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Contents

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:

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where:

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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.

The present document is part 3 of a multi-part deliverable covering the 5G System (5GS) User Equipment (UE) protocol conformance specification, as identified below:

- 3GPP TS 38.523-1 [8]: "5GS; User Equipment (UE) conformance specification; Part 1: Protocol".
- 3GPP TS 38.523-2 [9]: "5GS; User Equipment (UE) conformance specification; Part 2: Applicability of protocol test cases".
- **3GPP TS 38.523-3: "5GS; User Equipment (UE) conformance specification; Part 3: Protocol Test Suites"** (the present document).

1 Scope

The present document specifies the protocol and signalling conformance testing in TTCN-3 for the 3GPP UE connecting to the 5G System (5GS) via its radio interface(s).

The following TTCN test specification and design considerations can be found in the present document:

- the test system architecture;
- the overall test suite structure;
- the test models and ASP definitions;
- the test methods and usage of communication ports definitions;
- the test configurations;
- the design principles and assumptions;
- TTCN styles and conventions;
- the partial PIXIT proforma;
- the test suites.

The Test Suites designed in the document are based on the test cases specified in prose in 3GPP TS 38.523-1 [8]. The applicability of the individual test cases is specified in 3GPP TS 38.523-2 [9].

The present document is valid for TTCN development for 5GS UE conformance test according to 3GPP Releases starting from Release 15 up to the Release indicated on the cover page of the present document.

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".

[2] ISO/IEC 9646-1: "Information technology - Open Systems Interconnection - Conformance testing methodology and framework - Part 1: General concepts".

[3] ISO/IEC 9646-7: "Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 7: Implementation Conformance Statements".

[4] ETSI ES 201 873: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3".

[5] 3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment".

[6] 3GPP TS 38.508-2: "5GS; User Equipment (UE) conformance specification; Part 2: Common Implementation Conformance Statement (ICS) proforma".

[7] 3GPP TS 38.509: "5GS; Special conformance testing functions for User Equipment (UE)".

[8] 3GPP TS 38.523-1: "5GS; User Equipment (UE) conformance specification; Part 1: Protocol".

[9] 3GPP TS 38.523-2: "5GS; User Equipment (UE) conformance specification; Part 2: Applicability of protocol test cases".

[10] 3GPP TS 36.508: "Common test environments for User Equipment (UE) conformance testing".

[11] 3GPP TS 36.509: "Terminal logical test interface; Special conformance testing functions".

[12] 3GPP TS 36.523-3: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 3: Test suites".

[13] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[14] 3GPP TS 38.322: "NR; Radio Link Control (RLC) protocol specification".

[15] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[16] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[17] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[18] 3GPP TS 24.301: "Non-Access-Stratum (NAS) Protocol for Evolved Packet System (EPS); Stage 3".

[19] 3GPP TS 38.211: "NR; Physical channels and modulation".

[20] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[21] 3GPP TS 38.213: " NR; Physical layer procedures for control"

[22] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[23] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation".

[24] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state".

[25] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[26] 3GPP TS 24.501: "Non-Access-Stratum (NAS) Protocol for 5G System (5GS); Stage 3".

[27] RFC 5448: "Improved Extensible Authentication Protocol Method for 3rd Generation Authentication and Key Agreement (EAP-AKA')"

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP 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 3GPP TR 21.905 [1].

In addition for the purposes of the present document, the following terms, definitions, symbols and abbreviations apply:

- such given in ISO/IEC 9646-1 [2] and ISO/IEC 9646-7 [3]

NOTE: Some terms and abbreviations defined in [2] and [3] are explicitly included below with small modification to reflect the terminology used in 3GPP.

Implementation eXtra Information for Testing (IXIT): A statement made by a supplier or implementer of an UEUT which contains or references all of the information (in addition to that given in the ICS) related to the UEUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the UEUT.

IXIT proforma: A document, in the form of a questionnaire, which when completed for an UEUT becomes an IXIT.

Protocol Implementation Conformance Statement (PICS): An ICS for an implementation or system claimed to conform to a given protocol specification.

