Value applicable for the neighbouring E-UTRA cells on this carrier frequency. If absent the UE applies the maximum power according to the UE capability.

q-OffsetCell
Parameter “Qoffsets,n” 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.

threshX-High

threshX-HighQ
Parameter “ThreshX, HighQ” in TS 36.304 [4].

threshX-Low

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].

Conditional presence | Explanation
---|---
RSRQ | The field is mandatory present if threshServingLowQ is present in systemInformationBlockType3; 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

-- ASN1START
SystemInformationBlockType6 ::= SEQUENCE {
carrierFreqListUTRA-FDD | CarrierFreqListUTRA-FDD OPTIONAL, -- Need OR
carrierFreqListUTRA-TDD | CarrierFreqListUTRA-TDD OPTIONAL, -- Need OR
t-ReselectionUTRA | T-Reselection,
t-ReselectionUTRA-SF | SpeedStateScaleFactors OPTIONAL, -- Need OP
lateNonCriticalExtension OCTET STRING OPTIONAL -- Need OP
}
-- ASN1STOP
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
}

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),
...[
] threshX-Q-r9 SEQUENCE {
  threshX-HighQ-r9 ReselectionThresholdQ-r9,
threshX-LowQ-r9 ReselectionThresholdQ-r9
} OPTIONAL -- Cond RSRQ
}

SystemInformationBlockType6 field descriptions

carrierFreqListUTRA-FDD
List of carrier frequencies of UTRA FDD.
carrierFreqListUTRA-TDD
List of carrier frequencies of UTRA TDD.
p-MaxUTRA
The maximum allowed transmission power on the (uplink) carrier frequency, see TS 25.304 [40]. In dBm
q-RxLevMin
Parameter “Qrxlevmin” in TS 25.304 [40]. Actual value = IE value * 2+1 [dBm].
q-QualMin
Parameter “Qqualmin” in TS 25.304 [40]. Actual value = IE value [dB].
t-ReselectionUTRA
Parameter “TreselectionUTRAN” in TS 36.304 [4].
t-ReselectionUTRA-SF
Parameter “Speed dependent ScalingFactor for TreselectionUTRA” in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4].
threshX-High
threshX-HighQ
Parameter “ThreshX, HighQ” in TS 36.304 [4].
threshX-Low
threshX-LowQ
Parameter “ThreshX, LowQ” 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>
</tbody>
</table>

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

--- ASN1START

SystemInformationBlockType7 ::= SEQUENCE {
  t-ReselectionGERAN       T-Reselection, OPTIONAL, -- Need OR
  t-ReselectionGERAN-SF    SpeedStateScaleFactors OPTIONAL, -- Need OR
  carrierFreqsInfoList     CarrierFreqsInfoListGERAN OPTIONAL, -- Need OR
  ...,                      
  lateNonCriticalExtension OCTET STRING OPTIONAL  -- Need OP
}

CarrierFreqsInfoListGERAN ::= SEQUENCE {CarrierFreqsGERAN, 
  commonInfo                SEQUENCE {carrierFreqsGERAN, 
                                   cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
                                   ncc-Permitted BIT STRING (SIZE (8)),
                                   p-MaxGERAN INTEGER (0..39),
                                   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 pmaxGERAN is absent, the maximum power according to the UE capability is used.

q-RxLevMin
Parameter “Q_{olimn}” in TS 36.304 [1], minimum required RX level in the GSM cell. The actual value of Q_{olimn} in dBm = (IE value * 2) − 115.

threshX-High

threshX-Low

t-ReselectionGERAN
Parameter “TreselectionGERAN” in TS 36.304 [4].

t-ReselectionGERAN-SF
Parameter “Speed dependent ScalingFactor for TreselectionGERAN” 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

--- ASN1START
SystemInformationBlockType8 ::= SEQUENCE {
  systemTimeInfo SystemTimeInfoCDMA2000 OPTIONAL, -- Need OR
  searchWindowSize INTEGER {0..15} OPTIONAL, -- Need OR
  parametersHRPD  SEQUENCE {
    preRegistrationInfoHRPD PreRegistrationInfoHRPD,
    cellReselectionParametersHRPD CellReselectionParametersCDMA2000 OPTIONAL -- Need OR
  },
  parameters1XRTT SEQUENCE {
    csfb-RegistrationParam1XRTT CSFB-RegistrationParam1XRTT OPTIONAL, -- Need OP
    longCodeState1XRTT BIT STRING {SIZE (42)} OPTIONAL, -- Need OR
    cellReselectionParameters1XRTT CellReselectionParametersCDMA2000 OPTIONAL -- Need OR
  },
  ...,
  lateNonCriticalExtension OCTET STRING OPTIONAL, -- Need OP
  [[ csfb-SupportForDualRxUEs-r9 BOOLEAN STRING OPTIONAL, -- Need OR
    cellReselectionParametersHRPD-v920 CellReselectionParametersCDMA2000-v920 OPTIONAL, -- Need OR
  ],
  Cond NCL-HRPD
  cellReselectionParameters1XRTT-v920 CellReselectionParametersCDMA2000-v920 OPTIONAL, -- Need OR
  Cond NCL-1XRTT
  csfb-RegistrationParam1XRTT-v920 CSFB-RegistrationParam1XRTT-v920 OPTIONAL, -- Need OP
  longCodeState1XRTT-v920 BIT STRING {SIZE (42)} OPTIONAL, -- Need OR
  cellReselectionParameters1XRTT-v920 CellReselectionParametersCDMA2000-v920 OPTIONAL, -- Need OR
  ],
  [[ csfb-DualRxTxSupport-r10 ENUMERATED {true} OPTIONAL, -- Cond REG-1XRTT
    ac-BarringConfig1XRTT-r9 AC-BarringConfig1XRTT-r9 OPTIONAL
  ]],
}

CellReselectionParametersCDMA2000 ::= SEQUENCE {
  bandClassList BandClassListCDMA2000,
  neighCellList NeighCellListCDMA2000,
  t-ReselectionCDMA2000 T-Reselection,
  t-ReselectionCDMA2000-SF SpeedStateScaleFactors OPTIONAL -- Need OP
}

CellReselectionParametersCDMA2000-v920 ::= SEQUENCE {
  neighCellList-v920 NeighCellListCDMA2000-v920
}

NeighCellListCDMA2000 ::= SEQUENCE {
  [1..16] OF NeighCellCDMA2000
}

NeighCellCDMA2000 ::= SEQUENCE {
  bandClass BandClassInfoCDMA2000,
  cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
  threshX-High INTEGER {0..63},

PhysCellIdListCDMA2000 ::= SEQUENCE {
  [1..16] OF PhysCellIdCDMA2000
}

PhysCellIdListCDMA2000-v920 ::= SEQUENCE {
  [0..24] OF PhysCellIdCDMA2000
}

BandClassListCDMA2000 ::= SEQUENCE {
  [1..maxCDMA-BandClass] OF BandClassInfoCDMA2000
}

BandClassInfoCDMA2000 ::= SEQUENCE {
  bandClass BandClassInfoCDMA2000,
  cellReselectionPriority CellReselectionPriority OPTIONAL, -- Need OP
  threshX-High INTEGER {0..63},

...
SystemInformationBlockType8 field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ac-BarringConfig1XRTT</td>
<td>Contains the access class barring parameters the UE uses to calculate the access class barring factor, see C.S0097 [53].</td>
</tr>
<tr>
<td>ac-Barring0to9</td>
<td>Parameter used for calculating the access class barring factor for access overload classes 0 through 9. It is the parameter “PSIST” in C.S0004-A [34] for access overload classes 0 through 9.</td>
</tr>
<tr>
<td>ac-BarringN</td>
<td>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-A [34] for access overload class N.</td>
</tr>
<tr>
<td>ac-BarringMsg</td>
<td>Parameter used for modifying the access class barring factor for message transmissions. It is the parameter “MSG_PSIST” in C.S0004-A [34].</td>
</tr>
<tr>
<td>ac-BarringReg</td>
<td>Parameter used for modifying the access class barring factor for autonomous registrations. It is the parameter “REG_PSIST” in C.S0004-A [34].</td>
</tr>
<tr>
<td>ac-BarringEmg</td>
<td>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-A [34].</td>
</tr>
<tr>
<td>bandClass</td>
<td>Identifies the Frequency Band in which the Carrier can be found. Details can be found in C.S0057-B [24, Table 1.5].</td>
</tr>
<tr>
<td>bandClassList</td>
<td>List of CDMA2000 frequency bands.</td>
</tr>
<tr>
<td>cellReselectionParameters1XRTT</td>
<td>Cell reselection parameters applicable only 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-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>
</tbody>
</table>
### SystemInformationBlockType8 field descriptions

**csfb-DualRxTxSupport**
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].

**csfb-RegistrationParam1XRTT**
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.

**csfb-SupportForDualRxUEs**
Value TRUE indicates that the network supports dual Rx CSFB [51].

**longCodeState1XRTT**
The state of long code generation registers in CDMA2000 1XRTT system as defined in C.S0002-A [12, Section 1.3] at \[t/10\] × 10 + 320 ms, where \(t\) equals to the cdma-SystemTime. This field is required for 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.

**neighCellList**
List of CDMA2000 neighbouring cells. The total number of neighbouring cells in neighCellList for each RAT (1XRTT or HRPD) is limited to 32.

**neighCellList-v920**
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.

**neighCellsPerFreqList**

**neighCellsPerFreqList-v920**
Extended list of neighbour cell ids, in the same CDMA2000 Frequency Band as the corresponding instance in “NeighCellListCDMA2000”.

**parameters1XRTT**
Parameters applicable for interworking with CDMA2000 1XRTT system.

**parametersHRPD**
Parameters applicable only for interworking with CDMA2000 HRPD systems.

**physCellIdList**

**physCellIdList-v920**
Extended list of CDMA2000 cell ids, in the same CDMA2000 ARFCN as the corresponding instance in “NeighCellsPerBandclassCDMA2000”.

**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-A [25, Table 2.6.6.2.1-1] and C.S0024-A [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].

**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.

**threshX-High**
Parameter “ThreshX, HighP” 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-A [25].

**threshX-Low**
Parameter “ThreshX, LowP” 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-A [25].
- **SystemInformationBlockType9**

  The IE `SystemInformationBlockType9` contains a home eNB name (HNB Name).

  **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 field descriptions**

  - **messageIdentifier**
    
    The field is optional present, need OR, if `cellReselectionParameters1xRTT` is present; otherwise it is not present.

  - **serialNumber**
    
    The field is optional present, need OR, if `cellReselectionParametersHRPD` is present; otherwise it is not present.

  - **warningType**
    
    The field is optional present, need OR, if `csfb-RegistrationParam1XRTT` is present; otherwise it is not present.
**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, 9.4.1.2.2], 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, 9.4.1.2.1], while the trailing bit contains bit 0 of the second octet of the same equivalent IE.

**warningSecurityInfo**
Provides security information for the ETWS notification. The first octet (which is equivalent to the first octet of the equivalent IE defined in TS 36.413 [39, 9.2.1.51]) contains the first octet of the equivalent IE defined in and encoded according to TS 23.041 [37, 9.3.25], and so on.

**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**

```plaintext
-- ASN1START
SystemInformationBlockType11 ::= SEQUENCE {
  messageIdentifier     BIT STRING (SIZE (16)),
  serialNumber      BIT STRING (SIZE (16)),
  warningMessageSegmentType   ENUMERATED {notLastSegment, lastSegment},
  warningMessageSegmentNumber   INTEGER (0..63),
  warningMessageSegment    OCTET STRING,
  dataCodingScheme     OCTET STRING (SIZE (1))   OPTIONAL,  -- Cond Segment1
  ...,
  lateNonCriticalExtension    OCTET STRING    OPTIONAL  -- Need OP
}
-- ASN1STOP
```

**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, 9.4.2.2.4] 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, 9.4.1.2.2], 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, 9.4.1.2.1], while the trailing bit contains bit 0 of the 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.
### SystemInformationBlockType11 field descriptions

**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.

<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 SIB11, otherwise it is not present.</td>
</tr>
</tbody>
</table>

---

### SystemInformationBlockType12

The IE `SystemInformationBlockType12` contains a CMAS notification.

#### SystemInformationBlockType12 information element

```asn1
SystemInformationBlockType12-r9 ::= SEQUENCE {
  messageIdentifier-r9    BIT STRING (SIZE (16)),
  serialNumber-r9      BIT STRING (SIZE (16)),
  warningMessageSegmentType-r9  ENUMERATED {notLastSegment, lastSegment},
  warningMessageSegmentNumber-r9  INTEGER (0..63),
  warningMessageSegment-r9   OCTET STRING,
  dataCodingScheme-r9     OCTET STRING (SIZE (1))   OPTIONAL,  -- Cond Segment1
  lateNonCriticalExtension OCTET STRING     OPTIONAL, -- Need OP
  ...
}
```

#### 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, 9.4.2.2.4] 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, 9.4.1.2.2], 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, 9.4.1.2.2], 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]. 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

SystemInformationBlockType13-r9 ::= SEQUENCE {
  mbsfn-AreaInfoList-r9    MBSFN-AreaInfoList-r9,
  notificationConfig-r9    NBMS-NotificationConfig-r9,
  lateNonCriticalExtension OCTET STRING     OPTIONAL, -- Need OP
  ...                           
}

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

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))
  }  OPTIONAL,                -- Cond TM
  ue-TransmitAntennaSelection CHOICE{
    release       NULL,
    setup       ENUMERATED {closedLoop, openLoop}
  }
}

AntennaInfoDedicated-v920 ::= SEQUENCE {
  codebookSubsetRestriction-v920 CHOICE {
    n2TxAntenna-tm8-r9 BIT STRING (SIZE (6)),
    n4TxAntenna-tm8-r9 BIT STRING (SIZE (32))
  }  OPTIONAL                -- Cond TM8
}

AntennaInfoDedicated-r10 ::= SEQUENCE {
  transmissionMode-r10    ENUMERATED {
    tm1, tm2, tm3, tm4, tm5, tm6, tm7, tm8-v920,
    tm9-v1020, spare7, spare6, spare5, spare4,
    spare3, spare2, spare1},
  codebookSubsetRestriction-r10 BIT STRING OPTIONAL,   -- Cond TMX
  ue-TransmitAntennaSelection CHOICE{
    release       NULL,
    setup       ENUMERATED {closedLoop, openLoop}
  }
}

-- ASN1STOP
### AntennaInfo field descriptions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>antennaPortsCount</td>
<td>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].</td>
</tr>
<tr>
<td>codebookSubsetRestriction</td>
<td>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 only configures the field codebookSubsetRestriction if PMI/RI reporting is configured. If the UE is configured with transmissionMode tm9, E-UTRAN only configures the field codebookSubsetRestriction if PMI/RI reporting is configured and if the number of CSI-RS ports is greater than 1.</td>
</tr>
<tr>
<td>transmissionMode</td>
<td>Points to one of Transmission modes defined in TS 36.213 [23, 7.1] where tm1 refers to transmission mode 1, tm2 to transmission mode 2 etc.</td>
</tr>
<tr>
<td>codebookSubsetRestriction</td>
<td>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 only configures the field codebookSubsetRestriction if PMI/RI reporting is configured. If the UE is configured with transmissionMode tm9, E-UTRAN only configures the field codebookSubsetRestriction if PMI/RI reporting is configured and if the number of CSI-RS ports is greater than 1.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM</td>
<td>The field is mandatory present if the transmissionMode 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>TM8</td>
<td>The field is optional present, need OR, if AntennaInfoDedicated is included and transmissionMode is set to tm8. If AntennaInfoDedicated is included and transmissionMode 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 and the UE takes no action i.e. continues to use the existing value, if previously configured.</td>
</tr>
<tr>
<td>TMX</td>
<td>The field is mandatory present if the transmissionMode-r10 is set to tm3, tm4, tm5, tm6, 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

```asn1
AntennaInfoUL-r10 ::= SEQUENCE {
    transmissionModeUL-r10 ENUMERATED {tm1, tm2, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL, -- Need OR
    fourAntennaPortActivated-r10 ENUMERATED {setup} OPTIONAL -- Need OR
}
```

#### AntennaInfoUL field descriptions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fourAntennaPortActivated</td>
<td>Parameter indicates if four antenna ports are used for UL transmission mode 2. See TS 36.213 [23, 8.2].</td>
</tr>
</tbody>
</table>

### CQI-ReportConfig

The IE CQI-ReportConfig is used to specify the CQI reporting configuration.
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-RI-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-RI-Report-r9  ENUMERATED {setup} OPTIONAL -- Cond PMIRI
}

csi-SubframePatternConfig-r10  CHOICE {
release       NULL,
setup        SEQUENCE {
csi-MeasSubframeSet1-r10    MeasSubframePattern-r10,
csi-MeasSubframeSet2-r10    MeasSubframePattern-r10
}
}

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    NULL,
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
}
}
}

CQI-ReportAperiodic-r10 ::=  CHOICE {
release        NULL,
setup        SEQUENCE {

cqi-ReportModeAperiodic-r10  ENUMERATED {
  rm12, rm20, rm22, rm30, rm31,
  spare1, spare2, spare3},
aperiodicCSI-Trigger-r10  SEQUENCE {
  trigger1-r10     BIT STRING (SIZE (8)),
  trigger2-r10     BIT STRING (SIZE (8))
  }                  OPTIONAL -- Need OR
}

CQI-ReportModeAperiodic ::=  ENUMERATED {
  rm12, rm20, rm22, rm30, rm31,
  spare1, spare2, spare3
}

-- ASN1STOP
### CQI-ReportConfig 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 and *trigger2* corresponds to the CSI request field 11, see TS 36.213 [23, table 7.2.1-1A]. 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. One value applies for all serving cells (the associated functionality is common i.e. not performed independently for each cell).

#### 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 serving cells (the associated functionality is common i.e. not performed independently for each cell).

#### cqi-ConfigIndex
E-UTRAN configures cqi-ConfigIndex only for PCell and only if csi-SubframePatternConfig is configured.

#### cqi-ReportMode
Parameter: PUCCH_format1-1_CSI_reporting_mode, see TS 36.213 [23, 7.2.2].

#### cqi-FormatIndicatorPeriodic
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.

#### cqi-pmi-ConfigIndex
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.

#### cqi-Periodic
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.

#### cqi-PUCCH-ResourceIndex, cqi-PUCCH-ResourceIndexP1
Parameter: see TS 36.213 [23, 7.2]. E-UTRAN does not apply value 1185.

#### 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].

#### cqi-ReportPeriodic
Parameter: cqi-ReportPeriodic, 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. EUTRAN configures this field only when transmissionMode is set to tm8 or tm9.

#### cqi-RI-ConfigIndex
Parameter: RI Config Index lRI, see TS 36.213 [23, 7.2.2-1B]. 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.

#### cqi-RI-ConfigIndex2
Parameter: RI Config Index lRI, see TS 36.213 [23, 7.2.2-1B]. The parameter applies to the subframe pattern corresponding to csi-MeasSubframeSet2. E-UTRAN configures ri-ConfigIndex2 only if ri-ConfigIndex is configured.

#### conditionalPresence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>cqi-Setup</td>
<td>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 and the UE takes no action i.e. continues to use the existing value, if previously configured.</td>
</tr>
<tr>
<td>PMIRI</td>
<td>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 and the UE takes no action i.e. continues to use the existing value, if previously configured.</td>
</tr>
</tbody>
</table>
The IE `CrossCarrierSchedulingConfig` is used to specify the configuration when the cross carrier scheduling is used in a cell.

**CrossCarrierSchedulingConfig information elements**

```asn1
CrossCarrierSchedulingConfig-r10 ::= SEQUENCE {
  schedulingCellInfo-r10     CHOICE {
    own-r10        SEQUENCE {     -- No cross carrier
      cif-Presence-r10      BOOLEAN
    },
    other-r10        SEQUENCE {     -- Cross carrier
      schedulingCellId-r10    ServCellIndex-r10,
      pdsch-Start-r10      INTEGER (1..4)
    }
  }
}
```

**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 DCI formats, see TS 36.212 [22, 5.3.3.1].

- **pdsch-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.

The IE `CSI-RS-Config` is used to specify the CSI (Channel-State Information) reference signal configuration.

**CSI-RS-Config information elements**

```asn1
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  CHOICE {
    release      NULL,
    setup        SEQUENCE {
      zeroTxPowerResourceConfigList-r10 BIT STRING (SIZE (16)),
      zeroTxPowerSubframeConfig-r10  INTEGER (0..154)
    }
  }    OPTIONAL   -- Need ON
}
```
### CSI-RS-Config field descriptions

#### antennaPortsCount
Parameter represents the number of antenna ports used for transmission of CSI reference signals where an1 corresponds to 1, an2 to 2 antenna ports etc. see TS 36.211 [21, 6.10.5].

#### p-C
Parameter: $P_c$, see TS 36.213 [23, 7.2.5].

#### 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].

#### zeroTxPowerResourceConfigList
Parameter: ZeroPowerCSI-RS, see TS 36.211 [21, 6.10.5.2].

#### zeroTxPowerSubframeConfig
Parameter: $I_{CSI-RS}$, see TS 36.211 [21, table 6.10.5.3-1].

---

## DRB-Identity

The IE **DRB-Identity** is used to identify a DRB used by a UE.

### DRB-Identity information elements

```plaintext
-- ASN1START
DRB-Identity ::= INTEGER (1..32)
-- ASN1STOP
```

---

## LogicalChannelConfig

The IE **LogicalChannelConfig** is used to configure the logical channel parameters.

### LogicalChannelConfig information element

```plaintext
-- ASN1START
LogicalChannelConfig ::= SEQUENCE {
  ul-SpecificParameters Sequence {
    priority INTEGER (1..16),
    prioritisedBitRate ENUMERATED {
      kBps0, kBps8, kBps16, kBps32, kBps64, kBps128,
      kBps256, infinity, kBps12-v1020, kBps124-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
  },
  ...,
  [[ logicalChannelSR-Mask-r9 ENUMERATED {setup} OPTIONAL -- Cond SRmask
  ]]
}
-- ASN1STOP
```
LogicalChannelConfig field descriptions

**bucketSizeDuration**
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.

**logicalChannelGroup**
Mapping of logical channel to logical channel group for BSR reporting in TS 36.321 [6].

**logicalChannelSR-Mask**
Controlling SR triggering on a logical channel basis when an uplink grant is configured. See TS 36.321 [6].

**priority**
Logical channel priority in TS 36.321 [6]. Value is an integer.

**prioritisedBitRate**
Prioritized 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.

---

**MAC-MainConfig**

The IE `MAC-MainConfig` is used to specify the MAC main configuration for signalling and data radio bearers.

---

**MAC-MainConfig** information element

```asn1
-- ASN1START
MAC-MainConfig ::= SEQUENCE {
    ul-SCH-Config SEQUENCE {
        maxHARQ-Tx ENUMERATED {
            n1, n2, n3, n4, n5, n6, n7, n8,
            n10, n12, n16, n20, n24, n28,
            spare2, spare1} OPTIONAL, -- Need ON
        periodicBSR-Timer ENUMERATED {
            sf5, sf10, sf16, sf20, sf32, sf40, sf64, sf80,
            sf128, sf160, sf320, sf640, sf1280, sf2560,
            infinity, spare1} OPTIONAL, -- Need ON
        retxBSR-Timer ENUMERATED {
            sf320, sf640, sf1280, sf2560, sf5120,
            sf10240, spare2, spare1},
        ttiBundling BOOLEAN
    } OPTIONAL, -- Need ON
    drx-Config DRX-Config OPTIONAL, -- Need ON
    timeAlignmentTimerDedicated TimeAlignmentTimer,
    phr-Config 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
}]]
}

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)
} OPTIONAL -- Need OR

-- ASN1STOP
### MAC-MainConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dl-PathlossChange</strong></td>
<td>DL Pathloss Change 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).</td>
</tr>
<tr>
<td><strong>drx-InactivityTimer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>drx-RetransmissionTimer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>drxShortCycleTimer</strong></td>
<td>Timer for DRX in TS 36.321 [6]. Value in multiples of shortDRX-Cycle. A value of 1 corresponds to shortDRX-Cycle, a value of 2 corresponds to 2 * shortDRX-Cycle and so on.</td>
</tr>
<tr>
<td><strong>extendedBSR-Sizes</strong></td>
<td>If value TRUE is configured, the BSR index indicates extended BSR size levels as defined in TS 36.321 [6, Table 6.1.3.1.2].</td>
</tr>
<tr>
<td><strong>extendedPHR</strong></td>
<td>Indicates if power headroom shall be reported using the Extended Power Headroom Report MAC control element defined in TS 36.321 [6] (value TRUE) or the Power Headroom Report MAC control element defined in TS 36.321 [6] (value FALSE). E-UTRAN always configures the value “TRUE” if more than one Serving Cell with uplink is configured.</td>
</tr>
<tr>
<td><strong>longDRX-CycleStartOffset</strong></td>
<td>longDRX-Cycle and drxStartOffset in TS 36.321 [6]. 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.</td>
</tr>
<tr>
<td><strong>maxHARQ-Tx</strong></td>
<td>Maximum number of transmissions for UL HARQ in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>onDurationTimer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>periodicBSR-Timer</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>periodicPHR-Timer</strong></td>
<td>Timer for PHR 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.</td>
</tr>
<tr>
<td><strong>prohibitPHR-Timer</strong></td>
<td>Timer for PHR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf0 corresponds to 0 subframes, sf100 corresponds to 100 subframes and so on.</td>
</tr>
<tr>
<td><strong>retxBSR-Timer</strong></td>
<td>Timer for BSR reporting in TS 36.321 [6]. Value in number of sub-frames. Value sf640 corresponds to 640 sub-frames, sf1280 corresponds to 1280 sub-frames and so on.</td>
</tr>
<tr>
<td><strong>sCellDeactivationTimer</strong></td>
<td>SCell deactivation timer 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. 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 (although the associated functionality is performed independently for each SCell).</td>
</tr>
<tr>
<td><strong>shortDRX-Cycle</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>sr-ProhibitTimer</strong></td>
<td>Timer for SR transmission on PUCCH in TS 36.321 [6]. Value in number of SR period(s). Value 0 means no timer for SR transmission on PUCCH is configured. Value 1 corresponds to one SR period, Value 2 corresponds to 2*SR periods and so on.</td>
</tr>
<tr>
<td><strong>ttiBundling</strong></td>
<td>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 only for configurations 0, 1 and 6. For TDD, E-UTRAN does not simultaneously enable TTI bundling and semi-persistent scheduling in this release of specification. Furthermore, E-UTRAN does not simultaneously configure TTI bundling and SCells with configured uplink.</td>
</tr>
</tbody>
</table>

### PDCP-Config

The IE **PDCP-Config** is used to set the configurable PDCP parameters for data radio bearers.
**PDCP-Config** information element

```asn1
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
    } OPTIONAL,   -- Cond Setup
    rlc-UM        SEQUENCE {
        pdcp-SN-Size      ENUMERATED {len7bits, len12bits} OPTIONAL,   -- Cond Rlc-UM
    } OPTIONAL,   -- Cond Setup
    headerCompression     CHOICE {
        notUsed        NULL,
        rohc        SEQUENCE {
            maxCID        INTEGER (1..16383) DEFAULT 15,
            profiles      SEQUENCE {
                profile0x0001      BOOLEAN,
                profile0x0002      BOOLEAN,
                profile0x0003      BOOLEAN,
                profile0x0004      BOOLEAN,
                profile0x0006      BOOLEAN,
                profile0x0101      BOOLEAN,
                profile0x0102      BOOLEAN,
                profile0x0103      BOOLEAN,
                profile0x0104      BOOLEAN
            },
            ...,
        } OPTIONAL,
        ...,
        rn-IntegrityProtection-r10 ENUMERATED {enabled} OPTIONAL   -- Cond RN
    } OPTIONAL,
}
```

**PDCP-Config field descriptions**

- **discardTimer**
  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.

- **maxCID**
  Indicates the value of the MAX_CID parameter as specified in TS 36.323 [8].

- **pdcp-SN-Size**
  Indicates the PDCP Sequence Number length in bits. Value len7bits means that the 7-bit PDCP SN format is used and len12bits means that the 12-bit PDCP SN format is used, as specified in TS 36.323 [8].

- **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.

- **rn-IntegrityProtection**
  Indicates that integrity protection or verification shall be applied for all subsequent packets received and sent by the RN on the DRB.

- **statusReportRequired**
  Indicates whether or not the UE shall send a PDCP Status Report upon re-establishment of the PDCP entity as specified in TS 36.323 [8].
<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rlc-AM</strong></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 for a radio bearer configured with RLC AM. Otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>Rlc-UM</strong></td>
<td>The field is mandatory present upon setup of a PDCP entity for a radio bearer configured with RLC UM. Otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>RN</strong></td>
<td>The field is optionally present when signalled to the RN, need OR. Otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>Setup</strong></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>

**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
PDSCH-ConfigCommon ::= SEQUENCE {
  referenceSignalPower    INTEGER (-60..50),
  p-b         INTEGER (0..3)
}

PDSCH-ConfigDedicated ::= SEQUENCE {
  p-a         ENUMERATED {
    dB-6, dB-4dot77, dB-3, dB-1dot77,
    dB0, dB1, dB2, dB3
  }
}
```

**PDSCH-Config field descriptions**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>p-a</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>p-b</strong></td>
<td>Parameter: $P_B$, see TS 36.213 [23, Table 5.2-1].</td>
</tr>
<tr>
<td><strong>referenceSignalPower</strong></td>
<td>Parameter: <em>Reference-signal power</em>, which provides the downlink reference-signal EPRE, see TS 36.213 [23, 5.2]. The actual value in dBm.</td>
</tr>
</tbody>
</table>

**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**

```plaintext
-- ASN1START
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 tp-PCFICH-ConfigPUCCH TP-PCFICH-ConfigPUCCH OPTIONAL, -- Need ON tp-PCFICH-ConfigPUSCH TP-PCFICH-ConfigPUSCH OPTIONAL, -- Need ON cqi-ReportConfig CQI-ReportConfig OPTIONAL, -- Cond CQI-r8 soundingRS-UL-ConfigDedicated SoundingRS-UL-ConfigDedicated OPTIONAL, -- Need ON antennaInfo CHOICE { explicitValue AntennaInfoDedicated, defaultValue NULL } OPTIONAL, -- Cond AI-r8 schedulingRequestConfig SchedulingRequestConfig OPTIONAL, -- Need ON ...
[[ cqi-ReportConfig-v920 CQI-ReportConfig-v920 OPTIONAL, -- Cond CQI-r8 antennaInfo-v920 AntennaInfoDedicated-v920 OPTIONAL, -- Cond AI-r8 ]]
[[ antennaInfo-r10 CHOICE { explicitValue-r10 AntennaInfoDedicated-r10, defaultValue NULL } OPTIONAL, -- Cond AI-r10 antennaInfoUL-r10 AntennaInfoUL-r10 OPTIONAL, -- Need ON cif-Presence-r10 BOOLEAN OPTIONAL, -- Need ON cqi-ReportConfig-r10 CQI-ReportConfig-r10 OPTIONAL, -- Cond CQI-r10 csi-RS-Config-r10 CSI-RS-Config-r10 OPTIONAL, -- Need ON pusch-ConfigDedicated-r10 PUSCH-ConfigDedicated-r10 OPTIONAL, -- Need ON schedulingRequestConfig-r10 SchedulingRequestConfig-r10 OPTIONAL, -- Need ON soundingRS-UL-ConfigDedicated-r10 SoundingRS-UL-ConfigDedicated-r10 OPTIONAL, -- Need ON soundingRS-UL-ConfigDedicatedAperiodic-r10 SoundingRS-UL-ConfigDedicatedAperiodic-r10 OPTIONAL, -- Need ON uplinkPowerControlDedicated-r10 UplinkPowerControlDedicated-r10 OPTIONAL -- Need ON }

PhysicalConfigDedicatedSCell-r10 ::= SEQUENCE { -- DL configuration as well as configuration applicable for DL and UL nonUL-Configuration-r10 SEQUENCE { antennaInfo-r10 AntennaInfoDedicated-r10 OPTIONAL, -- Need ON crossCarrierSchedulingConfig-r10 CrossCarrierSchedulingConfig-r10 OPTIONAL, -- Need ON }
ul-Configuration-r10 SEQUENCE { antennaInfoUL-r10 AntennaInfoUL-r10 OPTIONAL, -- Need ON pusch-ConfigDedicatedSCell-r10 PUSCH-ConfigDedicatedSCell-r10 OPTIONAL, -- Need ON }

}}

-- ASN1END
```
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.

**tpc-PDCCH-ConfigPUCCH**

PDCCH configuration for power control of PUCCH using format 3/3A, see TS 36.212 [22].

**tpc-PDCCH-ConfigPUSCH**

PDCCH configuration for power control of PUSCH using format 3/3A, see TS 36.212 [22].

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1-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>A1-r10</td>
<td>The field is optionally present, need ON, if antennaInfoDedicated is absent. 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>SCellAdd</td>
<td>The field is mandatory present if cellIdentification is present; otherwise it is optional, need ON.</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 PE\text{MAX} in TS 36.101 [42]. The UE transmit power shall not exceed the configured maximum UE output power determined by this value as specified in TS 36.101 [42, 6.2.5].

**P-Max information element**

---

**PRACH-Config**

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**

```asn1
PRACH-ConfigSIB ::= SEQUENCE {
  rootSequenceIndex     INTEGER (0..837),
  prach-ConfigInfo     PRACH-ConfigInfo
}
```

**PRACH-Config**

```asn1
PRACH-Config ::= SEQUENCE {
  rootSequenceIndex     INTEGER (0..837),
  prach-ConfigInfo     PRACH-ConfigInfo  OPTIONAL -- Need ON
}
```

**PRACH-ConfigSCell-r10**

```asn1
PRACH-ConfigSCell-r10 ::= SEQUENCE {
  prach-ConfigIndex-r10     INTEGER (0..63)
}
```

**PRACH-ConfigInfo**

```asn1
PRACH-ConfigInfo ::= SEQUENCE {
  prach-ConfigIndex     INTEGER (0..63),
  highSpeedFlag      BOOLEAN,
  zeroCorrelationZoneConfig   INTEGER (0..15),
  prach-FreqOffset     INTEGER (0..94)
}
```

---

**PRACH-Config field descriptions**

- **highSpeedFlag**
  Parameter: High-speed-flag, see TS 36.211, [21, 5.7.2]. TRUE corresponds to Restricted set and FALSE to Unrestricted set.

- **prach-ConfigIndex**
  Parameter: prach-ConfigurationIndex, see TS 36.211 [21, 5.7.1].

- **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.

- **rootSequenceIndex**
  Parameter: RACH_ROOT_SEQUENCE, see TS 36.211 [21, 5.7.1].

- **zeroCorrelationZoneConfig**
  Parameter: Ncs 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.

---

**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**

```asn1
PresenceAntennaPort1 ::= BOOLEAN
```

---

**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**

```asn1
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-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 SEQUENCE {
            n3PUCCH-AN-List-r10 SEQUENCE (SIZE (1..4)) OF INTEGER (0..549) OPTIONAL, -- Need ON
            twoAntennaPortActivatedPUCCH-Format3-r10 CHOICE {
                release NULL,
                setup SEQUENCE {
                    n3PUCCH-AN-ListP1-r10 SEQUENCE (SIZE (1..4)) OF INTEGER (0..549)
                }
            }
        } OPTIONAL -- Need ON
    },
    channelSelection-r10 SEQUENCE {
        n1PUCCH-AN-CS-r10 CHOICE {
            release NULL,
            setup SEQUENCE {
                n1PUCCH-AN-CS-List-r10 SEQUENCE (SIZE (1..2)) OF N1PUCCH-AN-CS-r10
            }
        }
    } OPTIONAL -- Need ON
},
    twoAntennaPortActivatedPUCCH-Format1a1b-r10 ENUMERATED {true} OPTIONAL, -- Need OR
    simultaneousPUCCH-PUSCH-r10 ENUMERATED {true} OPTIONAL, -- Need OR
    n1PUCCH-AN-RepP1-r10 INTEGER (0..2047) OPTIONAL -- Need OR
}

N1PUCCH-AN-CS-r10 ::= SEQUENCE (SIZE (1..4)) 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].

**deltaPUCCH-Shift**
Parameter: \( \Delta_{PUCCH} \), see 36.211, 5.4.1, where ds1 corresponds to value 1 ds2 to 2 etc.

**n1PUCCH-AN**
Parameter: \( N_{PUCCH}^{(1)} \), see TS 36.213 [23, 10.1].

**n1PUCCH-AN-Rep, n1PUCCH-AN-RepP1**
Parameter: \( n_{PUCCH, ANRep}^{(1,p)} \) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1].

**n1PUCCH-AN-CS-List**
Parameter and reference: tbd

**n3PUCCH-AN-List, n3PUCCH-AN-ListP1**
Parameter: \( n_{PUCCH}^{(3,p)} \) for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1].

**nCS-An**
Parameter: \( N_{cs}^{(1)} \), see TS 211 [21, 5.4].

**nRB-CQI**
Parameter: \( N_{RB}^{(2)} \), see TS 36.211 [21, 5.4].

**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 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].

**repetitionFactor**
Parameter\( N_{ANRep}^{(2)} \), 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 transmissions is configured, see TS 36.213 [23, 10.1 and 5.1.1].

**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].

---

### 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

```asn1
-- ASN1START

PUSCH-ConfigCommon ::= SEQUENCE {
  pusch-ConfigBasic   SEQUENCE {
    n-SB        INTEGER (1..4),
    hoppingMode       ENUMERATED {interSubFrame, intraAndInterSubFrame},
    pusch-HoppingOffset enabled4QAM
  },
  ul-ReferenceSignalsPUSCH   UL-ReferenceSignalsPUSCH
}

PUSCH-ConfigDedicated ::= SEQUENCE {

-- ASN1END
```
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-ConfigDedicatedSCell-r10 ::= SEQUENCE {
groupHoppingDisabled-r10   ENUMERATED {true} OPTIONAL, -- Need OR
dmrs-WithOCC-Activated-r10 ENUMERATED {true} OPTIONAL -- Need OR

}

UL-ReferenceSignalsPUSCH ::= SEQUENCE {
groupHoppingEnabled     BOOLEAN,
groupAssignmentPUSCH    INTEGER {0..29},
cyclicShift       INTEGER {0..7}

}

-- ASN1STOP

**PUSCH-Config field descriptions**

**betaOffset-ACK-Index, betaOffset-ACK-Index-MC**
Parameter: $I_{\text{ACK}}$ for single- and multiple-codeword respectively, see TS 36.213 [23, Table 8.6.3-1]. One value applies for all serving cells with an uplink (the associated functionality is common i.e. not performed independently for each cell).

**betaOffset-CQI-Index, betaOffset-CQI-Index-MC**
Parameter: $I_{\text{CQI}}$ 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 (the associated functionality is common i.e. not performed independently for each cell).

**betaOffset-RI-Index, betaOffset-RI-Index-MC**
Parameter: $I_{\text{RI}}$ 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 (the associated functionality is common i.e. not performed independently for each cell).

**cyclicShift**
Parameters: cyclicShift, see TS 36.211 [21, Table 5.5.2.1.1-2].

**dmrs-WithOCC-Activated**
Parameter: Activate-DMRS-with OCC, see TS 36.211 [21, 5.5.2.1].

**enable64QAM**
See TS 36.213 [23, 8.6.1]. TRUE indicates that 64QAM is allowed while FALSE indicates that 64QAM is not allowed.

**groupHoppingEnabled**
Parameter: Group-hopping-enabled, see TS 36.211 [21, 5.5.1.3].

**groupHoppingDisabled**
Parameter: Disable-sequence-group-hopping, see TS 36.211 [21, 5.5.1.3].

**groupAssignmentPUSCH**
Parameter: ΔSS See TS 36.211 [21, 5.5.1.3].

**hoppingMode**
Parameter: Hopping-mode, see TS 36.211 [21, 5.3.4].

**n-SB**
Parameter: N_{sb} see TS 36.211 [21, 5.3.4].

**pusch-hoppingOffset**
Parameter: $N_{\text{HO}}$, see TS 36.211 [21, 5.3.4].

**sequenceHoppingEnabled**
Parameter: Sequence-hopping-enabled, see TS 36.211 [21, 5.5.1.4].

**ul-ReferenceSignalsPUSCH**
Used to specify parameters needed for the transmission on PUSCH (or PUCCH).
The IE RACH-ConfigCommon is used to specify the generic random access parameters.

**RACH-ConfigCommon** information element