Protocol Implementation eXtra Information for Testing (PIXIT): An IXIT related to testing for conformance to a given protocol specification.

3.2 Symbols

No specific symbols have been identified so far.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP 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 3GPP TR 21.905 [1].

5GC	5G Core Network
ASP	Abstract Service Primitive
ATS	Abstract Test Suite
CA	Carrier Aggregation
CBRA	Contention Based Random Access
CCE	Control Channel Element
CFRA	Contention Free Random Access
CORESET	Control Resource Set
DCI	Downlink Control Information
DL	Downlink
DL-SCH	Downlink Shared Channel
DMRS	Demodulation Reference Signal
EN-DC	E-UTRA-NR Dual Connectivity
EPC	Evolved Packet Core
FR1	Frequency Range 1
FR2	Frequency Range 2
HO	Handover
ICS	Implementation Conformance Statement
IUT	Implementation Under Test
IXIT	Implementation eXtra Information for Testing
LSB	Least Significant Bit
MCG	Master Cell Group
MN	Master Node
MSB	Most Significant Bit
NR	NR Radio Access
PDCCH	Physical Downlink Control Channel
PDSCH	Physical Downlink Shared Channel
PRACH	Physical Random Access Channel
PRB	Physical Resource Block
PSCell	Primary SCG Cell
PSS	Primary Synchronisation Signal
PUCCH	Physical Uplink Control Channel
PUSCH	Physical Uplink Shared Channel
RA	Random Access
RACH	Random Access Channel
RAR	Random Access Response
RAT	Radio Access Technology
RMSI	Remaining Minimum SI
SCG	Secondary Cell Group
SN	Secondary Node
SRS	Sounding Reference Signal
SS	System Simulator

SSB	Synchronization Signal and PBCH block
SSS	Secondary Synchronisation Signal
TC	Test Case
UL	Uplink
UL-SCH	Uplink Shared Channel
UT	Upper Tester

4 Test system architecture

4.1 General system architecture

The architecture specified in TS 36.523-3 [12] subclause 4.1.1 applies to the present document.

4.2 Component architecture

The architecture specified in TS 36.523-3 [12] subclause 4.1.2 applies to the present document, with NR RAT as another separate TTCN-3 parallel component.