```asn1
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 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}
  },
  ra-SupervisionInfo SEQUENCE {
    preambleTransMax ENUMERATED {
      n3, n4, n5, n6, n7, n8, n10, n20, n50,
      n100, n200},
    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),
}
```
RACH-ConfigCommon field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mac-ContentionResolutionTimer</td>
<td>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.</td>
</tr>
<tr>
<td>maxHARQ-Msg3Tx</td>
<td>Maximum number of Msg3 HARQ transmissions in TS 36.321 [6], used for contention based random access. Value is an integer.</td>
</tr>
<tr>
<td>messageSizeGroupA</td>
<td>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.</td>
</tr>
<tr>
<td>messagePowerOffsetGroupB</td>
<td>Threshold for preamble selection in TS 36.321 [6]. Value in dB. Value minus infinity corresponds to –infinity. Value dB0 corresponds to 0 dB, dB5 corresponds to 5 dB and so on.</td>
</tr>
<tr>
<td>numberOfRA-Preambles</td>
<td>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.</td>
</tr>
<tr>
<td>powerRampingStep</td>
<td>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.</td>
</tr>
<tr>
<td>preambleInitialReceivedTargetPower</td>
<td>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.</td>
</tr>
<tr>
<td>preamblesGroupAConfig</td>
<td>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.</td>
</tr>
<tr>
<td>preambleTransMax</td>
<td>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.</td>
</tr>
<tr>
<td>ra-ResponseWindowSize</td>
<td>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.</td>
</tr>
<tr>
<td>sizeOfRA-PreamblesGroupA</td>
<td>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.</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

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ra-PRACH-MaskIndex</td>
<td>Explicitly signalled PRACH Mask Index for RA Resource selection in TS 36.321 [6].</td>
</tr>
</tbody>
</table>

---

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

-- ASN1START

RadioResourceConfigCommonSIB ::= SEQUENCE {
  rach-ConfigCommon RACH-ConfigCommon,
  bcch-Config BCCH-Config,
  pucch-Config Common PUSCH-ConfigCommon,
  pcch-Config PCCH-Config,
  pdsch-ConfigCommon PDSCH-ConfigCommon,
  pbch-Config PBCH-Config,
  prach-Config Common PRACH-ConfigCommon,
  soundingRS-UL-ConfigCommon SoundingRS-UL-ConfigCommon,
  ul-linkPowerControlCommon UplinkPowerControlCommon,
  ...,
  [...] ulinkPowerControlCommon-v1020 UplinkPowerControlCommon-v1020 OPTIONAL -- Need OR
}

RadioResourceConfigCommon ::= SEQUENCE {
  rach-ConfigCommon RACH-ConfigCommon OPTIONAL, -- Need ON
  prach-Config PRACH-Config,
  pdsch-ConfigCommon PDSCH-ConfigCommon OPTIONAL, -- Need ON
  pbch-Config PBCH-Config,
  pcch-Config PCCH-Config,
  soundingRS-UL-ConfigCommon SoundingRS-UL-ConfigCommon,
  ul-linkPowerControlCommon UplinkPowerControlCommon,
  uplinkPowerControlCommon-v1020 UplinkPowerControlCommon-v1020 OPTIONAL -- Need OR
}

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 PUSCH-ConfigCommon,
    tdd-Config-r10 TDD-Config OPTIONAL -- Cond TDD
  },
  -- UL configuration
  ul-Configuration-r10 SEQUENCE {
    ul-CarrierFreq-r10 ARFCN-ValueEUTRA OPTIONAL, -- Need OP
    ul-Bandwidth-r10 ENUMERATED {n6, n15, n25, n50, n75, n100} OPTIONAL, -- Need OP
    additionalSpectrumEmission-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
  pusch-ConfigCommon-r10 PUSCH-ConfigCommon
  ...,
  [...] ulinkPowerControlCommon-v1020 UplinkPowerControlCommon-v1020 OPTIONAL -- Need ON
}

BCCH-Config ::= SEQUENCE {
  modificationPeriodCoeff ENUMERATED {n2, n4, n8, n16}
}
PCCH-Config ::= SEQUENCE {
  defaultPagingCycle ENUMERATED {rf32, rf64, rf128, rf256},
  nB ENUMERATED {fourT, twoT, oneT, halfT, quarterT, oneEighthT,
  oneSixteenthT, oneThirtySecondT}
}
UL-CyclicPrefixLength ::= ENUMERATED {len1, len2}
-- ASN1STOP

RadioResourceConfigCommon field descriptions

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.

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 and n16 corresponds to value 16.

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.

p-Max
Pmax to be used in the target cell. If absent the UE applies the maximum power according to the UE capability.

ul-Bandwidth
Parameter: transmission bandwidth configuration, NRB, 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.

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 36.211 [21, 5.2.1] where len1 corresponds to normal cyclic prefix and len2 corresponds to extended cyclic prefix.

Conditional presence Explanation

| TDD     | 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. |
| TDD-OR  | The field is optional for TDD, Need OR; it is not present for FDD and the UE shall delete any existing value for this field. |

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

-- ASN1START

RadioResourceConfigDedicated ::= SEQUENCE {
  srb-ToAddModList SRB-ToAddModList OPTIONAL, -- Cond HO-Conn
  drb-ToAddModList DRB-ToAddModList OPTIONAL, -- Cond HO-
toEUTRA
  drb-ToReleaseList DRB-ToReleaseList OPTIONAL, -- Need ON
  mac-MainConfig MAC-MainConfig,
    explicitValue CHOICE {
    defaultValue NULL OPTIONAL, -- Cond HO-
toEUTRA2
    sps-Config SPS-Config OPTIONAL, -- Need ON
    physicalConfigDedicated PhysicalConfigDedicated OPTIONAL, -- Need ON
    ...
  }[ rlf-TimersAndConstants-r9 RLF-TimersAndConstants-r9 OPTIONAL, -- Need ON

-- ASN1STOP
RadioResourceConfigDedicatedSCell-r10 ::= SEQUENCE {
  -- UE specific configuration extensions applicable for an SCell
  physicalConfigDedicatedSCell-r10 PhysicalConfigDedicatedSCell-r10 OPTIONAL, -- Need ON
  ...
}

SRB-ToAddModList ::= SEQUENCE (SIZE (1..2)) 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
  ...
}

DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod

DRB-ToAddMod ::= SEQUENCE {
  eps-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 Setup
  logicalChannelIdentity INTEGER (3..10) OPTIONAL, -- Cond DRB-Setup
  logicalChannelConfig LogicalChannelConfig OPTIONAL, -- Cond Setup
  ...
}

DRB-ToReleaseList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-Identity

MeasSubframePatternPCell-r10 ::= CHOICE {
  release NULL,
  setup MeasSubframePattern-r10
}

-- ASN1STOP
RadioResourceConfigDedicated field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>logicalChannelConfig</td>
<td>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.</td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
<td>The logical channel identity for both UL and DL.</td>
</tr>
<tr>
<td>mac-MainConfig</td>
<td>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 &quot;defaultValue&quot;.</td>
</tr>
<tr>
<td>_measSubframePatternPCell</td>
<td>Time domain measurement resource restriction pattern for the PCell measurements (RSRP, RSRQ and the radio link monitoring).</td>
</tr>
<tr>
<td>physicalConfigDedicated</td>
<td>The default dedicated physical configuration is specified in 9.2.4.</td>
</tr>
<tr>
<td>rlc-Config</td>
<td>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 UM RLC SN field size only upon handover within E-UTRA or upon the first reconfiguration after RRC connection re-establishment.</td>
</tr>
<tr>
<td>sps-Config</td>
<td>The default SPS configuration is specified in 9.2.3.</td>
</tr>
<tr>
<td>srb-Identity</td>
<td>Value 1 is applicable for SRB1 only. Value 2 is applicable for SRB2 only.</td>
</tr>
</tbody>
</table>

Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRB-Setup</td>
<td>The field is mandatory present if the corresponding DRB is being set up; 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; otherwise the field is optionally present, need ON. Upon connection establishment/ re-establishment only SRB1 is applicable.</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 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; in case of RRC connection establishment and RRC connection re-establishment the field is not present; otherwise the field is optionally present, need ON.</td>
</tr>
<tr>
<td>PDCP</td>
<td>The field is mandatory present if the corresponding DRB is being setup; the field is optionally present, need ON, upon handover within E-UTRA and upon the first reconfiguration after re-establishment but in both these cases only when fullConfig is not included in the RRCConnectionReconfiguration message; 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>
</tbody>
</table>

---

**RLC-Config**

The IE RLC-Config is used to specify the RLC configuration of SRBs and DRBs.

**RLC-Config** information element

---

-- ASN1START

RLC-Config ::= CHOICE {
  am               SEQUENCE { ul-AM-RLC, dl-AM-RLC },
  um-Bi-Directional SEQUENCE { ul-UM-RLC, dl-UM-RLC },
  um-Uni-Directional-UL SEQUENCE { ul-UM-RLC }
}
um-Uni-Directional-DL ::= SEQUENCE {
    dl-UM-RLC   DL-UM-RLC

    ...  
}

UL-AM-RLC ::= SEQUENCE {
    t-PollRetransmit  T-PollRetransmit,
    pollPDU          PollPDU,
    pollByte         PollByte,
    maxRetxThreshold ENUMERATED {
        t1, t2, t3, t4, t6, t8, t16, t32
    }
}

DL-AM-RLC ::= SEQUENCE {
    t-Reordering      T-Reordering,
    t-StatusProhibit  T-StatusProhibit
}

UL-UM-RLC ::= SEQUENCE {
    sn-FieldLength   SN-FieldLength
}

DL-UM-RLC ::= SEQUENCE {
    sn-FieldLength   SN-FieldLength,
    t-Reordering      T-Reordering
}

SN-FieldLength ::= ENUMERATED {size5, size10}

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, spare9, spare8,
    spare7, spare6, spare5, spare4, spare3,
    spare2, spare1
}

PollPDU ::= ENUMERATED {
    p4, p8, p16, p32, p64, p128, p256, pInfinity
}

PollByte ::= ENUMERATED {
    kB25, kB50, kB75, kB100, kB125, kB250, kB375,
    kB500, kB750, kB1000, kB1250, kB1500, kB2000,
    kB3000, kBInfinity, spare1
}

T-Reordering ::= 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, spare9, spare8,
    spare7, spare6, spare5, spare4, spare3,
    spare2, spare1
}

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, spare9, spare8,
    spare7, spare6, spare5, spare4, spare3,
    spare2, spare1
}

-- ASN1STOP
**RLC-Config field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<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>pollPDU</td>
<td>Parameter for RLC AM in TS 36.322 [7]. Value p4 corresponds to 4 PDUs, p8 to 8 PDUs and so on. plInfinity corresponds to an infinite number of PDUs.</td>
</tr>
<tr>
<td>pollByte</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.</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.</td>
</tr>
<tr>
<td>t-Reordering</td>
<td>Timer for reordering in TS 36.322 [7], in milliseconds. Value ms0 means 0ms, 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, ms5 means 5ms and so on.</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 field descriptions**

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>n3xy</td>
<td>Constants are described in section 7.4. n1 corresponds with 1, n2 corresponds with 2 and so on.</td>
</tr>
<tr>
<td>t3xy</td>
<td>Timers are described in section 7.3. Value ms0 corresponds with 0 ms, ms50 corresponds with 50 ms and so on.</td>
</tr>
</tbody>
</table>

---

**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)
  }
}
```


---

**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
}
```

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.

sr-ConfigIndex
Parameter. 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: nPUCCH.SRI for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1].

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

```
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    ENUMERATED {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  ENUMERATED {an1, an2, an4, spare1}
}
SoundingRS-UL-ConfigDedicatedAperiodic-r10 ::= CHOICE{
  release        NULL,
  setup        SEQUENCE {
```
**SoundingRS-UL-Config field descriptions**

**ackNackSRS-SimultaneousTransmission**
Parameter: Simultaneous-AN-and-SRS, see TS 36.213 [23, 8.2]. For SCells this field is not applicable and the UE shall ignore the value.

**cyclicShift, cyclicShiftAp**
Parameter: n\textsubscript{SRS} for periodic and aperiodic sounding reference signal transmission respectively. See TS 36.211 [21, 5.5.3.1], where cs0 corresponds to 0 etc.

**duration**
Parameter: Duration for periodic sounding reference signal transmission. See TS 36.213 [21, 8.2]. FALSE corresponds to “single” and value TRUE to “indefinite”.

**freqDomainPosition, freqDomainPositionAp**
Parameter: \text{RRC} n\textsubscript{SRS} for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, 5.5.3.2].

**srs-AntennaPort, srs-AntennaPortAp**
Indicates the number of antenna ports used for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, 5.5.3].

**srs-Bandwidth, srs-BandwidthAp**
Parameter: B\textsubscript{SRS} 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].

**srs-BandwidthConfig**
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.

**srs-ConfigApDCI-Format0 / srs-ConfigApDCI-Format1a2b2c / srs-ConfigApDCI-Format4**
Parameters indicate the resource configurations for aperiodic sounding reference signal transmissions triggered by DCI formats 0, 1A, 2B, 2C, 4. See TS 36.213 [23, 8.2].

**srs-ConfigIndex, srs-ConfigIndexAp**

**srs-HoppingBandwidth**
Parameter: SRS hopping bandwidth \(b\text{hop} \in \{0,1,2,3\}\) for periodic sounding reference signal transmission, see TS 36.211 [21, 5.5.3.2] where bw0 corresponds to value 0, bw1 to value 1 and so on.

**srs-MaxUpPts**
Parameter: srsMaxUpPts, see TS 36.211 [21, 5.5.3.2]. If this field is present, reconfiguration of \(n\text{max}_{\text{SRS,0}}\) applies for UpPts, otherwise reconfiguration does not apply.

**srs-SubframeConfig**
Parameter: SRS SubframeConfiguration. 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 to value 1 and so on.

**transmissionComb, transmissionCombAp**
Parameter: \(k\text{TC} \in \{0,1\}\) for periodic and aperiodic sounding reference signal transmission respectively, see TS 36.211 [21, 5.5.3.2].
### Conditional presence

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TDD</strong></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>

---

### SPS-Config

The IE *SPS-Config* is used to specify the semi-persistent scheduling configuration.

**SPS-Config information element**

```plaintext
-- 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-ConfigDL ::= CHOICE{
  release     NULL,
  setup       SEQUENCE {
    semiPersistSchedIntervalDL   ENUMERATED {
      sf10, sf20, sf32, sf40, sf64, sf80,
      sf128, sf160, sf320, sf640, spare6,
      spare5, spare4, spare3, spare2,
      spare1},
    numberOfConfSPS-Processes   INTEGER (1..8),
    n1PUCCH-AN-PersistentList   N1PUCCH-AN-PersistentList,
    ...
  } ]
]

SPS-ConfigUL ::= CHOICE {
  release     NULL,
  setup       SEQUENCE {
    semiPersistSchedIntervalUL   ENUMERATED {
      sf10, sf20, sf32, sf40, sf64, sf80,
      sf128, sf160, sf320, sf640, spare6,
      spare5, spare4, spare3, spare2,
      spare1},
    implicitReleaseAfter    ENUMERATED {e2, e3, e4, e8},
    p0-NominalPUSCH-Persistent  p0-NominalPUSCH-Persistent   INTEGER (-126..24),
    p0-UE-PUSCH-Persistent    INTEGER (-8..7),
  } ]
]

N1PUCCH-AN-PersistentList ::=  SEQUENCE (SIZE (1..4)) OF INTEGER (0..2047)

-- ASN1STOP
```
SPS-Config field descriptions

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.

n1PUCCH-AN-PersistentList, n1PUCCH-AN-PersistentListP1
List of parameter: $n^{(1)}_{PUCCH}$ for antenna port P0 and for antenna port P1 respectively, see TS 36.213 [23, 10.1]. Field n1PUCCH-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 Semi-Persistent Scheduling, see TS 36.321 [6].

p0-NominalPUSCH-Persistent
Parameter: $P_{O, NOMINAL, PUSCH}(0)$. 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.

p0-UE-PUSCH-Persistent
Parameter: $P_{O, UE, PUSCH}(0)$. 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.

semiPersistSchedC-RNTI
Semi-persistent Scheduling C-RNTI, see TS 36.321 [6].

semiPersistSchedIntervalDL
Semi-persistent scheduling interval in 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.

semiPersistSchedIntervalUL
Semi-persistent scheduling interval in 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, 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.

twoIntervalsConfig
Trigger of two-intervals-Semi-Persistent Scheduling in uplink. See TS 36.321 [6, 5.10]. If this field is present, two-intervals-SPS is enabled for uplink. Otherwise, two-intervals-SPS is disabled.

Conditional presence | Explanation
--- | ---
TDD | 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.

---

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}
}
-- ASN1STOP
```
**TDD-Config field descriptions**

<table>
<thead>
<tr>
<th>TDD-Config field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>specialSubframePatterns</strong></td>
</tr>
<tr>
<td>Indicates Configuration as in TS 36.211 [21, table 4.2-1] where ssp0 point to Configuration 0, ssp1 to Configuration 1 etc.</td>
</tr>
<tr>
<td><strong>subframeAssignment</strong></td>
</tr>
<tr>
<td>Indicates DL/UL subframe configuration where sa0 point to Configuration 0, sa1 to Configuration 1 etc. as specified in TS 36.211 [21, table 4.2-2]. One value applies for all serving cells (the associated functionality is common i.e. not performed independently for each cell)</td>
</tr>
</tbody>
</table>

---

**TimeAlignmentTimer**

The IE *TimeAlignmentTimer* is used to control how long the UE is considered 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. In this release of the specification, uplink time alignment is common for all serving cells.

**TimeAlignmentTimer information element**

```
-- ASN1START
TimeAlignmentTimer ::= ENUMERATED {
    sf500, sf750, sf1280, sf1920, sf2560, sf5120,
    sf10240, infinity}
-- ASN1STOP
```

---

**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**

```
-- ASN1START
TPC-PDCCH-Config ::= CHOICE {
    release        NULL,
    setup        SEQUENCE {
      tpc-RNTI       BIT STRING (SIZE (16)),
      tpc-Index       TPC-Index
    }
  }
TPC-Index ::= CHOICE {
    indexOfFormat3       INTEGER (1..15),
    indexOfFormat3A       INTEGER (1..31)
  }
-- ASN1STOP
```

---

**TPC-PDCCH-Config field descriptions**

<table>
<thead>
<tr>
<th>TPC-PDCCH-Config field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>indexOfFormat3</strong></td>
</tr>
<tr>
<td>Index of N when DCI format 3 is used. See TS 36.212 [22, 5.3.3.1.6].</td>
</tr>
<tr>
<td><strong>indexOfFormat3A</strong></td>
</tr>
<tr>
<td>Index of M when DCI format 3A is used. See TS 36.212 [22, 5.3.3.1.7].</td>
</tr>
<tr>
<td><strong>tpc-Index</strong></td>
</tr>
<tr>
<td>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).</td>
</tr>
<tr>
<td><strong>tpc-RNTI</strong></td>
</tr>
<tr>
<td>RNTI for power control using DCI format 3/3A, see TS 36.212 [22].</td>
</tr>
</tbody>
</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        ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1},
    p0-NominalPUCCH      INTEGER (-127..-96),
    deltaFList-PUCCH     DeltaFList-PUCCH,
    deltaPreambleMsg3     INTEGER (-1..6)
}

UplinkPowerControlCommon-v1020 ::= SEQUENCE {
    deltaF-PUCCH-Format3-r10    ENUMERATED {deltaF-1, deltaF0, deltaF2, deltaF3, deltaF4, deltaF5, deltaF6},
    deltaF-PUCCH-Format1bCS-r10    ENUMERATED {deltaF1, deltaF2, spare2, spare1}
}

UplinkPowerControlCommonSCell-r10 ::= SEQUENCE {
    p0-NominalPUSCH-r10     INTEGER (-126..24),
    alpha-r10       ENUMERATED {al0, al04, al05, al06, al07, al08, al09, al1}
}

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 {
    deltaTxD-OffsetListPUCCH-r10  DeltaTxD-OffsetListPUCCH-r10 OPTIONAL,  -- Need OR
    pSRS-OffsetAp-r10     INTEGER (0..15)     OPTIONAL  -- Need OR
}

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}
}

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, deltaF2, deltaF3, deltaF4, deltaF5, deltaF6},
    deltaF-PUCCH-Format2a    ENUMERATED {deltaF-2, deltaF0, deltaF2},
    deltaF-PUCCH-Format2b    ENUMERATED {deltaF-2, deltaF0, deltaF2}
}

DeltaTxD-OffsetListPUCCH-r10 ::= SEQUENCE {
    deltaTxD-OffsetPUCCH-Format1-r10  ENUMERATED {dB0, dB-2},
    deltaTxD-OffsetPUCCH-Format1b-r10  ENUMERATED {dB0, dB-2},
    deltaTxD-OffsetPUCCH-Format2a-r10 ENUMERATED {dB0, dB-2},
    deltaTxD-OffsetPUCCH-Format2b-r10 ENUMERATED {dB0, dB-2},
    ...
}

--- ASN1STOP
### UplinkPowerControl field descriptions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>accumulationEnabled</strong></td>
<td>Parameter: Accumulation-enabled, see TS 36.213 [23, 5.1.1.1]. TRUE corresponds to “enabled” whereas FALSE corresponds to “disabled”.</td>
</tr>
<tr>
<td><strong>alpha</strong></td>
<td>Parameter: α See TS 36.213, 5.1.1.1 where α0 corresponds to 0, α04 corresponds to value 0.4, α05 to 0.5, α06 to 0.6, α07 to 0.7, α08 to 0.8, α09 to 0.9 and α1 corresponds to 1.</td>
</tr>
<tr>
<td><strong>deltaF-PUCCH-FormatX</strong></td>
<td>Parameter: $\Delta_{F,\text{PUCCH}}(F)$ for the PUCCH formats 1, 1b, 2a, 2b, 3 and 1b with channel selection. See TS 36.213 [23, 5.1.2] where $\Delta_{F,\text{PUCCH}}(2)$ corresponds to -2 dB, $\Delta_{F,\text{PUCCH}}(0)$ corresponds to 0 dB and so on.</td>
</tr>
<tr>
<td><strong>deltaMCS-Enabled</strong></td>
<td>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”.</td>
</tr>
<tr>
<td><strong>deltaPreambleMsg3</strong></td>
<td>Parameter: $\Delta_{\text{PREAMBLE_Msg3}}$ see TS 36.213 [23, 5.1.1.1]. Actual value = IE value * 2 [dB].</td>
</tr>
<tr>
<td><strong>deltaTxD-OffsetPUCCH-FormatX</strong></td>
<td>Parameter: $\Delta_{\text{TD_OffsetPUCCH}}(F')$ for the PUCCH formats 1, 1a/1b, 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-2 corresponds to -2 dB.</td>
</tr>
<tr>
<td><strong>filterCoefficient</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>p0-NominalPUCCH</strong></td>
<td>Parameter: $P_{O,\text{Nominal_PUCCH}}$ See TS 36.213, 5.1.2.1, unit dBm.</td>
</tr>
<tr>
<td><strong>p0-NominalPUSCH</strong></td>
<td>Parameter: $P_{O,\text{Nominal_PUSCH}}(I)$ See TS 36.213, 5.1.1.1, unit dBm. This field is applicable for non-persistent scheduling, only.</td>
</tr>
<tr>
<td><strong>p0-UE-PUCCH</strong></td>
<td>Parameter: $P_{O,\text{UE_PUCCH}}$ See TS 36.213 [23, 5.1.2.1]. Unit dB</td>
</tr>
<tr>
<td><strong>p0-UE-PUSCH</strong></td>
<td>Parameter: $P_{O,\text{UE_PUSCH}}(I)$ See TS 36.213 [23, 5.1.1.1], unit dB. This field is applicable for non-persistent scheduling, only.</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).</td>
</tr>
<tr>
<td><strong>pSRS-Offset, pSRS-OffsetAp</strong></td>
<td>Parameter: $p_{SRS_Offset}$ for periodic and aperiodic sounding reference signal transmission respectively. See TS 36.213 [23, 5.1.3.1]. For $Ks=1.25$, the actual parameter value is $p_{SRS_Offset}$ value – 3. For $Ks=0$, the actual parameter value is $-10.5 + 1.5p_{SRS_Offset}$ value.</td>
</tr>
</tbody>
</table>

#### 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

```
--- ASN1START
NextHopChainingCount ::= INTEGER (0..7)
--- ASN1STOP
```
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

```asn1
SecurityAlgorithmConfig ::= SEQUENCE {
  cipheringAlgorithm     ENUMERATED {
    eea0, eeal, eea2, spare5, spare4, spare3, spare2, spare1, ...},
  integrityProtAlgorithm    ENUMERATED {
    eia0-v920, eia1, eia2, spare5, spare4, spare3, spare2, spare1, ...}
}
```

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>cipheringAlgorithm</code></td>
<td>Indicates the ciphering algorithm to be used for SRBs and DRBs, as specified in TS 33.401 [32, 5.1.3.2].</td>
</tr>
<tr>
<td><code>integrityProtAlgorithm</code></td>
<td>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).</td>
</tr>
</tbody>
</table>

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

```asn1
ShortMAC-I ::= BIT STRING (SIZE (16))
```

### 6.3.4 Mobility control information elements

#### AdditionalSpectrumEmission

The UE requirements related to IE `AdditionalSpectrumEmission` are defined in TS 36.101 [42, table 6.2.4-1].

### AdditionalSpectrumEmission information element

```asn1
AdditionalSpectrumEmission ::= INTEGER (1..32)
```

#### ARFCN-ValueCDMA2000

The IE `ARFCN-ValueCDMA2000` used to indicate the CDMA2000 carrier frequency within a CDMA2000 band, see C.S0002-A [12].

### ARFCN-ValueCDMA2000 information element

```asn1
-- ASN1START
```
ARFCN-ValueCDMA2000 ::= INTEGER (0..2047)

--- ASN1STOP

-- ARFCN-ValueEUTRA

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].

**ARFCN-ValueEUTRA** information element

--- ASN1START

ARFCN-ValueEUTRA ::= INTEGER (0..maxEARFCN)

--- ASN1STOP

-- ARFCN-ValueGERAN

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

--- ASN1START

ARFCN-ValueGERAN ::= INTEGER (0..1023)

--- ASN1STOP

-- ARFCN-ValueUTRA

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

--- ASN1START

ARFCN-ValueUTRA ::= INTEGER (0..16383)

--- ASN1STOP

-- BandclassCDMA2000

The IE **BandclassCDMA2000** is used to define the CDMA2000 band in which the CDMA2000 carrier frequency can be found, as defined in C.S0057-B [24, table 1.5-1].

**BandclassCDMA2000** information element

--- ASN1START

BandclassCDMA2000 ::= ENUMERATED {
  bc0, bc1, bc2, bc3, bc4, bc5, bc6, bc7, bc8,
  bc9, bc10, bc11, bc12, bc13, bc14, bc15, bc16,
  bc17, spare14, spare13, spare12, spare11, spare10,
  spare9, spare8, spare7, spare6, spare5, spare4,
  spare3, spare2, spare1, ...}

--- ASN1STOP
– **BandIndicatorGERAN**

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.

```plaintext
BandIndicatorGERAN information element
```

```plaintext
BandIndicatorGERAN ::= ENUMERATED {dcs1800, pcs1900}
```

– **CarrierFreqCDMA2000**

The IE *CarrierFreqCDMA2000* is used to provide the CDMA2000 carrier information.

```plaintext
CarrierFreqCDMA2000 information element
```

```plaintext
CarrierFreqCDMA2000 ::= SEQUENCE {
  bandClass       BandclassCDMA2000,
  arfcn       ARFCN-ValueCDMA2000
}
```

– **CarrierFreqGERAN**

The IE *CarrierFreqGERAN* is used to provide an unambiguous carrier frequency description of a GERAN cell.

```plaintext
CarrierFreqGERAN information element
```

```plaintext
CarrierFreqGERAN ::= SEQUENCE {
  arfcn       ARFCN-ValueGERAN,
  bandIndicator     BandIndicatorGERAN
}
```

**CarrierFreqGERAN field descriptions**

<table>
<thead>
<tr>
<th>arfcn</th>
<th>GERAN ARFCN of BCCH carrier.</th>
</tr>
</thead>
<tbody>
<tr>
<td>bandIndicator</td>
<td>Indicates how to interpret the ARFCN of the BCCH carrier.</td>
</tr>
</tbody>
</table>

– **CarrierFreqsGERAN**

The IE *CarrierFreqListGERAN* is used to provide one or more GERAN ARFCN values, as defined in TS 44.005 [43], which represents a list of GERAN BCCH carrier frequencies.

```plaintext
CarrierFreqsGERAN information element
```

```plaintext
CarrierFreqsGERAN ::= SEQUENCE {
  startingARFCN      ARFCN-ValueGERAN,
  bandIndicator      BandIndicatorGERAN,
  followingARFCNs     CHOICE {
    followingARFCNs   SEQUENCE { ARFCN-ValueGERAN, BandIndicatorGERAN }
  }
}
```
explicitListOfARFCNs ::= ExplicitListOfARFCNs,
equallySpacedARFCNs ::= SEQUENCE {
arfcn-Spacing INTEGER (1..8),
numberOfFollowingARFCNs INTEGER (0..31)
},
variableBitMapOfARFCNs OCTET STRING (SIZE (1..16))
}

ExplicitListOfARFCNs ::= SEQUENCE (SIZE (0..31)) OF ARFCN-ValueGERAN
-- ASN1STOP

CarrierFreqsGERAN field descriptions

arfcn-Spacing
Space, d, between a set of equally spaced ARFCN values.

bandIndicator
Indicates how to interpret the ARFCN of the BCCH carrier.

explicitListOfARFCNs
The remaining ARFCN values in the set are explicitly listed one by one.

followingARFCNs
Field containing a representation of the remaining ARFCN values in the set.

numberOfFollowingARFCNs
The number, n, of the remaining equally spaced ARFCN values in the set. The complete set of (n+1) ARFCN values is defined as: \(\{s, (s+d) \mod 1024), ((s+2*d) \mod 1024) \ldots ((s+n*d) \mod 1024)\}\).

startingARFCN
The first ARFCN value, s, in the set.

variableBitMapOfARFCNs
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 "1".

–

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

CellIndexList ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellIndex
CellIndex ::= INTEGER (1..maxCellMeas)

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

CellReselectionPriority ::= INTEGER (0..7)

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.

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>multipleSID</td>
<td>The CDMA2000 1xRTT Multiple SID storage indicator.</td>
</tr>
<tr>
<td>multipleNID</td>
<td>The CDMA2000 1xRTT Multiple NID 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 {
  ...}
```

### CellGlobalIdUTRA field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
CellGlobalIdUTRA ::= SEQUENCE {
  plmn-Identity        PLMN-Identity,
  cellIdentity         BIT STRING (SIZE (28))
}

-- ASN1STOP

<table>
<thead>
<tr>
<th>CellGlobalIdUTRA field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cellIdentity</strong></td>
</tr>
<tr>
<td><strong>plmn-Identity</strong></td>
</tr>
</tbody>
</table>

CellGlobalIdGERAN

The IE **CellGlobalIdGERAN** specifies the Cell Global Identification (CGI), the globally unique identity of a cell in GERAN.

CellGlobalIdGERAN information element

```asn1
CellGlobalIdGERAN ::= SEQUENCE {
  plmn-Identity        PLMN-Identity,
  locationAreaCode      BIT STRING (SIZE (16)),
  cellIdentity         BIT STRING (SIZE (16))
}
```

-- ASN1STOP

<table>
<thead>
<tr>
<th>CellGlobalIdGERAN field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cellIdentity</strong></td>
</tr>
<tr>
<td><strong>locationAreaCode</strong></td>
</tr>
<tr>
<td><strong>plmn-Identity</strong></td>
</tr>
</tbody>
</table>

CellGlobalIdCDMA2000

The IE **CellGlobalIdCDMA2000** specifies the Cell Global Identification (CGI), the globally unique identity of a cell in CDMA2000.

CellGlobalIdCDMA2000 information element

```asn1
CellGlobalIdCDMA2000 ::= CHOICE {
  cellGlobalId1XRTT      BIT STRING (SIZE (47)),
  cellGlobalIdHRPD      BIT STRING (SIZE (128))
}
```

-- ASN1STOP

<table>
<thead>
<tr>
<th>CellGlobalIdCDMA2000 field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>cellGlobalId1XRTT</strong></td>
</tr>
<tr>
<td><strong>cellGlobalIdHRPD</strong></td>
</tr>
</tbody>
</table>
-- CSG-Identity

The IE *CSG-Identity* is used to identify a Closed Subscriber Group.

**CSG-Identity information element**

```plaintext
-- ASN1START
CSG-Identity ::=  BIT STRING (SIZE (27))
-- ASN1STOP
```

-- MobilityControlInfo

The IE *MobilityControlInfo* includes parameters relevant for network controlled mobility to/within E-UTRA.

**MobilityControlInfo information element**

```plaintext
-- ASN1START
MobilityControlInfo ::=  SEQUENCE {
  targetPhysCellId     PhysCellId,
  carrierFreq         CarrierFreqEUTRA         OPTIONAL, -- Cond HO-toEUTRA
  carrierBandwidth     CarrierBandwidthEUTRA   OPTIONAL, -- Cond HO-toEUTRA
  additionalSpectrumEmission AdditionalSpectrumEmission OPTIONAL, -- Cond HO-toEUTRA
  t304                  ENUMERATED {
    ms50, ms100, ms150, ms200, ms500, ms1000, ms2000, spare1},
  newUE-Identity       C-RNTI,
  radioResourceConfigCommon RadioResourceConfigCommon,  
rach-ConfigDedicated   RACH-ConfigDedicated OPTIONAL, -- Need OP
...
}
CarrierBandwidthEUTRA ::=  SEQUENCE {
  dl-Bandwidth         ENUMERATED {
    n6, n15, n25, n50, n75, n100, spare10,     
    spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1},
  ul-Bandwidth         ENUMERATED {
    n6, n15, n25, n50, n75, n100, spare10,     
    spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL -- Need OP
}
CarrierFreqEUTRA ::=  SEQUENCE {
  dl-CarrierFreq       ARFCN-ValueEUTRA,  
  ul-CarrierFreq       ARFCN-ValueEUTRA OPTIONAL -- Cond FDD
}
-- ASN1STOP
```
**MobilityControlInfo field descriptions**

<table>
<thead>
<tr>
<th>carrierBandwidth</th>
<th>Provides the parameters Downlink bandwidth, and Uplink bandwidth, see TS 36.101 [42].</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>dl-Bandwidth</strong></td>
<td>Parameter: Downlink bandwidth, see TS 36.101 [42].</td>
</tr>
<tr>
<td>rach-ConfigDedicated</td>
<td>The dedicated random access parameters. If absent the UE applies contention based random access as specified in TS 36.321 [6].</td>
</tr>
<tr>
<td><strong>t304</strong></td>
<td>Timer T304 as described in section 7.3. ms50 corresponds with 50 ms, ms100 corresponds with 100 ms and so on.</td>
</tr>
<tr>
<td>ul-Bandwidth</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FDD</strong></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 “FDD”; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>HO-toEUTRA</strong></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>
</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
```

— **MobilityStateParameters**

The IE MobilityStateParameters contains parameters to determine UE mobility state.

**MobilityStateParameters information element**

```asn1
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)
}
```

---

**NOTE**

The initial context establishment for CSFB is described in 3GPP TS 36.331 (MobilityControlInfo) for LTE and 3GPP TS 36.221 (MobilityParametersCDMA2000 (1xRTT)) for 1xRTT.
<table>
<thead>
<tr>
<th><strong>n-CellChangeHigh</strong></th>
<th>The number of cell changes to enter high mobility state. Corresponds to NCR_H in TS 36.304 [4].</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n-CellChangeMedium</strong></td>
<td>The number of cell changes to enter medium mobility state. Corresponds to NCR_M in TS 36.304 [4].</td>
</tr>
<tr>
<td><strong>t-Evaluation</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>t-HystNormal</strong></td>
<td>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.</td>
</tr>
</tbody>
</table>

---

**PhysCellId**

The IE *PhysCellId* is used to indicate the physical layer identity of the cell, as defined in TS 36.211 [21].

**PhysCellId** information element

```asn1
PhysCellId ::= INTEGER (0..503)
```

---

**PhysCellIdRange**

The IE *PhysCellIdRange* is used to encode either a single or a range of physical cell identities. The range is encoded by using a *start* value and by indicating the number of consecutive physical cell identities (including *start*) in the range.

**PhysCellIdRange** information element

```asn1
PhysCellIdRange ::= SEQUENCE {
  start       PhysCellId,
  range       ENUMERATED {
    n4, n8, n12, n16, n24, n32, n48, n64, n84,
    n96, n128, n168, n252, n504, spare2,
    spare1} OPTIONAL -- Need OP
}
```

**PhysCellIdRange** field descriptions

<table>
<thead>
<tr>
<th>field</th>
<th>description</th>
</tr>
</thead>
<tbody>
<tr>
<td>range</td>
<td>Indicates the number of physical cell identities in the range (including <em>start</em>). 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 <em>start</em> applies.</td>
</tr>
<tr>
<td>start</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

```asn1
-- ASN1START
```
PhysCellIdRangeUTRA-FDDList field descriptions

range
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.

start
Indicates the lowest primary scrambling code in the range.

---

PhysCellIdCDMA2000
The IE PhysCellIdCDMA2000 identifies the PNOffset that represents the "Physical cell identity" in CDMA2000.

PhysCellIdCDMA2000 information element

---

PhysCellIdGERAN
The IE PhysCellIdGERAN contains the Base Station Identity Code (BSIC).

PhysCellIdGERAN 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-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**

```asn1
PhysCellIdUTRA-TDD ::= INTEGER (0..127)
```

–  **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**

```asn1
PLMN-Identity ::= SEQUENCE {
mcc         MCC     OPTIONAL,     -- Cond MCC
mnc         MNC
}

MCC ::= SEQUENCE (SIZE (3)) OF MCC-MNC-Digit

MNC ::= SEQUENCE (SIZE (2..3)) OF MCC-MNC-Digit

MCC-MNC-Digit ::= INTEGER (0..9)
```

**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**

<table>
<thead>
<tr>
<th>MCC</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>This IE is mandatory when <em>PLMN-Identity</em> is included in <em>CellGlobalIdEUTRA</em>, in <em>CellGlobalIdUTRA</em>, in <em>CellGlobalIdGERAN</em> or in <em>RegisteredMME</em>. This IE is also mandatory in the first occurrence of the IE <em>PLMN-Identity</em> within the IE <em>PLMN-IdentityList</em>. Otherwise it is optional, need OP.</td>
<td></td>
</tr>
</tbody>
</table>

–  **PreRegistrationInfoHRPD**

```asn1
PreRegistrationInfoHRPD ::= SEQUENCE {
  preRegistrationAllowed    BOOLEAN,
  preRegistrationZoneId     PreRegistrationZoneIdHRPD OPTIONAL, -- cond PreRegAllowed
  secondaryPreRegistrationZoneIdList SecondaryPreRegistrationZoneIdListHRPD OPTIONAL -- Need OR
}

SecondaryPreRegistrationZoneIdListHRPD ::= SEQUENCE (SIZE (1..2)) OF PreRegistrationZoneIdHRPD

PreRegistrationZoneIdHRPD ::= INTEGER (0..255)
```
## PreRegistrationInfoHRPD field descriptions

<table>
<thead>
<tr>
<th>Field Description</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>preRegistrationAllowed</strong></td>
<td>TRUE indicates that a UE shall perform a CDMA2000 HRPD pre-registration if the UE does not have a valid / current pre-registration. FALSE indicates that the UE is not allowed to perform CDMA2000 HRPD pre-registration in the current cell.</td>
</tr>
<tr>
<td><strong>preRegistrationZoneID</strong></td>
<td>ColorCode (see C.S0024-A [26], C.S0087-0 [44]) of the CDMA2000 Reference Cell corresponding to the HRPD sector under the HRPD AN that is configured for this LTE cell. It is used to control when the UE should register or re-register.</td>
</tr>
<tr>
<td><strong>secondaryPreRegistrationZoneldList</strong></td>
<td>List of SecondaryColorCodes (see C.S0024-A [26], C.S0087-0 [44]) of the CDMA2000 Reference Cell corresponding to the HRPD sector under the HRPD AN that is configured for this LTE cell. They are used to control when the UE should re-register.</td>
</tr>
</tbody>
</table>

---

### Conditional presence

<table>
<thead>
<tr>
<th>Field</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PreRegAllowed</strong></td>
<td>The field is mandatory in case the preRegistrationAllowed is set to true. 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 $Q_{qualmin}$ in 36.304 [4]. Actual value $Q_{qualmin} = IE$ value [dB].

#### Q-QualMin information element

```
-- ASN1START
Q-QualMin-r9 ::= INTEGER {-34..-3}
-- ASN1STOP
```

---

### 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 $Q_{rxlevmin}$ in 36.304 [4]. Actual value $Q_{rxlevmin} = IE$ value $* 2$ [dBm].

#### Q-RxLevMin information element

```
-- ASN1START
Q-RxLevMin ::= INTEGER {-70..-22}
-- ASN1STOP
```

---

### Q-OffsetRange

The IE *Q-OffsetRange* is used to indicate a cell 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

```
-- ASN1START
Q-OffsetRange ::= ENUMERATED {
  dB-24, dB-22, dB-20, dB-18, dB-16, dB-14, dB-12, dB-10, dB-8, dB-6, dB-5, dB-4, dB-3, dB-2, dB-1, dB0, dB1, dB2, dB3, dB4, dB5, dB6, dB8, dB10, dB12, dB14, dB16, dB18, dB20, dB22, dB24}
-- ASN1STOP
```
– 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**

```
-- ASN1START
Q-OffsetRangeInterRAT ::= INTEGER (-15..15)
-- ASN1STOP
```

– ReselectionThreshold

The IE ReselectionThreshold is used to indicate an Rx level threshold for cell reselection. Actual value of threshold = IE value * 2 [dB].

**ReselectionThreshold information element**

```
-- ASN1START
ReselectionThreshold ::= INTEGER (0..31)
-- ASN1STOP
```

– ReselectionThresholdQ

The IE ReselectionThresholdQ is used to indicate a quality level threshold for cell reselection. Actual value of threshold = IE value [dB].

**ReselectionThresholdQ information element**

```
-- ASN1START
ReselectionThresholdQ-r9 ::= INTEGER (0..31)
-- ASN1STOP
```

– SCellIndex

The IE SCellIndex concerns a short identity, used to identify an SCell.

**SCellIndex information element**

```
-- ASN1START
SCellIndex-r10 ::= INTEGER (1..7)
-- ASN1STOP
```

– 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**

```
-- ASN1START
```
ServCellIndex-r10 ::= INTEGER {0..7}  

-- ASN1STOP

– 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**

```
SpeedStateScaleFactors ::= SEQUENCE {
  sf-Medium       ENUMERATED {oDot25, oDot5, oDot75, lDot0},
  sf-High        ENUMERATED {oDot25, oDot5, oDot75, lDot0}
}
```

**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**

```
SystemInfoListGERAN ::= SEQUENCE (SIZE (1..maxGERAN-SI)) OF OCTET STRING (SIZE (1..23))
```

**SystemInfoListGERAN field descriptions**

Each OCTET STRING contains one complete System Information (SI) message as defined in TS 44.018 [45, table 9.1.1] 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**

```
SystemTimeInfoCDMA2000 ::= SEQUENCE {
}
```

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).
cdma-EUTRA-Synchronisation BOOLEAN,
cdma-SystemTime CHOICE {
  synchronousSystemTime BIT STRING (SIZE (39)),
  asynchronousSystemTime BIT STRING (SIZE (49))
}

-- ASN1STOP

<table>
<thead>
<tr>
<th>SystemTimeInfoCDMA2000 field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>asynchronousSystemTime</td>
</tr>
<tr>
<td>The CDMA2000 system time corresponding to</td>
</tr>
<tr>
<td>the SFN boundary at or after the ending</td>
</tr>
<tr>
<td>boundary of the SI-Window in which</td>
</tr>
<tr>
<td>SystemInformationBlockType8 is transmitted.</td>
</tr>
<tr>
<td>If not synchronized then the size is 49</td>
</tr>
<tr>
<td>bits and the unit is [8 CDMA2000 chips</td>
</tr>
<tr>
<td>based on 1.2288 Mcps].</td>
</tr>
<tr>
<td>cdma-EUTRA-Synchronisation</td>
</tr>
<tr>
<td>TRUE indicates that the networks are</td>
</tr>
<tr>
<td>synchronised i.e. there is no drift in</td>
</tr>
<tr>
<td>the timing between E-UTRA and CDMA2000.</td>
</tr>
<tr>
<td>FALSE indicates that the networks are not</td>
</tr>
<tr>
<td>synchronised, i.e. the timing between E-UTR</td>
</tr>
<tr>
<td>a and CDMA2000 can drift.</td>
</tr>
<tr>
<td>synchronousSystemTime</td>
</tr>
<tr>
<td>CDMA2000 system time corresponding to the</td>
</tr>
<tr>
<td>SFN boundary at or after the ending</td>
</tr>
<tr>
<td>boundary of the SI-window in which</td>
</tr>
<tr>
<td>SystemInformationBlockType8 is transmitted.</td>
</tr>
<tr>
<td>If synchronized to CDMA2000 system time</td>
</tr>
<tr>
<td>then the size is 39 bits and the unit is</td>
</tr>
<tr>
<td>10 ms based on a 1.2288 Mcps chip rate.</td>
</tr>
</tbody>
</table>

--- 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

```
TrackingAreaCode ::= BIT STRING (SIZE (16))
```

--- T-Reselection

The IE T-Reselection concerns the cell reselection timer TreselectionRAT for E-UTRA, UTRA, GERAN or CDMA2000. Value in seconds.

--- T-Reselection information element

```
T-Reselection ::= INTEGER (0..7)
```

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 "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

```
AllowedMeasBandwidth ::= ENUMERATED {mbw6, mbw15, mbw25, mbw50, mbw75, mbw100}
```
— **Hysteresis**

The IE *Hysteresis* is a parameter used within the entry and leave condition of an event triggered reporting condition. The actual value is IE value * 0.5 dB.

**Hysteresis** information element

```
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

```
LocationInfo-r10 ::= SEQUENCE {
  locationCoordinates-r10     CHOICE {
    ellipsoid-Point-r10      OCTET STRING,
    ellipsoidPointWithAltitude-r10   OCTET STRING,
    ...,
  },
  horizontalVelocity-r10     OCTET STRING    OPTIONAL,
  gnss-TOD-msec-r10      OCTET STRING    OPTIONAL,
  ...}
```

**LocationInfo** field descriptions

- **ellipsoid-Point**
  Parameter *Ellipsoid-Point* defined in TS36.355 [54].

- **ellipsoidPointWithAltitude**
  Parameter *EllipsoidPointWithAltitude* defined in TS36.355 [54].

- **gnss-TOD-msec**
  Parameter *Gnss-TOD-msec* defined in TS36.355 [54].

- **horizontalVelocity**
  Parameter *HorizontalVelocity* defined in TS36.355 [54].

— **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

```
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 ON

speedStatePars  CHOICE {
  release  NULL,
  setup  SEQUENCE {
    mobilityStateParameters  MobilityStateParameters,
    timeToTrigger-SF  SpeedStateScaleFactors
  }
}  OPTIONAL, -- Need ON

MeasIdToRemoveList ::=  SEQUENCE (SIZE (1..maxMeasId)) OF MeasId
MeasObjectToRemoveList ::=  SEQUENCE (SIZE (1..maxObjectId)) OF MeasObjectId
ReportConfigToRemoveList ::=  SEQUENCE (SIZE (1..maxReportConfigId)) OF ReportConfigId

-- ASN1STOP

MeasConfig field descriptions

measGapConfig
Used to setup and release measurement gaps.

measIdToRemoveList
List of measurement identities to remove.

measObjectToRemoveList
List of measurement objects to remove.

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.

reportConfigToRemoveList
List of measurement reporting configurations to remove.

s-Measure
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.

timeToTrigger-SF
The timeToTrigger in ReportConfigEUTRA and in ReportConfigInterRAT are multiplied with the scaling factor applicable for the UE’s speed state.

MeasGapConfig
The IE MeasGapConfig specifies the measurement gap configuration and controls setup/ release of measurement gaps.

MeasGapConfig information element

-- ASN1START

MeasGapConfig ::=  CHOICE {
  release  NULL,
  setup  SEQUENCE {
    gapOffset  CHOICE {
      gp0  INTEGER (0..39),
      gp1  INTEGER (0..79),
      ...
    }
  }
}

-- ASN1STOP

ETSI
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. Also used to specify the measurement gap pattern to be applied, as defined in TS 36.133 [16].

-- 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

-- ASN1START
MeasId ::= INTEGER (1..maxMeasId)
-- ASN1STOP

-- 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.

MeasIdToAddModList information element

-- ASN1START
MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxMeasId)) OF MeasIdToAddMod
MeasIdToAddMod ::= SEQUENCE {
    measId       MeasId,
    measObjectId  MeasObjectId,
    reportConfigId  ReportConfigId
}
-- ASN1STOP

-- MeasObjectCDMA2000
The IE MeasObjectCDMA2000 specifies information applicable for inter-RAT CDMA2000 neighbouring cells.