5 Test models

5.1 EN-DC

5.1.1 Layer 3

5.1.1.1 Single NR carrier

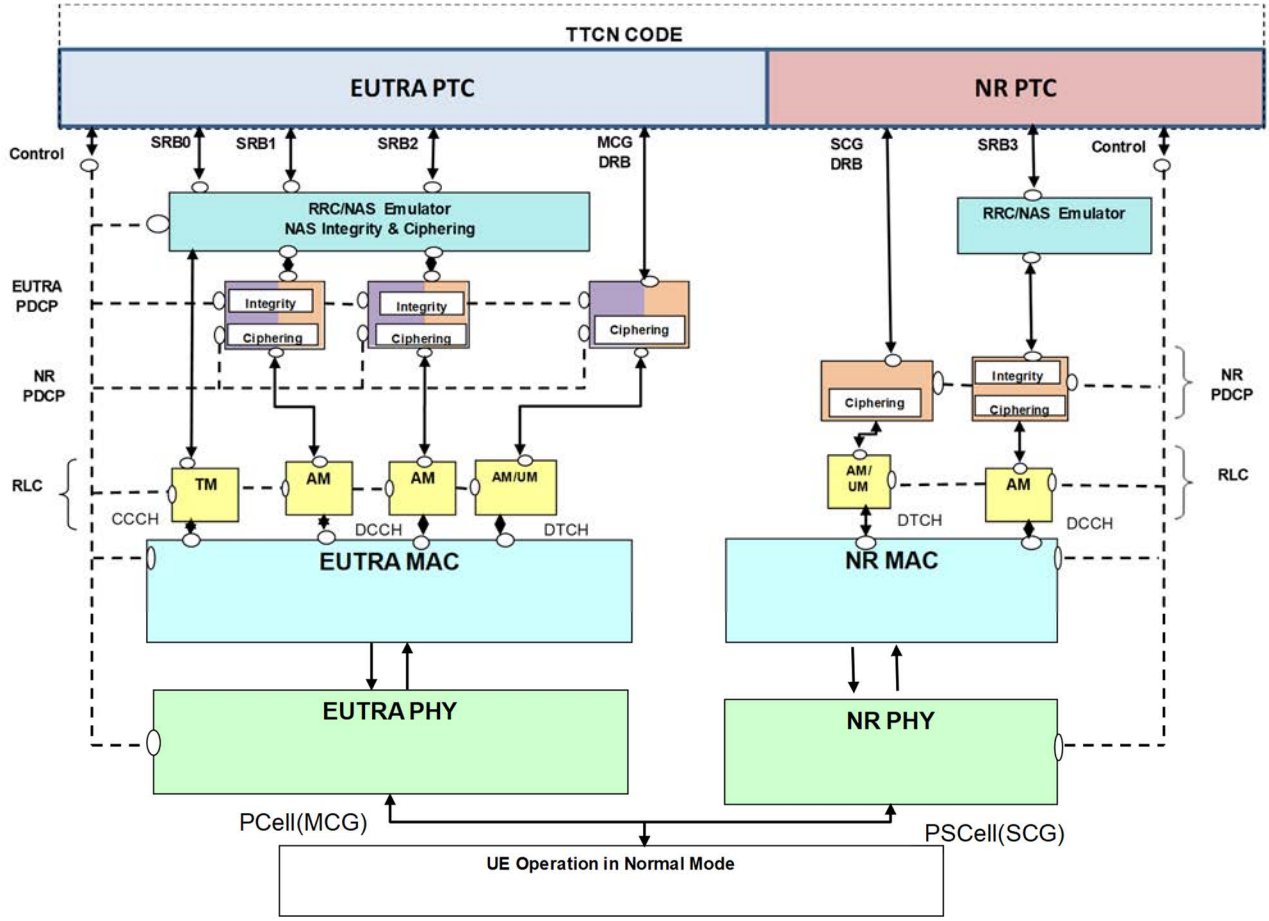


Figure 5.1.1.1-1: Test model for EN-DC Layer3 testing (*MCG and SCG*)