MeasObjectCDMA2000 information element

-- ASN1START
MeasObjectCDMA2000 ::= SEQUENCE {
    cdma2000-Type        CDMA2000-Type,
    carrierFreq          CarrierFreqCDMA2000,
    searchWindowSize     INTEGER (0..15)  OPTIONAL, -- Need ON
    offsetFreq           Q-OffsetRangeInterRAT DEFAULT 0,
    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
}
-- ASN1STOP
MeasObjectCDMA2000 field descriptions

- **carrierInfo**
  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 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-A [25].

---

**MeasObjectEUTRA**

The IE *MeasObjectEUTRA* specifies information applicable for intra-frequency or inter-frequency E-UTRA cells.

**MeasObjectEUTRA information element**

```asn1
MeasObjectEUTRA ::= SEQUENCE {
  carrierFreq        ARFCN-ValueEUTRA,
  allowedMeasBandwidth AllowedMeasBandwidth,
  presenceAntennaPort1 PresenceAntennaPort1,
  neighCellConfig    NeighCellConfig,
  offsetFreq         Q-OffsetRange DEFAULT dB0,
  -- 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
  ]
}
```

```
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  -- Need OF
  }
}
```

```
MeasSubframeCellList-r10 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF PhysCellIdRange
```
MeasObjectEUTRA field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>blackCellsToAddMoList</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.</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>measCycleSCell</td>
<td>Parameter: $T_{\text{measure, scc}}$ See TS 36.133 [16, 8.3.3]. The parameter is used only when an SCell is configured on the frequency indicated by the measObject and is in deactivated state, but the field may also be signalled when an SCell is not configured. Value sf160 corresponds to 160 sub-frames, sf256 corresponds to 256 sub-frames and so on.</td>
</tr>
<tr>
<td>measSubframeCellList</td>
<td>List of cells for which measSubframePatternNeigh is applied. If not included the UE applies time domain measurement resource restriction for all neighbour cells.</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.</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 of cells in the black list.</td>
</tr>
</tbody>
</table>

MeasObjectGERAN

The IE MeasObjectGERAN specifies information applicable for inter-RAT GERAN neighbouring frequencies.

MeasObjectGERAN information element

MeasObjectGERAN field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ncc-Permitted</td>
<td>Field encoded as a bit map, where bit N is set to &quot;0&quot; if a BCCH carrier with NCC = N-1 is not permitted for monitoring and set to &quot;1&quot; 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.</td>
</tr>
</tbody>
</table>

MeasObjectld

The IE MeasObjectld used to identify a measurement object configuration.
**MeasObjectId** information element

```
MeasObjectId ::= INTEGER (1..maxObjectId)
```

---

**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,
    ...}
}
```

---

**MeasObjectUTRA**

The IE **MeasObjectUTRA** specifies information applicable for inter-RAT UTRA neighbouring cells.

**MeasObjectUTRA** information element

```
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-FDD       PhysCellIdUTRA-FDD,
    utra-TDD       PhysCellIdUTRA-TDD
  }                OPTIONAL,  -- Need ON
  ...,
  [[ csg-allowedReportingCells-v930   CSG-AllowedReportingCells-r9 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
```

```
CellsToAddModUTRA-TDD ::= SEQUENCE {
  cellIndex       INTEGER (1..maxCellMeas),
  physCellId       PhysCellIdUTRA-TDD
}
CSG-AllowedReportingCells-r9 ::= SEQUENCE {
  physCellIdRangeUTRA-FDDList-r9   PhysCellIdRangeUTRA-FDDList-r9 OPTIONAL -- Need OR
}

MeasObjectUTRA field descriptions

- **carrierFreq**
  Identifies UTRA carrier frequency for which this configuration is valid.

- **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.

---

MeasResults

The IE `MeasResults` covers measured results for intra-frequency, inter-frequency and inter-RAT mobility.

MeasResults information element

---

MeasResults ::= SEQUENCE {
  measId        MeasId,
  measResultPCell     SEQUENCE {
    rsrpResult       RSRP-Range,
    rsrqResult       RSRQ-Range
  },
  measResultNeighCells    CHOICE {
    measResultListEUTRA     MeasResultListEUTRA,
    measResultListUTRA     MeasResultListUTRA,
    measResultListGERAN     MeasResultListGERAN,
    measResultsCDMA2000     MeasResultsCDMA2000,
    ...                  OPTIONAL,
    [...]                  OPTIONAL,
    [...]                  OPTIONAL
  },
  [ [ locationInfo-r10     LocationInfo-r10    OPTIONAL,
    measResultServFreqList-r10   MeasResultServFreqList-r10  OPTIONAL
  ]]
}

MeasResultListEUTRA ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultEUTRA

MeasResultEUTRA ::= SEQUENCE {
  physCellId       PhysCellId,
 cgi-Info       SEQUENCE {
    cellGlobalId      CellGlobalIdEUTRA,
    trackingAreaCode     TrackingAreaCode,
    plmn-IdentityList     PLMN-IdentityList2     OPTIONAL
  },
  measResult       SEQUENCE {
    rsrpResult       RSRP-Range OPTIONAL,
    rsrqResult       RSRQ-Range OPTIONAL,
    [...]                  OPTIONAL,
    [...]                  OPTIONAL
  }
}

MeasResultServFreqList-r10 ::= SEQUENCE (SIZE (1..maxServCell-r10)) OF MeasResultServFreq-r10

MeasResultServFreq-r10 ::=   SEQUENCE {
  servFreqId-r10      ServCellIndex-r10,
  measResultSCell-r10     SEQUENCE {
    ...                  OPTIONAL,
    [...]                  OPTIONAL
  }
}
MeasResultUTRA ::= 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
    ]]
  }
}

MeasResultGERAN ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultGERAN

MeasResultGERAN ::= SEQUENCE {
  carrierFreq CarrierFreqGERAN,
  physCellId PhysCellIdGERAN,
  cgi-Info SEQUENCE {
    cellGlobalId CellGlobalIdGERAN,
    routingAreaCode BIT STRING (SIZE (8)) OPTIONAL
  } OPTIONAL,
  measResult SEQUENCE {
    rssi INTEGER (0..63),
    ...,
  }
}

MeasResultsCDMA2000 ::= SEQUENCE {
  preRegistrationStatusHRPD BOOLEAN,
  measResultListCDMA2000 MeasResultListCDMA2000
}

MeasResultListCDMA2000 ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultCDMA2000

MeasResultCDMA2000 ::= SEQUENCE {
  physCellId PhysCellIdCDMA2000,
  cgi-Info CellGlobalIdCDMA2000 OPTIONAL,
  measResult SEQUENCE {
    pilotPnPhase INTEGER (0..32767) OPTIONAL,
    pilotStrength INTEGER (0..63),
    ...,
  }
}

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
}

-- ASN1STOP
<table>
<thead>
<tr>
<th><strong>MeasResults field descriptions</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>measId</strong></td>
</tr>
<tr>
<td>Identifies the measurement identity for which the reporting is being performed.</td>
</tr>
<tr>
<td><strong>measResult</strong></td>
</tr>
<tr>
<td>Measured result of an E-UTRA cell;</td>
</tr>
<tr>
<td>Measured result of a UTRA cell;</td>
</tr>
<tr>
<td>Measured result of a GERAN cell or frequency; or</td>
</tr>
<tr>
<td>Measured result of a CDMA2000 cell.</td>
</tr>
<tr>
<td>Measured result of UE Rx–Tx time difference.</td>
</tr>
<tr>
<td><strong>measResultListCDMA2000</strong></td>
</tr>
<tr>
<td>List of measured results for the maximum number of reported best cells for a CDMA2000 measurement identity.</td>
</tr>
<tr>
<td><strong>measResultListEUTRA</strong></td>
</tr>
<tr>
<td>List of measured results for the maximum number of reported best cells for an E-UTRA measurement identity.</td>
</tr>
<tr>
<td><strong>measResultListGERAN</strong></td>
</tr>
<tr>
<td>List of measured results for the maximum number of reported best cells or frequencies for a GERAN measurement identity.</td>
</tr>
<tr>
<td><strong>measResultListUTRA</strong></td>
</tr>
<tr>
<td>List of measured results for the maximum number of reported best cells for a UTRA measurement identity.</td>
</tr>
<tr>
<td><strong>measResultPCell</strong></td>
</tr>
<tr>
<td>Measured result of the PCell.</td>
</tr>
<tr>
<td><strong>measResultsCDMA2000</strong></td>
</tr>
<tr>
<td>Contains the CDMA2000 HRPD pre-registration status and the list of CDMA2000 measurements.</td>
</tr>
<tr>
<td><strong>csg-MemberStatus</strong></td>
</tr>
<tr>
<td>Indicates whether or not the UE is a member of the CSG of the neighbour cell.</td>
</tr>
<tr>
<td><strong>currentSFN</strong></td>
</tr>
<tr>
<td>Indicates the current system frame number when receiving the UE Rx-Tx time difference measurement results from lower layer.</td>
</tr>
<tr>
<td><strong>locationAreaCode</strong></td>
</tr>
<tr>
<td>A fixed length code identifying the location area within a PLMN, as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td><strong>MeasResultServFreqList</strong></td>
</tr>
<tr>
<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.</td>
</tr>
<tr>
<td><strong>pilotPnPhase</strong></td>
</tr>
<tr>
<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-A [25]. This information is used in either SRVCC handover or enhanced 1xRTT CS fallback procedure to CDMA2000 1xRTT.</td>
</tr>
<tr>
<td><strong>pilotStrength</strong></td>
</tr>
<tr>
<td><strong>plmn-IdentityList</strong></td>
</tr>
<tr>
<td>The list of PLMN Identity read from broadcast information when the multiple PLMN Identities are broadcast. This field contains the list of identities starting from the second entry of PLMN Identities in the broadcast information.</td>
</tr>
<tr>
<td><strong>preRegistrationStatusHRPD</strong></td>
</tr>
<tr>
<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

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>routingAreaCode</td>
<td>The RAC identity read from broadcast information, as defined in TS 23.003 [27].</td>
</tr>
<tr>
<td>rsrpResult</td>
<td>Measured RSRP result of an E-UTRA cell. The rsrpResult is only reported if configured by the eNB.</td>
</tr>
<tr>
<td>rsrqResult</td>
<td>Measured RSRQ result of an E-UTRA cell. The rsrqResult is only reported if configured by the eNB.</td>
</tr>
<tr>
<td>rssi</td>
<td>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/leastmost bit of the bit string contains the most significant bit.</td>
</tr>
<tr>
<td>ue-RxTxTimeDiffResult</td>
<td>UE Rx-Tx time difference measurement result of the PCell, provided by lower layers. According to UE Rx-Tx time difference report mapping in TS 36.133 [16].</td>
</tr>
<tr>
<td>utra-EcN0</td>
<td>According to CPICH_Ec/No in TS 25.133 [29] for FDD. Fourteen spare values. The field is not present for TDD.</td>
</tr>
</tbody>
</table>

---

### QuantityConfig

The IE `QuantityConfig` specifies the measurement quantities and layer 3 filtering coefficients for E-UTRA and inter-RAT measurements.

**QuantityConfig information element**

```asn1
-- 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 ::= SEQUENCE {
  filterCoefficientRSRP    FilterCoefficient     DEFAULT fc4,
  filterCoefficientRSRQ    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}
}

-- ASN1STOP
```
QuantityConfig field descriptions

filterCoefficient2-FDD
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.

filterCoefficientRSRP
Specifies the filtering coefficient used for RSRP.

filterCoefficientRSRQ
Specifies the filtering coefficient used for RSRQ.

measQuantityCDMA2000
Measurement quantity used for CDMA2000 measurements. pilotPnPhaseAndPilotStrength is only applicable for MeasObjectCDMA2000 of cdma2000-Type = type1XRTT.

measQuantityGERAN
Measurement quantity used for GERAN measurements.

measQuantityUTRA
Measurement quantity used for UTRA measurements.

quantityConfigCDMA2000
Specifies quantity configurations for CDMA2000 measurements.

quantityConfigEUTRA
Specifies filter configurations for E-UTRA measurements.

quantityConfigGERAN
Specifies quantity and filter configurations for GERAN measurements.

quantityConfigUTRA
Specifies quantity and filter configurations for UTRA measurements. Field quantityConfigUTRA-v1020 is applicable only when reportQuantityUTRA-FDD is configured.

ReportConfigEUTRA

The IE ReportConfigEUTRA specifies criteria for triggering of an E-UTRA measurement reporting event. The E-UTRA measurement reporting events 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;
Event A4: Neighbour becomes better than absolute threshold;
Event A5: PCell becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.
Event A6: Neighbour becomes amount of offset better than SCell.

ReportConfigEUTRA information element

-- ASN1START
ReportConfigEUTRA ::= SEQUENCE {
    triggerType event
    eventId eventA1
        a1-Threshold ThresholdEUTRA
    ,
    eventA2
        a2-Threshold ThresholdEUTRA
    ,
    eventA3
        a3-Offset INTEGER (-30..30),
        reportOnLeave BOOLEAN
    ,
    eventA4
        a4-Threshold ThresholdEUTRA
    ,
    eventA5
        a5-Threshold1 ThresholdEUTRA,
        a5-Threshold2 ThresholdEUTRA
    ,
    ...
}
eventA6-r10  SEQUENCE {
  a6-Offset-r10  INTEGER (-30..30),
  a6-ReportOnLeave-r10  BOOLEAN
}

},
hysteresis  Hysteresis,
timeToTrigger  TimeToTrigger

},
periodical  SEQUENCE {
  purpose  ENUMERATED {
    reportStrongestCells, reportCGI
  }
  triggerQuantity  ENUMERATED {rsrp, rsrq},
  reportQuantity  ENUMERATED {sameAsTriggerQuantity, both},
  maxReportCells  INTEGER (1..maxCellReport),
  reportInterval  ReportInterval,
  reportAmount  ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity},
  ...,
  [ [ si-RequestForHO-r9  ENUMERATED {setup}  OPTIONAL, -- Cond reportCGI
    ue-RxTxTimeDiffPeriodical-r9  ENUMERATED {setup}  OPTIONAL -- Need OR
  ]],
  [ [ includeLocationInfo-r10  ENUMERATED {true}  OPTIONAL, -- Cond reportMDT
    reportAddNeighMeas-r10  ENUMERATED {setup}  OPTIONAL -- Need OR
  ]]
}

ThresholdEUTRA ::= CHOICE{
  threshold-RSRP  RSRP-Range,
  threshold-RSRQ  RSRQ-Range
}

--- ASN1STOP

ReportConfigEUTRA field descriptions

**a3-Offset/ a6-Offset**
Offset value to be used in EUTRA measurement report triggering condition for event a3/ a6. The actual value is IE value * 0.5 dB.

**aN-ThresholdM**
Threshold to be used in EUTRA measurement report triggering condition for event number aN. If multiple thresholds are defined for event number aN, the thresholds are differentiated by M.

**eventId**
Choice of E-UTRA event triggered reporting criteria.

**maxReportCells**
Max number of cells, excluding the serving cell, to include in the measurement report.

**reportAmount**
Number of measurement reports applicable for triggerType event as well as for triggerType periodical. In case purpose is set to reportCGI only value 1 applies.

**reportOnLeave/ a6-ReportOnLeave**
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.

**reportQuantity**
The quantities to be included in the measurement report. The value both means that both the rsrp and rsrq quantities are to be included in the measurement report.

**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 IE value – 140 dBm.
For RSRQ: RSRQ based threshold for event evaluation. The actual value is (IE value – 40)/2 dB.

**timeToTrigger**
Time during which specific criteria for the event needs to be met in order to trigger a measurement report.

**triggerQuantity**
The quantities used to evaluate the triggering condition for the event. The values rsrp and rsrq correspond to Reference Signal Received Power (RSRP) and Reference Signal Received Quality (RSRQ), see TS 36.214 [48].

**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.
### Conditional presence

<table>
<thead>
<tr>
<th>Conditional presence</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.</td>
</tr>
<tr>
<td>reportMDT</td>
<td>The field is optional, need OR, in case triggerType is set to eventA2 or periodical; otherwise the field is not present.</td>
</tr>
</tbody>
</table>

---

*ReportConfigId*

The IE `ReportConfigId` is used to identify a measurement reporting configuration.

**ReportConfigId information element**

```asn1
ReportConfigId ::= INTEGER {1..maxReportConfigId}
```

---

*ReportConfigInterRAT*

The IE `ReportConfigInterRAT` specifies criteria for triggering of an inter-RAT measurement reporting event. The inter-RAT measurement reporting events are labelled B\(N\) with \(N\) equal to 1, 2 and so on.

- **Event B1**: Neighbour becomes better than absolute threshold;
- **Event B2**: PCell becomes worse than absolute threshold1 AND Neighbour becomes better than another absolute threshold2.

The b1 and b2 event thresholds for CDMA2000 are the CDMA2000 pilot detection thresholds are expressed as an unsigned binary number equal to \([-2 \times 10 \log_{10} E_{c}/I_{o}]\) in units of 0.5dB, see C.S0005-A [25] for details.

**ReportConfigInterRAT information element**

```asn1
ReportConfigInterRAT ::= SEQUENCE {
    triggerType CHOICE {
        event SEQUENCE {
            eventId CHOICE {
                eventB1 SEQUENCE {
                    b1-Threshold CHOICE {
                        b1-ThresholdUTRA ThresholdUTRA,
                        b1-ThresholdGERAN ThresholdGERAN,
                        b1-ThresholdCDMA2000 ThresholdCDMA2000
                    }
                },
                eventB2 SEQUENCE {
                    b2-Threshold1 ThresholdUTRA,
                    b2-Threshold2 CHOICE {
                        b2-Threshold2UTRA ThresholdUTRA,
                        b2-Threshold2GERAN ThresholdGERAN,
                        b2-Threshold2CDMA2000 ThresholdCDMA2000
                    }
                },
                ...
            },
            hysteresis Hysteresis,
            timeToTrigger TimeToTrigger
        },
        periodical SEQUENCE {
            purpose ENUMERATED {
                reportStrongestCells,
                reportStrongestCellsForSON,
                reportCGI
            }
        }
    },
    maxReportCells INTEGER {1..maxCellReport},
    reportInterval ReportInterval,
    reportAmount ENUMERATED {r1, r2, r4, r8, r16, r32, r64, infinity}
}
```
ReportConfigInteRAT field descriptions

\textbf{bN-ThresholdM}
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.

\textbf{eventId}
Choice of inter-RAT event triggered reporting criteria.

\textbf{maxReportCells}
Max number of cells, excluding the serving cell, to include in the measurement report. In case \texttt{purpose} is set to \texttt{reportStrongestCellsForSON} only value 1 applies.

\textbf{Purpose}
\texttt{reportStrongestCellsForSON} applies only in case \texttt{reportConfig} is linked to a \texttt{measObject} set to \texttt{measObjectUTRA} or \texttt{measObjectCDMA2000}.

\textbf{reportAmount}
Number of measurement reports applicable for \texttt{triggerType} \texttt{event} as well as for \texttt{triggerType} \texttt{periodical}. In case \texttt{purpose} is set to \texttt{reportCGI} or \texttt{reportStrongestCellsForSON} only value 1 applies.

\textbf{reportQuantityUTRA-FDD}
The quantities to be included in the UTRA measurement report. The value \textit{both} means that both the cpich RSCP and cpich EcN0 quantities are to be included in the measurement report.

\textbf{si-RequestForHO}
The field applies to the \texttt{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.

\textbf{ThresholdGERAN}
The actual value is IE value – 110 dBm.

\textbf{ThresholdUTRA}
\texttt{utra-RSCP} corresponds to CPICH_RSCP in TS 25.133 [29] for FDD and P-CCPCH_RSCP in TS 25.123 [30] for TDD.\n\texttt{utra-EcN0} corresponds to CPICH_Ec/No in TS 25.133 [29] for FDD, and is not applicable for TDD.\nFor \texttt{utra-RSCP}: The actual value is IE value – 115 dBm.\nFor \texttt{utra-EcN0}: The actual value is (IE value – 49)/2 dB.

\textbf{timeToTrigger}
Time during which specific criteria for the event needs to be met in order to trigger a measurement report.

\begin{table}[h]
\centering
\begin{tabular}{ |c|p{10cm}| }
\hline
\textbf{Conditional presence} & \textbf{Explanation} \\
\hline
\texttt{reportCGI} & The field is optional, need OR, in case \texttt{purpose} is included and set to \texttt{reportCGI}; otherwise the field is not present. \\
\hline
\end{tabular}
\end{table}

\textbf{ReportConfigToAddModList}
The IE \texttt{ReportConfigToAddModList} concerns a list of reporting configurations to add or modify

\textbf{ReportConfigToAddModList information element}
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 periodical. 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.

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].

RSRQ-Range

The IE RSRQ-Range specifies the value range used in RSRQ measurements and thresholds. Integer value for RSRQ measurements according to mapping table in TS 36.133 [16].

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, ms40 corresponds to 40 ms, and so on.
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
```

– **AreaConfiguration**

The *AreaConfiguration* indicates area for which UE is requested to perform measurement logging. If not configured, measurement logging applies in the entire RPLMN of the UE at the point of receiving the configuration.

**AreaConfiguration** information element

```
-- ASN1START
AreaConfiguration-r10 ::= CHOICE {
  cellGlobalIdList-r10   CellGlobalIdList-r10,
  trackingAreaCodeList-r10   TrackingAreaCodeList-r10
}
CellGlobalIdList-r10 ::= SEQUENCE (SIZE (1..32)) OF CellGlobalIdEUTRA
TrackingAreaCodeList-r10 ::= SEQUENCE (SIZE (1..8)) OF TrackingAreaCode
-- ASN1STOP
```

– **C-RNTI**

The IE *C-RNTI* identifies a UE having a RRC connection within a cell.

**C-RNTI** information element

```
-- ASN1START
C-RNTI ::= BIT STRING (SIZE (16))
-- ASN1STOP
```

– **DedicatedInfoCDMA2000**

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

```
-- ASN1START
DedicatedInfoCDMA2000 ::= OCTET STRING
-- ASN1STOP
```
DedicatedInfoNAS

The IE 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

FilterCoefficient

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

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.

LoggingDuration information element

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.

LoggingInterval information element
— **MeasSubframePattern**

The IE *MeasSubframePattern* is used to specify time domain measurement resource restriction. 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 for measurement.

### MeasSubframePattern information element

```asn1
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

```asn1
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

```asn1
NeighCellConfig ::=   BIT STRING (SIZE (2))
```

#### NeighCellConfig field descriptions

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>neighCellConfig</td>
<td>Provides information related to MBSFN and TDD UL/DL configuration of neighbour cells of this frequency.</td>
</tr>
<tr>
<td>00</td>
<td>Not all neighbour cells have the same MBSFN subframe allocation as the serving cell on this frequency, if configured, and as the PCell otherwise.</td>
</tr>
<tr>
<td>10</td>
<td>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.</td>
</tr>
<tr>
<td>01</td>
<td>No MBSFN subframes are present in all neighbour cells.</td>
</tr>
<tr>
<td>11</td>
<td>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.</td>
</tr>
<tr>
<td>00</td>
<td>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.</td>
</tr>
</tbody>
</table>
OtherConfig field descriptions

Indicates, for each of the applicable RATs (EUTRA, UTRA), whether or not proximity indication is enabled for cells of the concerned RAT whose CSG IDs are in the UEs CSG whitelist. Note.

NOTE: Enabling/ disabling of proximity indication includes enabling/ disabling of the related functionality e.g. autonomous search in connected mode.

RAND-CDMA2000 (1xRTT)

The RAND-CDMA2000 concerns a random value, generated by the eNB, to be passed to the CDMA2000 upper layers.

RAT-Type

The IE RAT-Type is used to indicate the radio access technology (RAT), including E-UTRA, of the requested/ transferred UE capabilities.

RRC-TransactionIdentifier

The IE RRC-TransactionIdentifier is used, together with the message type, for the identification of an RRC procedure (transaction).
RRC-TransactionIdentifier ::= INTEGER (0..3)

-- ASN1STOP

---

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**

```
S-TMSI ::= SEQUENCE {
    mmec        MMEC,
    m-TMSI        BIT STRING (SIZE (32))
}
```

---

**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**

```
TraceReference-r10 ::= SEQUENCE {
    plmn-Identity-r10    PLMN-Identity,
    traceId-r10      OCTET STRING (SIZE (3))
}
```

---

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**

```
UE-CapabilityRAT-ContainerList ::=SEQUENCE (SIZE (0..maxRAT-Capabilities)) OF UE-CapabilityRAT-Container

UE-CapabilityRAT-Container ::= SEQUENCE {
    rat-Type       RAT-Type,
    ueCapabilityRAT-Container   OCTET STRING
}
```

---
UECapabilityRAT-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.

**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 Annex B.1) to the network. The IE **UE-EUTRA-Capability** is transferred in E-UTRA or in another RAT.

**UE-EUTRA-Capability** information element

```asn1
-- ASN1START
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
}

UE-EUTRA-Capability-v920-IEs ::= SEQUENCE {
  phyLayerParameters-v920           PhyLayerParameters-v920,
  interRAT-ParametersGERAN-v920     IRAT-ParametersGERAN-v920,
  interRAT-ParametersUTRA-v920      IRAT-ParametersUTRA-v920,
  interRAT-ParametersCDMA2000-v920  IRAT-ParametersCDMA2000-v920,
  deviceType-r9                     ENUMERATED {noBenFromBatConsumpOpt} 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 {
}

-- ASN1END
```
lateNonCriticalExtension OCTET STRING 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,
  rf-Parameters-v1020 RF-Parameters-v1020 OPTIONAL,
  measParameters-v1020 MeasParameters-v1020 OPTIONAL,
  featureGroupIndicators-v1020 BIT STRING (SIZE (32)) OPTIONAL,
  interRAT-ParametersCDMA2000-v1020 IRAT-ParametersCDMA2000-1XRTT-v1020 OPTIONAL,
  ue-BasedNetwPerfMeasParameters-r10 UE-BasedNetwPerfMeasParameters-r10 OPTIONAL,
  interRAT-ParametersUTRA-TDD-v1020 IRAT-ParametersUTRA-TDD-v1020 OPTIONAL,
  nonCriticalExtension SEQUENCE {} OPTIONAL
}

AccessStratumRelease ::= ENUMERATED {
  rel8, rel9, rel10, spare5, spare4, spare3,
  spare2, spare1, ...}

PDCP-Parameters ::= SEQUENCE {
  supportedROHC-Profiles SEQUENCE {
    profile0x0001 BOOLEAN,
    profile0x0002 BOOLEAN,
    profile0x0003 BOOLEAN,
    profile0x0004 BOOLEAN,
    profile0x0006 BOOLEAN,
    profile0x0101 BOOLEAN,
    profile0x0102 BOOLEAN,
    profile0x0103 BOOLEAN,
    profile0x0104 BOOLEAN
  },
  maxNumberROHC-ContextSessions ENUMERATED {
    cs2, cs4, cs8, cs12, cs16, cs24, cs32,
    cs48, cs64, cs128, cs256, cs512, cs1024,
    cs16384, spare2, spare1}
      DEFAULT cs16,
  ...
}

PhyLayerParameters ::= SEQUENCE {
  ue-TxAntennaSelectionSupported BOOLEAN,
  ue-SpecificRefSigsSupported BOOLEAN
}

PhyLayerParameters-v920 ::= SEQUENCE {
  enhancedDualLayerFDD-r9 ENUMERATED {supported} OPTIONAL,
  enhancedDualLayerTDD-r9 ENUMERATED {supported} OPTIONAL
}

PhyLayerParameters-v1020 ::= SEQUENCE {
  twoAntennaPortsForPUCCH-r10 ENUMERATED {supported} OPTIONAL,
  tm9-8Tx-FDD-r10 ENUMERATED {supported} OPTIONAL,
  pmi-Disabling-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
}

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-v1020 ::= SEQUENCE {
  supportedBandCombination-r10 SupportedBandCombination-r10
}

SupportedBandCombination-r10 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandCombinationParameters-
  r10
BandCombinationParameters-r10 ::= SEQUENCE (SIZE (1..maxSimultaneousBands-r10)) OF BandParameters-r10

BandParameters-r10 ::= SEQUENCE {
  bandEUTRA-r10 INTEGER (1..64),
  bandParametersUL-r10 BandParametersUL-r10 OPTIONAL,
  bandParametersDL-r10 BandParametersDL-r10 OPTIONAL
}

BandParametersUL-r10 ::= SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF CA-MIMO-ParametersUL-r10

CA-MIMO-ParametersUL-r10 ::= SEQUENCE {
  ca-BandwidthClassUL-r10 CA-BandwidthClass-r10,
  supportedMIMO-CapabilityUL-r10 MIMO-CapabilityUL-r10 OPTIONAL
}

BandParametersDL-r10 ::= SEQUENCE (SIZE (1..maxBandwidthClass-r10)) OF CA-MIMO-ParametersDL-r10

CA-MIMO-ParametersDL-r10 ::= SEQUENCE {
  ca-BandwidthClassDL-r10 CA-BandwidthClass-r10,
  supportedMIMO-CapabilityDL-r10 MIMO-CapabilityDL-r10 OPTIONAL
}

CA-BandwidthClass-r10 ::= ENUMERATED {a, b, c, d, e, f, ...}

MIMO-CapabilityUL-r10 ::= ENUMERATED {twoLayers, fourLayers}

MIMO-CapabilityDL-r10 ::= ENUMERATED {twoLayers, fourLayers, eightLayers}

SupportedBandListEUTRA ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandEUTRA

SupportedBandEUTRA ::= SEQUENCE {
  bandEUTRA INTEGER (1..64),
  halfDuplex BOOLEAN
}

MeasParameters ::= SEQUENCE {
  bandListEUTRA BandListEUTRA
}

MeasParameters-v1020 ::= SEQUENCE {
  bandCombinationListEUTRA-r10 BandCombinationListEUTRA-r10
}

BandListEUTRA ::= SEQUENCE (SIZE (1..maxBands)) OF BandInfoEUTRA

BandCombinationListEUTRA-r10 ::= SEQUENCE (SIZE (1..maxBandComb-r10)) OF BandInfoEUTRA

BandInfoEUTRA ::= SEQUENCE {
  interFreqBandList InterFreqBandList,
  interRAT-BandList InterRAT-BandList
}

InterFreqBandInfo ::= SEQUENCE {
  interFreqNeedForGaps BOOLEAN
}

InterRAT-BandList ::= SEQUENCE (SIZE (1..maxBands)) OF InterRAT-BandInfo

IRAT-ParametersUTRA-FDD ::= SEQUENCE {
  supportedBandListUTRA-FDD SupportedBandListUTRA-FDD
}

IRAT-ParametersUTRA-v920 ::= SEQUENCE {
  e-RedirectionUTRA-r9 ENUMERATED {supported}
}

SupportedBandListUTRA-FDD ::= SEQUENCE (SIZE (1..maxBands)) OF SupportedBandUTRA-FDD

SupportedBandUTRA-FDD ::= ENUMERATED {
  bandI, bandII, bandIII, bandIV, bandV, bandVI,
  bandVII, bandVIII, bandIX, bandX, bandXI,
IRAT-ParametersUTRA-TDD128 ::= SEQUENCE {
  supportedBandListUTRA-TDD128  SupportedBandListUTRA-TDD128
}

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, ...
}

IRAT-ParametersUTRA-TDD384 ::= SEQUENCE {
  supportedBandListUTRA-TDD384  SupportedBandListUTRA-TDD384
}

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, ...
}

IRAT-ParametersUTRA-TDD768 ::= SEQUENCE {
  supportedBandListUTRA-TDD768  SupportedBandListUTRA-TDD768
}

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-PS-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 {
  gsm450, gsm480, gsm710, gsm750, gsm810, gsm850,
  gsm900P, gsm900E, gsm900R, gsm1800, gsm1900,
  spare5, spare4, spare3, spare2, spare1, ...
}

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-Mob1XRTT-r9 ENUMERATED {supported}   OPTIONAL
}

IRAT-ParametersCDMA2000-1XRTT-v1020 ::= SEQUENCE {
  e-CSFB-dual-1XRTT-r10 ENUMERATED {supported}
SupportedBandList1XRTT ::= SEQUENCE (SIZE (1..maxCDMA-BandClass)) OF BandclassCDMA2000

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
}

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
}

-- ASN1STOP
### UE-EUTRA-Capability field descriptions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>accessStratumRelease</strong></td>
<td>Set to rel10 in this version of the specification.</td>
</tr>
<tr>
<td><strong>bandCombinationListEUTRA</strong></td>
<td>One entry corresponding to each supported band combination listed in the same order as in supportedBandCombination.</td>
</tr>
<tr>
<td><strong>bandEUTRA</strong></td>
<td>E-UTRA band as defined in TS 36.101 [42].</td>
</tr>
<tr>
<td><strong>bandListEUTRA</strong></td>
<td>One entry corresponding to each supported E-UTRA band listed in the same order as in supportedBandListEUTRA. This field shall include all bands which are indicated in BandCombinationParameters-r10.</td>
</tr>
<tr>
<td><strong>CA-BandwidthClass</strong></td>
<td>The CA bandwidth class supported by the UE as defined in TS 36.101 [42, Table 5.6A-1].</td>
</tr>
<tr>
<td><strong>deviceType</strong></td>
<td>UE may set the value to “noBenFromBatConsumpOpt” 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>
</tr>
<tr>
<td><strong>dtm</strong></td>
<td>Indicates whether the UE supports DTM in GERAN.</td>
</tr>
<tr>
<td><strong>e-CSFB-1XRTT</strong></td>
<td>Indicates whether the UE supports enhanced CS fallback to CDMA2000 1xRTT or not.</td>
</tr>
<tr>
<td><strong>e-CSFB-ConcPS-Mob1XRTT</strong></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><strong>e-CSFB-dual-1XRTT</strong></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><strong>enhancedDualLayerTDD-Supported</strong></td>
<td>Indicates whether the UE supports enhanced dual layer (PDSCH transmission mode 8) for TDD or not. This bit shall be set to “TRUE” by a Rel-9 TDD UE when the functionality has been IOT tested.</td>
</tr>
<tr>
<td><strong>e-RedirectionUTRA-TDD</strong></td>
<td>Indicates whether the UE supports enhanced redirection to UTRA TDD using SIB related to multiple carrier frequencies provided by RRConnectionRelease or not.</td>
</tr>
<tr>
<td><strong>featureGroupIndicators</strong></td>
<td>The definitions of the bits in the bit string are described in Annex B.</td>
</tr>
<tr>
<td><strong>halfDuplex</strong></td>
<td>If halfDuplex is set to true, only half duplex operation is supported for the band, otherwise full duplex operation is supported.</td>
</tr>
<tr>
<td><strong>intraFreqProximityIndication</strong></td>
<td>Indicates whether the UE supports proximity indication for intra-frequency E-UTRAN cells whose CSG Identities are in the UE’s CSG Whitelist.</td>
</tr>
<tr>
<td><strong>intraFreqSI-AcquisitionForHO</strong></td>
<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>
</tr>
<tr>
<td><strong>interFreqBandList</strong></td>
<td>One entry corresponding to each supported E-UTRA band listed in the same order as in supportedBandListEUTRA.</td>
</tr>
<tr>
<td><strong>interFreqNeedForGaps</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>interFreqProximityIndication</strong></td>
<td>Indicates whether the UE supports proximity indication for inter-frequency E-UTRAN cells whose CSG Identities are in the UE’s CSG Whitelist.</td>
</tr>
<tr>
<td><strong>interFreqSI-AcquisitionForHO</strong></td>
<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 inter-frequency cell.</td>
</tr>
<tr>
<td><strong>interRAT-BandList</strong></td>
<td>One entry corresponding to each supported band of another RAT listed in the same order as in the interRAT-Parameters.</td>
</tr>
<tr>
<td><strong>interRAT-NeedForGaps</strong></td>
<td>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 the interRAT-BandList.</td>
</tr>
<tr>
<td><strong>interRAT-PS-HO-ToGERAN</strong></td>
<td>Indicates whether the UE supports inter-RAT PS handover to GERAN or not.</td>
</tr>
<tr>
<td><strong>loggedMeasurementsIdle</strong></td>
<td>Indicates whether the UE supports logged measurements in Idle mode.</td>
</tr>
</tbody>
</table>
### UE-EUTRA-Capability field descriptions

**maxNumberROHC-ContextSessions**
Set to the maximum number of concurrently active ROHC contexts supported by the UE. cs2 corresponds with 2 (context sessions), cs4 corresponds with 4 and so on.

**MIMO-CapabilityDL**
The number of supported layers for spatial multiplexing in DL.

**MIMO-CapabilityUL**
The number of supported layers for spatial multiplexing in UL.

**NonContiguousUL-RA-WithinCC-List**
One entry corresponding to each supported E-UTRA band listed in the same order as in supportedBandListEUTRA.

**rach-Report**
Indicates whether the UE supports delivery of rachReport.

**standaloneGNSS-Location**
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.

**SupportedBandGERAN**
GERAN band as defined in TS 45.005 [20].

**SupportedBandList1XRTT**
One entry corresponding to each supported CDMA2000 1xRTT band class.

**SupportedBandListHRPD**
One entry corresponding to each supported CDMA2000 HRPD band class.

**SupportedBandUTRA-FDD**
UTRA band as defined in TS 25.101 [17].

**SupportedBandUTRA-TDD128**
UTRA band as defined in TS 25.102 [18].

**SupportedBandUTRA-TDD384**
UTRA band as defined in TS 25.102 [18].

**SupportedBandUTRA-TDD768**
UTRA band as defined in TS 25.102 [18].

**ue-Category**
UE category as defined in TS 36.306 [5]. Set to values 1 to 8 in this version of the specification. If the UE includes ue-Category-v1020 (category 6 to 8) it shall also include rf-Parameters-v1020 even if it does not support carrier aggregation.

**ue-TxAntennaSelectionSupported**
TRUE indicates that the UE is capable of supporting UE transmit antenna selection as described in TS 36.213 [23, 8,7].

**utran-ProximityIndication**
Indicates whether the UE supports proximity indication for UTRAN cells whose CSG IDs are in the UE’s CSG Whitelist.

**utran-SI-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 UMTS cell.

---

**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:** All the combinations of **CA-MIMO-ParametersUL** and **CA-MIMO-ParametersDL** for one band and across all the bands in each BandCombinationParameters are supported by the UE and have the same measurement gap requirement (i.e. the same BandInfoEUTRA applies). The BandCombinationParameters for the same band combination can be included more than once.

---

**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

```asn1
UE-TimersAndConstants ::= SEQUENCE {
  t300 ENUMERATED {
    ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},
  t301 ENUMERATED {
    ms100, ms200, ms300, ms400, ms600, ms1000, ms1500, ms2000},
  -- ASNISTART
    -- ASNIEND
```
6.3.7 MBMS information elements

– **MBMS-NotificationConfig**

The IE **MBMS-NotificationConfig** specifies the MBMS notification related configuration parameters, that are applicable for all MBSFN areas.

**MBMS-NotificationConfig information element**

```
-- ASN1START
MBMS-NotificationConfig-r9 ::= SEQUENCE {
  notificationRepetitionCoeff-r9  ENUMERATED {n2, n4},
  notificationOffset-r9    INTEGER (0..10),
  notificationSF-Index-r9    INTEGER (1..6)
}
-- ASN1STOP
```

**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: SFN mod notification repetition period = notificationOffset

- **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.
  TDD: Value 1, 2, 3, 4, and 5 correspond with subframe #3, #4, #7, #8, and #9 respectively.

- **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.

– **MBSFN-AreaInfoList**

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      INTEGER (0..255),
  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}
  },
  ...
}

-- ASN1STOP

MBSFN-AreaInfoList field descriptions

**mbsfn-AreaId**
Indicates the MBSFN area ID, parameter $N_{ID}^{MBSFN}$ in TS 36.211 [21, 6.10.2.1].

**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.

**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 $mcch-RepetitionPeriod = mcch-Offset$.

**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.

**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, Section 5.3.3.1] and so on.

**signallingMCS**
Indicates the Modulation and Coding Scheme (MCS) applicable for the subframes indicated by the field $sf-AllocInfo$ and for the first subframe of each MCH scheduling period (which may contain the MCH scheduling information provided by MAC). Value $n2$ corresponds with the value 2 for parameter $I_{MCS}$ in TS 36.213 [23, Table 7.1.7.1-1], and so on.

**sf-AllocInfo**
Indicates the subframes of the radio frames indicated by the $mcch-RepetitionPeriod$ and the $mcch-Offset$, 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.

---

**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),
}
```

-- ASN1STOP
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. Uplink subframes are not allocated.

**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. Uplink subframes are not allocated. The last bit is not used.

---

**PMCH-InfoList**

The IE **PMCH-InfoList** specifies configuration of all PMCHs of an MBSFN area. The information provided for an individual PMCH includes the configuration parameters of the sessions that are carried by the concerned PMCH.

**PMCH-InfoList information element**

```asn1
PMCH-InfoList-r9 ::= SEQUENCE (SIZE (0..maxPMCH-PerMBSFN)) OF PMCH-Info-r9
PMCH-Info-r9 ::= SEQUENCE { pmch-Config-r9, mbms-SessionInfoList-r9, ...
MBMS-SessionInfoList-r9 ::= SEQUENCE (SIZE (0..maxSessionPerPMCH)) OF MBMS-SessionInfo-r9
MBMS-SessionInfo-r9 ::= SEQUENCE { tmgi-r9, sessionId-r9, logicalChannelIdentity-r9, ...
PMCH-Config-r9 ::= SEQUENCE { sf-AllocEnd-r9, dataMCS-r9, mch-SchedulingPeriod-r9, ...
TMGI-r9 ::= SEQUENCE { plmn-Id-r9, plmn-Index-r9, explicitValue-r9, }
```

### PMCH-InfoList field descriptions

**dataMCS**

Indicates the value for parameter $I_m^c$ in TS 36.213 [23, Table 7.1.7.1-1], which defines the Modulation and Coding Scheme (MCS) applicable for the subframes of this (P)MCH as indicated by the field `commonSF-Alloc`. 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 of 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 8r8 corresponds to 8 radio frames, 16r16 corresponds to 16 radio frames and so on. The `mch-SchedulingPeriod` starts in the radio frames for which: SFN mod `mch-SchedulingPeriod` = 0.

**plmn-Index**

Index of the entry in field `plmn-IdentityList` within `SystemInformationBlockType1`.

**sessionId**

Indicates the identity of a session of an MBMS service.

**serviceId**

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 $n^{th}$ entry in pmch-InfoList are the subsequent subframes starting from either the subframe identified by `sf-AllocEnd` of the $(n-1)^{th}$ listed (P)MCH or, for $n=1$, the first subframe, through the subframe identified by `sf-AllocEnd` of the $n^{th}$ listed (P)MCH. Value 0 corresponds with the first subframe defined by field `commonSF-Alloc`.