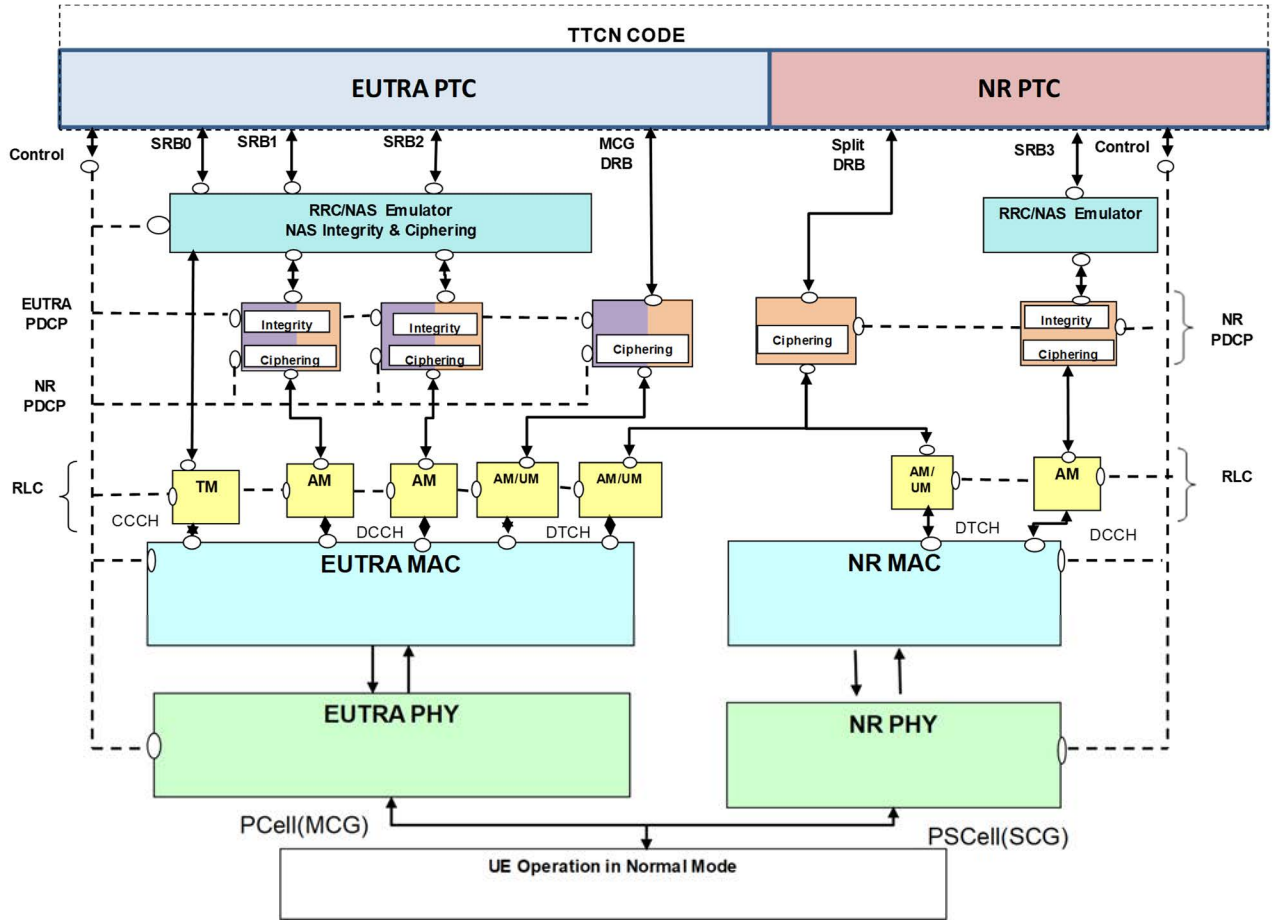


Figure 5.1.1.1-2: Test model for EN-DC Layer3 testing (*MCG and split DRB*)

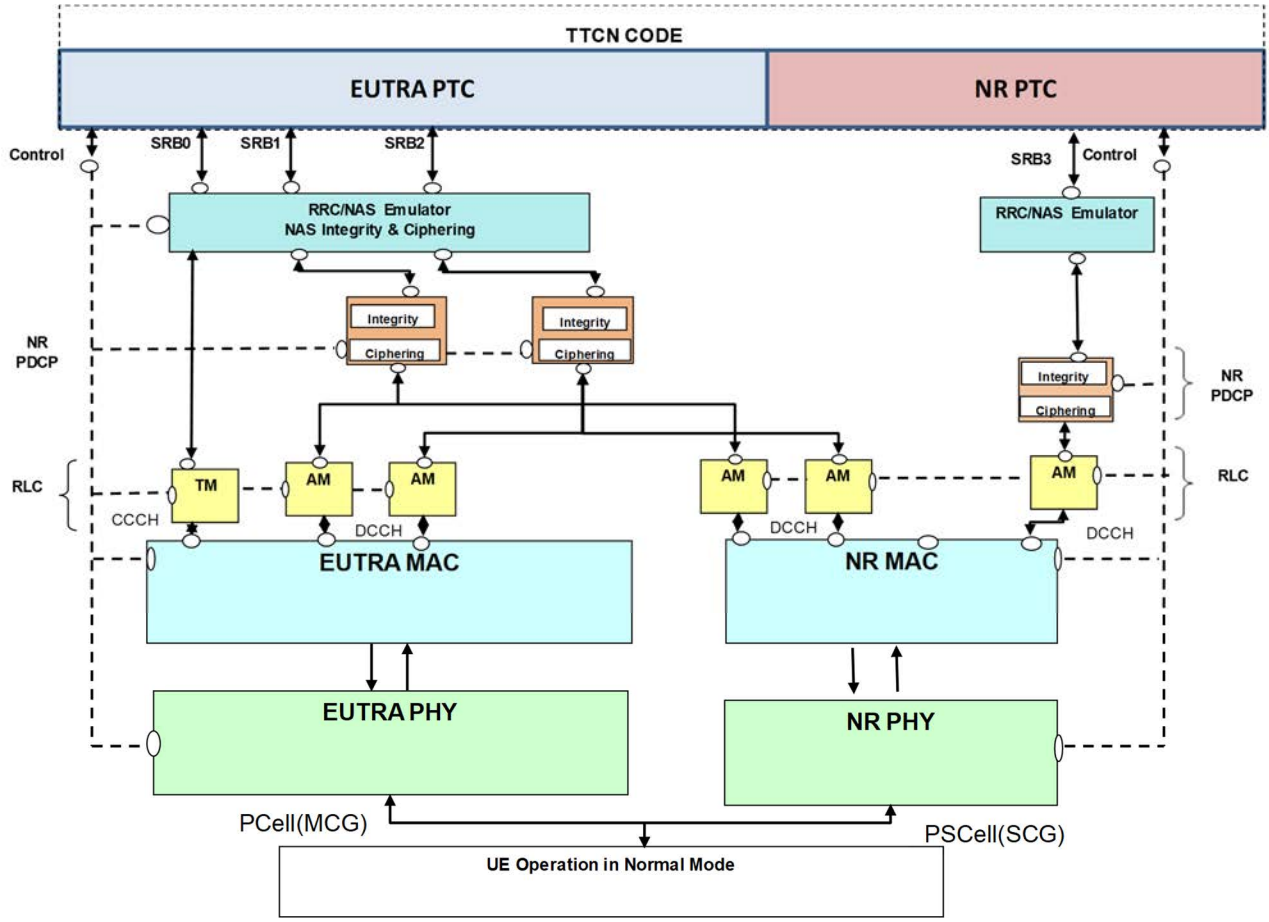


Figure 5.1.1.1-3: Test model for EN-DC Layer3 testing (*Split SRB(s)*, DRBs removed for clarity)

The UE is configured in normal mode. On the UE side Ciphering and Integrity (PDCP and NAS) are enabled and ROHC is not configured.

On the SS Side L1, MAC and RLC (EUTRA/NR) and PDCP (EUTRA/NR) are configured in normal way and shall perform all their functions. SRB0, 1 & 2 are configured only in EUTRA. For SRB0 the DL and UL port is above RLC. For SRB1 and SRB2 the port is above/below the EUTRA RRC and NAS emulator, which is implemented as a parallel test component. For DRB, the port is above PDCP. PDCP Ciphering/Integrity is enabled. NAS integrity/Ciphering is enabled.

NOTE: PDCP (EUTRA/NR) is always configured in the EUTRA PTC for SRB1 & 2.

The EUTRA RRC/NAS emulator for SRB1 and SRB2 shall provide the Ciphering and Integrity functionality for the EPS NAS messages. In UL direction, SS shall report RRC messages, still containing (where appropriate) the secure and encoded NAS message, to the RRC port. In DL, RRC and NAS messages with same timing information shall be embedded in one PDU after integrity and ciphering for NAS messages.

SRB3 is connected directly to the SRB port in the NR PTC/dummy NR RRC/NAS emulator.

The NR PDCP can be configured in either the EUTRA or NR PTC for one or more SRBs or DRBs. If NR PDCP is configured, the bearer can be split. In this case the PDCP will be fully configured on the cell upon which the bearer is terminated and the other PTC will be configured with a proxy PDCP. Data shall be sent/received only on the PTC upon which the bearer is terminated. The SS shall route data to/from either cell, via the routing information provided.