### 6.4 RRC multiplicity and type constraint values

#### Multiplicity and type constraint definitions

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Constraint</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>maxBandComb-r10</td>
<td>INTEGER ::= 128</td>
<td>Maximum number of band combinations.</td>
</tr>
<tr>
<td>maxBands</td>
<td>INTEGER ::= 64</td>
<td>Maximum number of bands listed in EUTRA UE caps</td>
</tr>
<tr>
<td>maxBandwidthClass-r10</td>
<td>INTEGER ::= 16</td>
<td>Maximum number of supported CA BW classes per band</td>
</tr>
<tr>
<td>maxCDMA-BandClass</td>
<td>INTEGER ::= 32</td>
<td>Maximum value of the CDMA band classes</td>
</tr>
<tr>
<td>maxCellBlack</td>
<td>INTEGER ::= 16</td>
<td>Maximum number of blacklisted physical cell identity ranges listed in SIB type 4 and 5</td>
</tr>
<tr>
<td>maxCellInfoGERAN-r9</td>
<td>INTEGER ::= 32</td>
<td>Maximum number of GERAN cells for which system information can be provided as redirection assistance</td>
</tr>
<tr>
<td>maxCellInfoUTRA-r9</td>
<td>INTEGER ::= 16</td>
<td>Maximum number of UTRA cells for which system information can be provided as redirection assistance</td>
</tr>
<tr>
<td>maxFreqUTRA-TDD-r10</td>
<td>INTEGER ::= 6</td>
<td>Maximum number of UTRA TDD carrier frequencies for which system information can be provided as redirection assistance</td>
</tr>
<tr>
<td>maxCellInter</td>
<td>INTEGER ::= 16</td>
<td>Maximum number of neighbouring inter-frequency cells listed in SIB type 5</td>
</tr>
<tr>
<td>maxCellIntra</td>
<td>INTEGER ::= 16</td>
<td>Maximum number of neighbouring intra-frequency cells listed in SIB type 4</td>
</tr>
<tr>
<td>maxCellListGERAN</td>
<td>INTEGER ::= 3</td>
<td>Maximum number of lists of GERAN cells</td>
</tr>
<tr>
<td>maxCellMeas</td>
<td>INTEGER ::= 32</td>
<td>Maximum number of entries in each of the cell lists in a measurement object</td>
</tr>
<tr>
<td>maxCellReport</td>
<td>INTEGER ::= 8</td>
<td>Maximum number of reported cells</td>
</tr>
<tr>
<td>maxDRB</td>
<td>INTEGER ::= 11</td>
<td>Maximum number of Data Radio Bearers</td>
</tr>
<tr>
<td>maxEARFCN</td>
<td>INTEGER ::= 65535</td>
<td>Maximum value of EUTRA carrier frequency</td>
</tr>
</tbody>
</table>
maxFreq INTEGER ::= 8 -- Maximum number of carrier 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
maxLogMeasReport-r10 INTEGER ::= 520 -- Maximum number of logged measurement entries
-- that can be reported by the UE in one message
maxMBSPN-Allocations INTEGER ::= 8 -- Maximum number of MBSPN frame allocations with
-- different offset
maxMBSPN-Area INTEGER ::= 8
maxMBSPN-Area-1 INTEGER ::= 7
maxMeasId INTEGER ::= 32
maxObjectId INTEGER ::= 32
maxPageRec INTEGER ::= 16 --
maxPhysCellIdRange-r9 INTEGER ::= 4 -- Maximum number of physical cell identity ranges
maxPNOffset INTEGER ::= 511 -- Maximum number of CDMA2000 PNOffsets
maxPMCH-PerMBSPN INTEGER ::= 15
maxRAT-Capabilities INTEGER ::= 8 -- Maximum number of interworking RATs (incl EUTRA)
maxReportConfigId INTEGER ::= 32
maxRSTD-Freq-r10 INTEGER ::= 3 -- Maximum number of frequency layers for RSTD
-- measurement
maxSCell-r10 INTEGER ::= 4 -- Maximum number of SCells
maxServCell-r10 INTEGER ::= 5 -- Maximum number of 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
maxUTRA-FDD-Carrier INTEGER ::= 16 -- Maximum number of UTRA FDD carrier frequencies
maxUTRA-TDD-Carrier INTEGER ::= 16 -- Maximum number of UTRA TDD carrier frequencies

-- ASN1STOP

NOTE: The value of maxDRB align with SA2.

-- End of EUTRA-RRC-Definitions

-- ASN1START
END
-- ASN1STOP

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,
CarrierFreqGERAN,
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 and inter-RAT mobility related measurements.

**VarLogMeasConfig UE variable**

```
VarLogMeasConfig-r10 ::= SEQUENCE {  
  areaConfiguration-r10   AreaConfiguration-r10  OPTIONAL,  
  loggingDuration-r10    LoggingDuration-r10,  
  loggingInterval-r10    LoggingInterval-r10  }
```

The UE variable `VarLogMeasReport` includes the logged measurements information.

**VarLogMeasReport UE variable**

```
VarLogMeasReport-r10 ::= SEQUENCE {  
  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 LogMeasInfoList-r10  }
```

```
LogMeasInfoList-r10 ::= SEQUENCE (SIZE (1..maxLogMeas-r10)) OF LogMeasInfo-r10
```

-- ASN1STOP
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.

```asn1
VarMeasConfig ::= 
  SEQUENCE {
    -- Measurement identities
    measIdList       MeasIdToAddModList     OPTIONAL,
    -- Measurement objects
   _measObjectList      MeasObjectToAddModList    OPTIONAL,
    -- Reporting configurations
    reportConfigList     ReportConfigToAddModList   OPTIONAL,
    -- Other parameters
    quantityConfig      QuantityConfig      OPTIONAL,
    s-Measure       INTEGER (-140..-44)     OPTIONAL,
    speedStatePars      CHOICE {
      release        NULL,
      setup        SEQUENCE {
        mobilityStateParameters    MobilityStateParameters,
        timeToTrigger-SF     SpeedStateScaleFactors
      }                  OPTIONAL
    }
  }
```

The UE variable `VarMeasReportList` includes information about the measurements for which the triggering conditions have been met.

```asn1
VarMeasReportList ::=    SEQUENCE (SIZE (1..maxMeasId)) OF VarMeasReport
VarMeasReport ::=     SEQUENCE {
  -- List of measurement that have been triggered
  measId        MeasId,
  cellsTriggeredList     CellsTriggeredList    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
}
```

The UE variable `VarRLF-Report` includes the radio link failure information or handover failure information.

```asn1
VarRLF-Report ::=     SEQUENCE {
  -- RLF information
  physCellIdEUTRA       PhysCellId,
  physCellIdUTRA       CHOICE {
    fdd          PhysCellIdUTRA-FDD,
    tdd          PhysCellIdUTRA-TDD
  },
  physCellIdGERAN       SEQUENCE {
    carrierFreq        CarrierFreqGERAN,
    physCellId        PhysCellIdGERAN
  },
  physCellIdCDMA2000      PhysCellIdCDMA2000
}
```
VarRLF-Report-r10 ::= SEQUENCE {
    rlf-Report-r10             RLF-Report-r9,
    plmn-Identity-r10          PLMN-Identity
}
-- ASN1STOP

– VarShortMAC-Input

The UE variable VarShortMAC-Input specifies the input used to generate the shortMAC-I.

**VarShortMAC-Input UE variable**

-- ASN1START

VarShortMAC-Input ::= SEQUENCE {
    cellIdentity      CellIdentity,
    physCellId        PhysCellId,
    c-RNTI           C-RNTI
}
-- ASN1STOP

**VarShortMAC-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 the failure.</td>
</tr>
<tr>
<td>physCellId</td>
<td>Set to the physical cell identity of the PCell the UE was connected to prior to the failure.</td>
</tr>
</tbody>
</table>

– 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

7.2 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>

-- ETSI
### 7.3 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</td>
<td>Reception of RRCConnectionSetup or RRCConnectionReject message, 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>T301</td>
<td>Transmission of RRCConnectionReestablishmentRequest</td>
<td>Reception of RRCConnectionReestablishmentRequest or RRCConnectionReestablishmentReject message as well as when the selected cell becomes unsuitable</td>
<td>Go to RRC_IDLE</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</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</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 MobilityFromEUTRACommand message including CellChangeOrder</td>
<td>Criterion for successful completion of handover to EUTRA 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</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</td>
<td>Inform upper layers about barring alleviation as specified in 5.3.3.7</td>
</tr>
<tr>
<td>T310</td>
<td>Upon detecting physical layer problems 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, upon triggering the handover procedure and upon initiating the connection re-establishment procedure</td>
<td>If security is not activated: 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>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).</td>
<td>Discard the cell reselection priority information provided by dedicated signalling.</td>
</tr>
</tbody>
</table>
Timer | Start | Stop | At expiry |
--- | --- | --- | --- |
T321 | Upon receiving measConfig including a reportConfig with the purpose set to reportCGI | 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 | Initiate the measurement reporting procedure, stop performing the related measurements and remove the corresponding measId |
T330 | Upon receiving LoggedMeasurementConfiguration message | Upon log volume exceeding the suitable UE memory, upon initiating the release of LoggedMeasurementConfiguration procedure | Perform the actions specified in 5.6.6.4 |

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; indications received from lower layers</td>
</tr>
<tr>
<td>N311</td>
<td>Maximum number of consecutive &quot;in-sync&quot; indications received from lower layers</td>
</tr>
</tbody>
</table>

8 Protocol data unit abstract syntax

8.1 General

The RRC PDU contents in clause 6 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, 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 and BCCH.

Padding bits shall be set to 0 and the number of padding bits is a multiple of 8.

![Diagram of RRC level padding]

Figure 8.5-1: RRC level padding
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 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.

9.1.1.2 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 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>Normal MAC headers are used</td>
<td></td>
</tr>
<tr>
<td>Logical channel configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<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>logicalChannelSR-Mask-r9</td>
<td>release</td>
<td></td>
<td>v920</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>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.

9.1.1.4 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>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>
<td></td>
</tr>
</tbody>
</table>
9.1.2 SRB configurations

9.1.2.1 SRB1

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.1.2.2 SRB2

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>logicalChannelIdentity</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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. 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.

9.2.1 SRB configurations

9.2.1.1 SRB1

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ul-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-PollRetransmit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pollPDU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pollByte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;maxRetxThreshold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dl-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-Reordering</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-StatusProhibit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logical channel configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
</tbody>
</table>
9.2.1.2 SRB2

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLC configuration CHOICE</td>
<td>am</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ul-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-PollRetransmit</td>
<td>ms45</td>
<td>infinity</td>
<td></td>
</tr>
<tr>
<td>&gt;pollPDU</td>
<td>infinity</td>
<td>infinity</td>
<td></td>
</tr>
<tr>
<td>&gt;pollByte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;maxRetxThreshold</td>
<td>14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dl-RLC-Config</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;t-Reordering</td>
<td>ms35</td>
<td>infinity</td>
<td></td>
</tr>
<tr>
<td>&gt;t-StatusProhibit</td>
<td>ms0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Logical channel configuration

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>priority</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>prioritisedBitRate</td>
<td>infinity</td>
<td>infinity</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>
</tbody>
</table>

9.2.2 Default MAC main configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAC main configuration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>maxHARQ-tx</td>
<td>n5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>periodicBSR-Timer</td>
<td>infinity</td>
<td>infinity</td>
<td></td>
</tr>
<tr>
<td>retxBSR-Timer</td>
<td>sf2560</td>
<td></td>
<td></td>
</tr>
<tr>
<td>thBundling</td>
<td>FALSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>drx-Config</td>
<td>release</td>
<td>release</td>
<td></td>
</tr>
<tr>
<td>phr-Config</td>
<td>release</td>
<td>release</td>
<td></td>
</tr>
<tr>
<td>sr-ProhibitTimer</td>
<td>0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9.2.3 Default semi-persistent scheduling configuration

<table>
<thead>
<tr>
<th>SPS-Config</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;sps-ConfigDL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;sps-ConfigUL</td>
<td>release</td>
<td>release</td>
<td></td>
</tr>
</tbody>
</table>

9.2.4 Default physical channel configuration

Parameters

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
<th>Ver</th>
</tr>
</thead>
<tbody>
<tr>
<td>PDSCH-ConfigDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;p-a</td>
<td>dB0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUCCH-ConfigDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; tdd-AckNackFeedbackMode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;ackNackRepetition</td>
<td>bundling</td>
<td>release</td>
<td></td>
</tr>
<tr>
<td>Only valid for TDD mode</td>
<td></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>
<td></td>
<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>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UplinkPowerControlDedicated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;p0-UE-PUSCH</td>
<td>0</td>
<td>en0 (disabled)</td>
<td></td>
</tr>
<tr>
<td>&gt;deltaMCS-Enabled</td>
<td>TRUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;accumulationEnabled</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;p0-UE-PUCCH</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;pSRS-Offset</td>
<td>fc4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; filterCoefficient</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 9.2.5 Default values timers and constants

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
<th>Semantics description</th>
</tr>
</thead>
<tbody>
<tr>
<td>t310</td>
<td>ms1000</td>
<td></td>
</tr>
<tr>
<td>n310</td>
<td>n1</td>
<td></td>
</tr>
<tr>
<td>t311</td>
<td>ms1000</td>
<td></td>
</tr>
<tr>
<td>n311</td>
<td>n1</td>
<td></td>
</tr>
</tbody>
</table>

#### 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.

```asn1
-- ASN1START
EUTRA-InterNodeDefinitions DEFINITIONS AUTOMATIC TAGS ::= BEGIN IMPORTS AntennaInfoCommon, ...
```
10.2.2 Message definitions

– **HandoverCommand**

This message is used to transfer the handover command generated by the target eNB, which is transparently transferred by the source RAN to the UE.

Direction: target eNB to source eNB/ source RAN

**HandoverCommand message**

<table>
<thead>
<tr>
<th>Field Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>handoverCommandMessage</td>
</tr>
<tr>
<td>Contains the entire DL-DCCH-Message including the <em>RRCConnectionReconfiguration</em> message used to perform handover to E-UTRAN, generated (entirely) by the target eNB.</td>
</tr>
</tbody>
</table>

– **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

```
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, spare6, spare5, spare4, spare3,
        spare2, spare1, ...}    OPTIONAL,  -- Cond HO2
    nonCriticalExtension    SEQUENCE {}      OPTIONAL
}
```

---

**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.

**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 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**
E-UTRA radio access capabilities are always included and in case of inter-RAT handover to E-UTRA, UTRA radio access capabilities may be included. (If UTRA radio access capabilities are received from the source RAN, they are ignored by target eNB.) In case of inter-RAT handover to E-UTRA and the source is GERAN, GERAN capabilities are always included.

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 temporary continues extensions of this part of the configuration in a target PCell not supporting them.

<table>
<thead>
<tr>
<th>Conditional presence</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HO</strong></td>
<td>The field is mandatory present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
<tr>
<td><strong>HO2</strong></td>
<td>The field is optional present in case of handover within E-UTRA; otherwise the field is not present.</td>
</tr>
</tbody>
</table>
**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

---

**UERadioAccessCapabilityInformation message**

---

**UERadioAccessCapabilityInformation field descriptions**

Including E-UTRA, GERAN, and CDMA2000-1xRTT Bandclass radio access capabilities (separated). UTRA radio access capabilities are not included.

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.

---

**AS-Config information element**
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

- **antennaInfoCommon**
  This field provides information about the number of antenna ports in the source PCell.

- **sourceDL-CarrierFreq**
  Provides the parameter Downlink EARFCN in the source PCell, see TS 36.101 [42].

- **sourceOtherConfig**
  Provides other configuration in the source PCell.

- **sourceMasterInformationBlock**
  MasterInformationBlock transmitted in the source PCell.

- **sourceMeasConfig**
  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.

- **sourceRadioResourceConfig**
  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.

- **sourceSCellConfigList**
  Radio resource configuration (common and dedicated) of the SCells configured in the source eNB.

- **sourceSecurityAlgorithmConfig**
  This field provides the AS integrity protection (SRBs) and AS ciphering (SRBs and DRBs) algorithm configuration used in the source PCell.

- **sourceSystemInformationBlockType1**
  SystemInformationBlockType1 transmitted in the source PCell.

- **sourceSystemInformationBlockType2**
  SystemInformationBlockType2 transmitted in the source PCell.

---

**AS-Context**

The IE AS-Context is used to transfer local E-UTRAN context required by the target eNB.

**AS-Context** information element

```
--- ASN1START
AS-Context ::= SEQUENCE {
    reestablishmentInfo  ReestablishmentInfo OPTIONAL  -- Cond HO
}
--- ASN1STOP
```

**AS-Context field descriptions**

- **reestablishmentInfo**
  Including information needed for the RRC connection re-establishment.

<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>
</tbody>
</table>
The ReestablishmentInfo IE contains information needed for the RRC connection re-establishment.

**ReestablishmentInfo** information element

```
-- ASN1START
ReestablishmentInfo ::= SEQUENCE {
    sourcePhysCellId     PhysCellId,
    targetCellShortMAC-I    ShortMAC-I,
    additionalReestabInfoList   AdditionalReestabInfoList    OPTIONAL,
    ...
}
AdditionalReestabInfoList ::= SEQUENCE ( SIZE (1..maxReestabInfo) ) OF AdditionalReestabInfo
AdditionalReestabInfo ::= SEQUENCE{
    cellIdentity      CellIdentity,
    key-eNodeB-Star     Key-eNodeB-Star,
    shortMAC-I       ShortMAC-I
}
Key-eNodeB-Star ::= BIT STRING (SIZE (256))
-- ASN1STOP
```

**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]. This parameter is only used for X2 handover, and for S1 handover, it shall be ignored by target eNB.

- **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 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

```
-- 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,
        hr1min10, 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 */
}
CandidateCellInfoList-r10 ::= SEQUENCE (SIZE (1..maxFreq)) OF CandidateCellInfo-r10
CandidateCellInfo-r10 ::= SEQUENCE {
    -- cellIdentification
    physCellId-r10     PhysCellId,
    dl-CarrierFreq-r10    ARFCN-ValueEUTRA,

```
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 information elements 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 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;

<table>
<thead>
<tr>
<th>Name</th>
<th>Presence in clause 6</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>RadioResourceConfigDedicated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; srb-ToAddModList</td>
<td>OPTIONAL, -Cond HO-Conn</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; rlc-Config</td>
<td>OPTIONAL, -Cond Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; logicalChannelConfig</td>
<td>OPTIONAL, -Cond Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; ul-SpecificParameters</td>
<td>OPTIONAL, -Cond UL</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; logicalChannelGroup</td>
<td>OPTIONAL, -Need OR</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelSR-Mask-r9</td>
<td>OPTIONAL, -Cond SRmask</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;drb-ToAddModList</td>
<td>OPTIONAL, -Cond HO-toEUTRA</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; eps-BearerIdentity</td>
<td>OPTIONAL, -Cond DRB-Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; pdcp-Config</td>
<td>OPTIONAL, -Cond PDCP</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; discardTimer</td>
<td>OPTIONAL, -Cond Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; rlc-AM</td>
<td>OPTIONAL, -Cond Rlc-AM</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; rlc-UM</td>
<td>OPTIONAL, -Cond Rlc-UM</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; rlc-Config</td>
<td>OPTIONAL, -Cond Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelIdentity</td>
<td>OPTIONAL, -Cond DRB-Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelConfig</td>
<td>OPTIONAL, -Cond Setup</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; ul-SpecificParameters</td>
<td>OPTIONAL, -Cond UL</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; logicalChannelGroup</td>
<td>OPTIONAL, -Need OR</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; logicalChannelSR-Mask-r9</td>
<td>OPTIONAL, -Cond SRmask</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;mac-MainConfig</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; ul-SCH-Config</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; maxHARQ-Tx</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; periodicBSR-Timer</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; drx-Config</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; shortDRX</td>
<td>OPTIONAL, -Need OR</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; phr-Config</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;sr-ProhibitTimer</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt; sps-Config</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; sps-ConfigDL</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; sps-ConfigUL</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; p0-Persistent</td>
<td>OPTIONAL, -Need OP</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; twIntervalsConfig</td>
<td>OPTIONAL, -Cond TDD</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt; physicalConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; pdsch-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; pucch-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; tdd-AckNackFeedbackMode</td>
<td>OPTIONAL, -Cond TDD</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; pusch-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; uplinkPowerControlDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; tpc-PDCCH-ConfigPUCCH</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; tpc-PDCCH-ConfigPUSCH</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; cqi-ReportConfig</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; cqi-ReportModeAperiodic</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; cqi-ReportPeriodic</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; soundingRS-UL-ConfigDedicated</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; antennaInfo</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; codebookSubsetRestriction</td>
<td>OPTIONAL, -Cond TM</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; schedulingRequestConfig</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; cqi-ReportConfig-v920</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; cqi-Mask-r9</td>
<td>OPTIONAL, -Cond cqi-Setup</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt;&gt; pmi-RI-Report-r9</td>
<td>OPTIONAL, -Cond PMI-RI</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt;&gt; antennaInfo-v920</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; codebookSubsetRestriction-v920</td>
<td>OPTIONAL, -Cond TM8</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td>&gt; rlf-TimersAndConstants-r9</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
</tbody>
</table>

For the measurement configuration, a corresponding operation as 5.5.6.1 and 5.5.2.2a is executed by target eNB.
Within the `sourceMeasConfig` 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;

<table>
<thead>
<tr>
<th>Name</th>
<th>Presence in clause 6</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>MeasConfig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; measObjectToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt; measObject</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; measObjectEUTRA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt; blackCellsToAddModList</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt;&gt;&gt; cellForWhichToReportCGI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; measObjectUTRA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; cellForWhichToReportCGI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; csg-allowedReportingCells-v930</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt; measObjectGERAN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt; searchWindowSize</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; cellsToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt;&gt; cellForWhichToReportCGI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;&gt;&gt; reportConfigToAddModList</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
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<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
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<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
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<td></td>
<td>OPTIONAL, -Need ON</td>
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<td></td>
<td>OPTIONAL, -Need ON</td>
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<td>OPTIONAL, -Need ON</td>
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<td></td>
<td>OPTIONAL, -Need ON</td>
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<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
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<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need OP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Cond PreRegAllowed</td>
<td>- The conditional presence applies</td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
</tbody>
</table>

Within the `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;

<table>
<thead>
<tr>
<th>Name</th>
<th>Presence in clause 6</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OtherConfig</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; reportProximityConfig-r9</td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OPTIONAL, -Need ON</td>
<td></td>
</tr>
</tbody>
</table>
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>
</tr>
</thead>
<tbody>
<tr>
<td>#DRBs</td>
<td>The number of DRBs that a UE shall support</td>
<td>8</td>
</tr>
<tr>
<td>#RLC-AM</td>
<td>The number of RLC AM entities that a UE shall support</td>
<td>10</td>
</tr>
<tr>
<td>#minCellperMeasObject EUTRA</td>
<td>The minimum number of neighbour cells (excluding blacklist cells) that a UE shall be able to store within a MeasObjectEUTRA</td>
<td>32</td>
</tr>
<tr>
<td>#minBlackCellRangesp erMeasObjectEUTRA</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>
</tr>
<tr>
<td>#minCellperMeasObject UTRA</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a MeasObjectUTRA</td>
<td>32</td>
</tr>
<tr>
<td>#minCellperMeasObject GERAN</td>
<td>The minimum number of neighbour cells that a UE shall be able to store within a measObjectGERAN</td>
<td>32</td>
</tr>
<tr>
<td>#minCellperMeasObject CDMA2000</td>
<td>The minimum number of neighbour cells (excluding blacklist cells) that a UE shall be able to store in total in all measurement objects configured</td>
<td>256</td>
</tr>
</tbody>
</table>

11.2 Processing delay requirements for RRC procedures

The UE performance requirements for RRC procedures are specified in the following table, by means of a value N:

\[ N = \text{the number of } 1\text{ms subframes from the end of reception of the E-UTRAN -> UE message on the UE physical layer up to when the UE shall be ready for the reception of uplink grant for the UE -> E-UTRAN response message with no access delay other than the TTI-alignment (e.g. excluding delays caused by scheduling, the random access procedure or physical layer synchronisation).} \]

NOTE: No processing delay requirements are specified for RN-specific procedures.

![Figure 11.2-1: Illustration of RRC procedure delay](image_url)
<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><strong>RRC Connection Control Procedures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RRC connection establishment</td>
<td>RRCCConnectionSetup</td>
<td>RRCCConnectionSetupComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection release</td>
<td>RRCCConnectionRelease</td>
<td></td>
<td></td>
<td>NA</td>
</tr>
<tr>
<td>RRC connection re-configuration (radio resource configuration)</td>
<td>RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (measurement configuration)</td>
<td>RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-configuration (intra-LTE mobility)</td>
<td>RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>RRC connection re-establishment</td>
<td>RRCCConnectionReestablishment</td>
<td>RRCCConnectionReestablishmentComplete</td>
<td>15</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 re-configuration (RB establishment)</td>
<td>SecurityModeCommand, RRCCConnectionReconfiguration</td>
<td>RRCCConnectionReconfigurationComplete</td>
<td>20</td>
<td>The two DL messages are transmitted in the same TTI</td>
</tr>
<tr>
<td>Paging</td>
<td>Paging</td>
<td></td>
<td></td>
<td>NA</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 | MobilityFromEUTRACommand | | | NA |
| Handover from E-UTRA to CDMA2000 | HandoverFromEUTRAAPreparationRequest (CDMA2000) | | | NA |
| Measurement procedures | MeasurementReporting | MeasurementReport | NA | |

| **Other procedures** | | | | |
| UE capability transfer | UECapabilityEnquiry | UECapabilityInformation | 10 | |
| Counter check | CounterCheck | CounterCheckResponse | 10 | |
| Proximity indication | ProximityIndication | | | NA |
| UE information | UEInformationRequest | UEInformationResponse | 15 | |
| MBMS counting | MBMSCountingRequest | MBMSCountingResponse | NA | |
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`), 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 "-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>Conf</td>
<td>Confirmation</td>
</tr>
<tr>
<td>Config</td>
<td>Configuration</td>
</tr>
<tr>
<td>DL</td>
<td>Downlink</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>Reestab</td>
<td>Reestablishment</td>
</tr>
<tr>
<td>Req</td>
<td>Request</td>
</tr>
<tr>
<td>Sched</td>
<td>Scheduling</td>
</tr>
<tr>
<td>Thresh</td>
<td>Threshold</td>
</tr>
<tr>
<td>Transm</td>
<td>Transmission</td>
</tr>
<tr>
<td>UL</td>
<td>Uplink</td>
</tr>
</tbody>
</table>

NOTE: The table A.3.1.2-1 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.

```
-- /example/ ASN1START
LogicalChannelConfig ::=   SEQUENCE {
    ul-SpecificParameters    SEQUENCE {
        priority       Priority,
        prioritisedBitRate     PrioritisedBitRate,
        bucketSizeDuration     BucketSizeDuration,
        logicalChannelGroup     INTEGER (0..3)
    }  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.

```
-- /example/ ASN1START
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 {}
}

-- ASN1STOP
```

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.

```
-- /example/ ASN1START
RRCConnectionReconfiguration ::= SEQUENCE {
  rrc-TransactionIdentifier  RRC-TransactionIdentifier,
  criticalExtensions  CHOICE {
    c1      CHOICE {
      rrcConnectionReconfiguration-r8  RRCConnectionReconfiguration-r8-IEs,
      spare3  NULL, spare2  NULL, spare1  NULL
    },
    criticalExtensionsFuture  SEQUENCE {}
  }
}

RRCConnectionReconfiguration-r8-IEs ::= SEQUENCE {
  -- Enter the IEs here.
  ...
}

-- ASN1STOP
```

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 c1 CHOICE. Spare alternatives (i.e., spare3 down to spare1 in this case) may be included within the 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 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 c1 CHOICE and the spare alternatives may be excluded, as shown in the example below.

```asn1
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
  ...
}
```

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
RRCMessage-r8-IEs ::=      SEQUENCE {
  field1         InformationElement1,
  field2         InformationElement2,
  nonCriticalExtension     SEQUENCE {}      OPTIONAL -- Need OP
}
```

The ASN.1 section specifying the contents of a PDU type may be followed by a 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>%PDU-TypeIdentifier%</th>
<th>field descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>%field identifier%</td>
<td>Field description.</td>
</tr>
<tr>
<td>%field identifier%</td>
<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.

The following rows are used to provide field descriptions. Each row shall include a first paragraph with a field identifier (in **bold and italic** font style) referring to the part of the PDU to which it applies. The following paragraphs at the same
row may include (in regular font style), e.g., semantic description, references to other specifications and/or specification of value units, which are relevant for the particular part of the PDU.

The parts of the PDU contents that do not require a field description shall be omitted from the field description table.

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:

```
-- /example/ ASN1START
PreambleInfo ::=     SEQUENCE {
    numberOfRA-Preambles    INTEGER (1..64) DEFAULT 1,
    ...
}
-- ASN1STOP
```

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:

```
-- /example/ ASN1START
PRACH-Config ::=    SEQUENCE {
    rootSequenceIndex     INTEGER (0..1023),
    prach-ConfigInfo     PRACH-ConfigInfo OPTIONAL  -- Need ON
}
-- ASN1STOP
```

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.

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):

```
-- /example/ ASN1START
LogicalChannelConfig ::=   SEQUENCE {
    ul-SpecificParameters    SEQUENCE {
        priority       INTEGER (0),
        ...
    }  OPTIONAL                 -- Cond UL
}
-- ASN1STOP
```

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
-- /example/ ASN1START
PLMN-IdentityInfoList ::= SEQUENCE (SIZE (1..6)) OF PLMN-IdentityInfo

PLMN-IdentityInfo ::= SEQUENCE {
  plmn-Identity PLMN-Identity,
  cellReservedForOperatorUse ENUMERATED {reserved, notReserved}
}
-- ASN1STOP
```

rather than as in the following (bad) example, which may cause generated code to contain types with unpredictable names:

```asn1
-- /bad example/ ASN1START
PLMN-IdentityList ::= SEQUENCE (SIZE (1..6)) OF SEQUENCE {
  plmn-Identity PLMN-Identity,
  cellReservedForOperatorUse ENUMERATED {reserved, notReserved}
}
-- ASN1STOP
```

### 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

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:

```asn1
-- /example/ ASN1START
RRCMessage ::= SEQUENCE {
  rrc-TransactionIdentifier    RRC-TransactionIdentifier,
  criticalExtensions     CHOICE {
    c1         CHOICE {
      rrcMessage-r8      RRCMessage-r8-IEs,
      spare3 NULL, spare2 NULL, spare1 NULL
    },
    criticalExtensionsFuture   SEQUENCE {}
  }
}

-- ASN1STOP
```

```asn1
-- /example/ ASN1START
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
      }
    }
  }
}
```

---
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, 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/ of a field contained in an OCTET or BIT STRING:

- When a nonCriticalExtension is actually used, a "Need" statement is not provided for the field, which always is a group including at least one extension and a field facilitating further possible extensions.

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
    field4-r9       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,
    ...,
```
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
}

RRCMessage-v940-IEs ::= SEQUENCE {
  field6-v940 InformationElement6-r9 OPTIONAL, -- Need OR
  nonCriticalExtensions   SEQUENCE {}
}
-- 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

```asn1
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
  ]]
}
```

Some remarks regarding the extensions shown in the above example:

- The fields *childIE1-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   ChIE1-ConfigurableFeature  OPTIONAL   -- Need ON
}
```

---
ChildIE1-WithoutEM-vNx0 ::= SEQUENCE {
  chIE1-ConfigurableFeature-vNx0 ChIE1-ConfigurableFeature-vNx0 OPTIONAL -- Cond ConfigF
}

ChildIE1-ConfigurableFeature ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    -- Root encoding
  }
}

ChildIE1-ConfigurableFeature-vNx0 ::= SEQUENCE {
  chIE1-NewField-rN INTEGER (0..31)
}

--- ASN1STOP

<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

--- /example/ ASN1START

ChildIE2-WithoutEM ::= CHOICE {
  release NULL,
  setup SEQUENCE {
    -- Root encoding
  }
}

ChildIE2-WithoutEM-vNx0 ::= SEQUENCE {
  chIE2-NewField-rN INTEGER (0..31) OPTIONAL -- Cond ConfigF
}

--- ASN1STOP

<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 chIE2-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>

---

**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.

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>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>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>MBSFNAreaConfiguration</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>MeasurementReport</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Justification for case &quot;P&quot;: RAN2 agreed that measurement configuration may be sent prior to 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>RRCCConnectionReconfiguration</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCCConnectionReconfigurationComplete</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>Unprotected, if sent as response to RRCCConnectionReconfigurationComplete which was sent before security activation</td>
</tr>
<tr>
<td>RRCCConnectionReestalishment</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>This message is not protected by PDCP operation.</td>
</tr>
<tr>
<td>RRCCConnectionReestablishmentComplete</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCCConnectionReject</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.</td>
</tr>
<tr>
<td>RRCCConnectionRelease</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>RRCCConnectionRequest</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRCCConnectionSetup</td>
<td>+</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>RRCCConnectionSetupComplete</td>
<td>+</td>
<td>NA</td>
<td>NA</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>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>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></td>
</tr>
<tr>
<td>ULHandoverPreparationTransfer(CDMA2000)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>This message should follow HandoverFromEUTRAPreparationRequest</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]'.

<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>ULInformationTransfer</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>
Annex B (normative): Release 8 AS feature handling

B.1 Feature group indicators

This annex contains the definitions of the bits in field featureGroupIndicators.

In this release of the protocol, the UE shall include the field featureGroupIndicators in the IE UE-EUTRA-Capability. All the functionalities defined within the field featureGroupIndicators defined in Table B.1-1 are mandatory for the UE, if the related capability (frequency band, RAT or SR-VCC) 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, 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, as zero (0).

If the optional field featureGroupIndicators is not included by a UE of a future release, the network may assume that all features pertaining to the RATs supported by the UE, listed in Table B.1-1 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 that is capable of the "Voice domain preference for E-UTRAN" defined in TS 24.301 [35] being set to "IMS PS voice only", "IMS PS voice preferred, CS voice as secondary" or "CS voice preferred, IMS PS voice as secondary".

<table>
<thead>
<tr>
<th>Index of indicator</th>
<th>Definition</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>
</tr>
</thead>
<tbody>
<tr>
<td>(bit number)</td>
<td>(description of the supported functionality, if indicator set to one)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (leftmost bit)</td>
<td>- Intra-subframe frequency hopping for PUSCH scheduled by UL grant - DCI format 3a (TPC commands for PUCCH and PUSCH with single bit power adjustments) - PDSCH transmission mode 5 - 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</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>- 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 PUCCH: Mode 2-0 – UE selected subband CQI without PMI - Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-1 – UE selected subband CQI with single PMI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>- 5bit RLC UM SN - 7bit PDCP SN</td>
<td>- can only be set to 1 if the UE has set bit number 7 to 1.</td>
<td>Yes, if UE supports VoLTE</td>
</tr>
<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></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>
| 5 | - Long DRX cycle  
- DRX command MAC control element | Yes |
| 6 | - Prioritised bit rate | Yes |
| 7 | - RLC UM | - can only be set to 0 if the UE does not support VoLTE  
Yes, if UE supports VoLTE |
| 8 | - EUTRA RRC_CONNECTED to UTRA CELL_DCH PS handover | - can only be set to 1 if the UE has set bit number 22 to 1  
Yes, if UE supports UTRA |
| 9 | - EUTRA RRC_CONNECTED to GERAN GSM_Dedicated handover | - related to SR-VCC  
- can only be set to 1 if the UE has set bit number 23 to 1 |
| 10 | - EUTRA RRC_CONNECTED to GERAN  
(Packet_) Idle by Cell Change Order  
- EUTRA RRC_CONNECTED to GERAN  
(Packet_) Idle by Cell Change Order with NACC  
(Network Assisted Cell Change) | - related to SR-VCC  
- can only be set to 1 if the UE has set bit number 24 to 1 |
| 11 | - EUTRA RRC_CONNECTED to CDMA2000  
1xRTT CS Active handover | - related to SR-VCC  
- can only be set to 1 if the UE has set bit number 25 to 1 |
| 12 | - EUTRA RRC_CONNECTED to CDMA2000  
HRPD Active handover | - can only be set to 1 if the UE has set bit number 26 to 1 |
| 13 | - Inter-frequency handover (within FDD or TDD) | - can only be set to 1 if the UE has set bit number 25 to 1  
Yes, unless UE only supports band 13 |
| 14 | - Measurement reporting event: Event A4 – Neighbour > threshold  
- Measurement reporting event: Event A5 – Serving < threshold1 & Neighbour > threshold2 | - can only be set to 1 if the UE has set at least one of the bit number 22, 23, 24 or 26 to 1. |
| 15 | - Measurement reporting event: Event B1 – Neighbour > threshold | - can only be set to 1 if the UE has set bit number 5 to 1. |
| 16 | - non-ANR related intra-frequency periodical measurement reporting;  
- non-ANR related inter-frequency periodical measurement reporting, if the UE has set bit number 25 to 1; and  
- non-ANR related inter-RAT periodical measurement reporting for UTRAN, GERAN,  
1xRTT or HRPD, if the UE has set bit number 22, 23, 24 or 26 to 1, respectively.  
NOTE: “non-ANR related periodical measurement reporting” corresponds only to periodical trigger type with purpose set to reportStrongestCells. Event triggered periodical reporting (i.e., event trigger type with reportAmount > 1) is a mandatory functionality of event triggered reporting and therefore not the subject of this bit. | Yes |
| 17 | - Periodical measurement reporting for SON / ANR  
- ANR related intra-frequency measurement reporting events | - can only be set to 1 if the UE has set bit number 5 to 1. |
| 18 | - ANR related inter-frequency measurement reporting events | - can only be set to 1 if the UE has set bit number 5 to 1.  
Yes, unless UE only supports band 13 |
| 19 | - ANR related inter-RAT measurement reporting events | - can only be set to 1 if the UE has set bit number 5 to 1. |
| 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 | - 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  
Yes |
| 21 | - Predefined intra- and inter-subframe frequency hopping for PUSCH with $N_{sb} > 1$
|    | - Predefined inter-subframe frequency hopping for PUSCH with $N_{sb} > 1$
| 22 | - UTRAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode
| 23 | - GERAN measurements, reporting and measurement reporting event B2 in E-UTRA connected mode
| 24 | - 1xRTT measurements, reporting and measurement reporting event B2 in E-UTRA connected mode
| 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.
| 26 | - HRPD measurements, reporting and measurement reporting event B2 in E-UTRA connected mode
| 27 | - EUTRA RRC_CONNECTED to UTRA CELL_DCH CS handover
|    | - related to SR-VCC
|    | - can only be set to 1 if the UE has set bit number 8 to 1
| 28 | - TTI bundling
| 29 | - Semi-Persistent Scheduling
| 30 | - Handover between FDD and TDD
|    | - can only be set to 1 if the UE has set bit number 13 to 1
| 31 | Undefined
| 32 | Undefined

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 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 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</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 for PS handover</td>
<td>Group 8 (PS handover) or Group 27 (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 featureGroupIndicators-v1020.

In this release of the protocol, the UE shall include the field featureGroupIndicators-v1020 in the IE UE-EUTRA-Capability-v1020-IEs. All the functionalities defined within the field featureGroupIndicators-v1020 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 featureGroupIndicators-v1020 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 featureGroupIndicators-v1020.

<table>
<thead>
<tr>
<th>Index of indicator</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>
</tr>
</thead>
<tbody>
<tr>
<td>101 (leftmost bit)</td>
<td>- DMRS with OCC (orthogonal cover code) and SGH (sequence group hopping) disabling</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>NOTE: if the UE supports two or more layers for spatial multiplexing in UL, this bit shall be set to 1.</td>
<td></td>
<td></td>
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<tr>
<td>102</td>
<td>- Trigger type 1 SRS (aperiodic SRS) transmission (Up to X ports)</td>
<td></td>
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<td></td>
<td>NOTE: X = number of supported layers on given band</td>
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<td></td>
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<tr>
<td>103</td>
<td>- PDSCH transmission mode 9 when up to 4 CSI reference signal ports are configured</td>
<td></td>
<td>- for Category 8 UEs, this bit shall be set to 1.</td>
</tr>
<tr>
<td>104</td>
<td>- PDSCH transmission mode 9 for TDD when 8 CSI reference signal ports are configured</td>
<td></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. - for Category 8 UEs, this bit shall be set to 1.</td>
</tr>
<tr>
<td>105</td>
<td>- Periodic CQI/PMI/RI reporting on PUCCH: Mode 2-0 – UE selected subband CQI without PMI, when PDSCH transmission mode 9 is configured</td>
<td></td>
<td>- this bit can be set to 1 only if indices 2 (Table B.1-1) and 103 are set to 1.</td>
</tr>
<tr>
<td></td>
<td>- 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</td>
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<td>---</td>
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<td></td>
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</tbody>
</table>
| 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 \textit{tm9-8Tx-FDD-r10} is set to 'supported')** and if index 2 (Table B.1-1) is set to 1. |
| 107 | - Aperiodic CQI/PMI/RI reporting on PUSCH: Mode 2-0 – UE selected subband CQI without PMI, when PDSCH transmission mode 9 is configured  
- **this bit can be set to 1 only if indices 1 (Table B.1-1) and 103 are set to 1.** |
| 108 | - 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 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 \textit{tm9-8Tx-FDD-r10} is set to 'supported')** and if index 1 (Table B.1-1) is set to 1. |
| 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 \textit{tm9-8Tx-FDD-r10} is set to 'supported').** |
| 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 \textit{tm9-8Tx-FDD-r10} is set to 'supported').** |
| 111 | - Measurement reporting trigger Event A6  
- **this bit can be set to 1 only if the UE supports carrier aggregation.** |
| 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.** |
| 113 | - Trigger type 0 SRS (periodic SRS) transmission on X Serving Cells  
\textbf{NOTE: X = number of supported component carriers in a given band combination}  
- **this bit can be set to 1 only if the UE supports carrier aggregation in UL.** |
| 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.** |
| 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  
- **this bit can be set to 1 only if the UE supports two or more layers for spatial multiplexing in UL** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>multiplexing in UL.</th>
</tr>
</thead>
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Annex D (informative):
Change history
3GPP TS 36.331 version 10.2.0 Release 10

290

ETSI TS 136 331 V10.2.0 (2011-07)

Change history
Date
12/2007
03/2008
03/2008
05/2008
09/2008
12/2008
03/2009

TSG #
RP-38
RP-39
RP-39
RP-40
RP-41
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TSG Doc.
RP-070920
RP-080163
RP-080164
RP-080361
RP-080693
RP-081021
RP-090131
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RP-43

RP-090131 0066

Rev Subject/Comment
Approved at TSG-RAN #38 and placed under Change Control
4
CR to 36.331 with Miscellaneous corrections
2
CR to 36.331 to convert RRC to agreed ASN.1 format
1
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
1
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
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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
1
Configuration of the Two-Intervals-SPS
Corrections on Scaling Factor Values of Qhyst
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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
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Corrections on s-Measure
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R1 of CR0023 (R2-091029) on combination of SPS and TTI
bundling for TDD
L3 filtering for path loss measurements
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S-measure handling for reportCGI
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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
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CR to 36.331 - Clarification on Configured PRACH Freq Offset
Clarification on TTI bundling configuration
1
Update of R2-091039 on Inter-RAT UE Capability
Feature Group Support Indicators
Corrections to RLF detection
Indication of Dedicated Priority
2
Security Clean up
Correction of TTT value range
Correction on CDMA measurement result IE
1
Clarification of Measurement Reporting
Spare values in DL and UL Bandwidth in MIB and SIB2
1
Clarifications to System Information Block Type 8
Reception of ETWS secondary notification
1
Validity time for ETWS message Id and Sequence No
CR for Timers and constants values used during handover to EUTRA
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
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Inter-Node AS Signalling
Set of values for the parameter "messagePowerOffsetGroupB"
CR to paging reception for ETWS capable UEs in
RRC_CONNECTED
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CR for CSG related items in 36.331
1
SRS common configuration
RRC processing delay
CR for HNB Name
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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

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UTRAN 3GPP TS 36.331 CR on Clarification on cell change order from GERAN to E-
Restricting the reconfiguration of UM RLC SN field size
Correction of UE measurement model
Security clarification
Minor corrections to the feature grouping
Octet alignment of VarShortMAC-Input
Sending of GERAN SI/PSI information at Inter-RAT Handover
GERAN (measObject)
Corrections regarding use of carrierFreq for CDMA (SIB8) and TDD HARQ-ACK feedback mode
Correction to presence condition for pdcp-config
Corrections to DRB modification
UE radio capability transfer
36.331 CR related to "not applicable"
Corrections to IE dataCodingScheme in SIB11
Periodic measurements
Further ASN.1 review related issues
Correction regarding Redirection Information fo GERAN review
Miscellaneous corrections and clarifications resulting from ASN.1 parameter, nB
Proposed CR to 36.331 Description alignment for paging reselection
Draft CR to 36.331 on Inheriting of dedicated priorities at inter-RAT reselection
Proposed CR to 36.331 Description alignment for paging parameter, nB
Miscellaneous corrections and clarifications resulting from ASN.1 review
Correction regarding Direction Information to GERAN
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Periodic measurements
Further analysis on code point "OFF" for ri-ConfigIndex
Adding and deleting same measurement or configuration in one message
Corrections to IE dataCodingScheme in SIB11
Clarification on Mobility from E-UTRA
36.331 CR related to "not applicable"
UE radio capability transfer
CR to 36.331 on value of CDMA band classes
Corrections to DRB modification
Corrections to presence condition for pdcp-config
TDD HARQ-ACK feedback mode
Corrections regarding use of carrierFreq for CDMA (SIB8) and GERAN (measObject)
Sending of GERAN SI/PSI information at Inter-RAT Handover
Clarification of CSG support
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<th>8.5.0</th>
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| RP-51 | 110272 | 0640 | 1 Small corrections to ETWS &amp; CMAS system information | 10.0.0 | 10.1.0 |
| RP-51 | 110290 | 0641 | 1 UE capability signalling structure w.r.t carrier aggregation, MIMO and measurement gap | 10.0.0 | 10.1.0 |
| RP-51 | 110289 | 0642 | 1 Normal PHR and the multiple uplink carriers | 10.0.0 | 10.1.0 |
| RP-51 | 110280 | 0643 | 1 Corrections to TS36.331 on SIB2 handling | 10.0.0 | 10.1.0 |
| RP-51 | 110280 | 0644 | 1 Adding a Power Management indication in PHR | 10.0.0 | 10.1.0 |
| RP-51 | 110289 | 0646 | 1 Clarification for CA and TTI bundling in RRC | 10.0.0 | 10.1.0 |
| RP-51 | 110443 | 0648 | 1 Updates to FGI settings | 10.0.0 | 10.1.0 |</p>
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