5.1.1.2 NR carrier aggregation

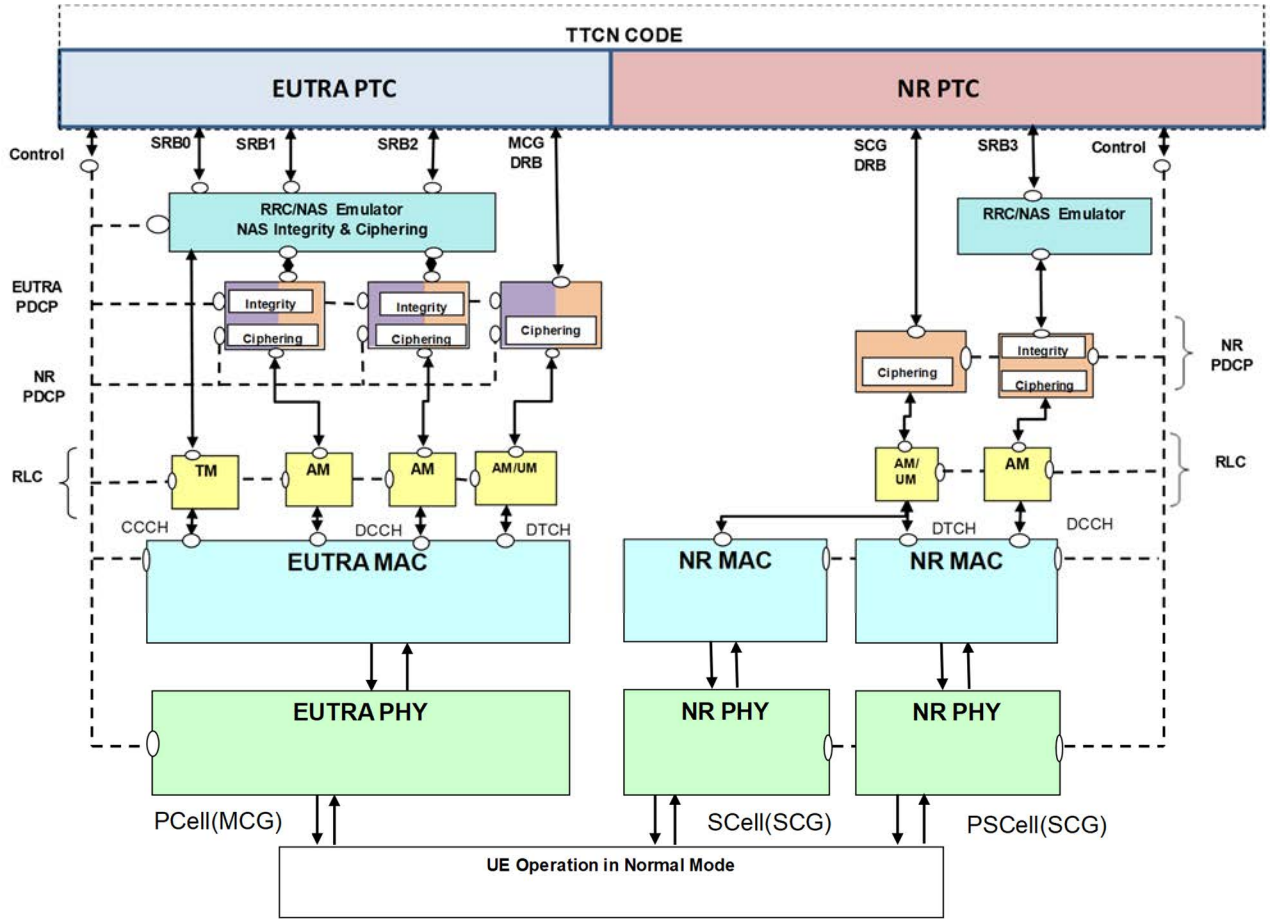


Figure 5.1.1.2-1: Test model for EN-DC Layer3 CA testing

The EN-DC Layer3 CA test model builds on top of the EN-DC Layer3 test model, with the differences specified hereafter.

On the SS NR side, in the SCG there is one PSCell and one SCell configured:

- PSCell: The associated SCell is linked to this PSCell,to enable the connection of the SCell MAC layer to the PSCell RLC/PDCP layers for DCCH/DTCH.

- SCell: Only PHY and MAC layers are configured, and MIB is broadcast.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception in PSCell over system indication port, if configured. In a similar way the reception of PRACH preambles in PSCell / SCell is reported by SS over the same port, if configured.

5.1.2 Layer 2

5.1.2.1 PDCP

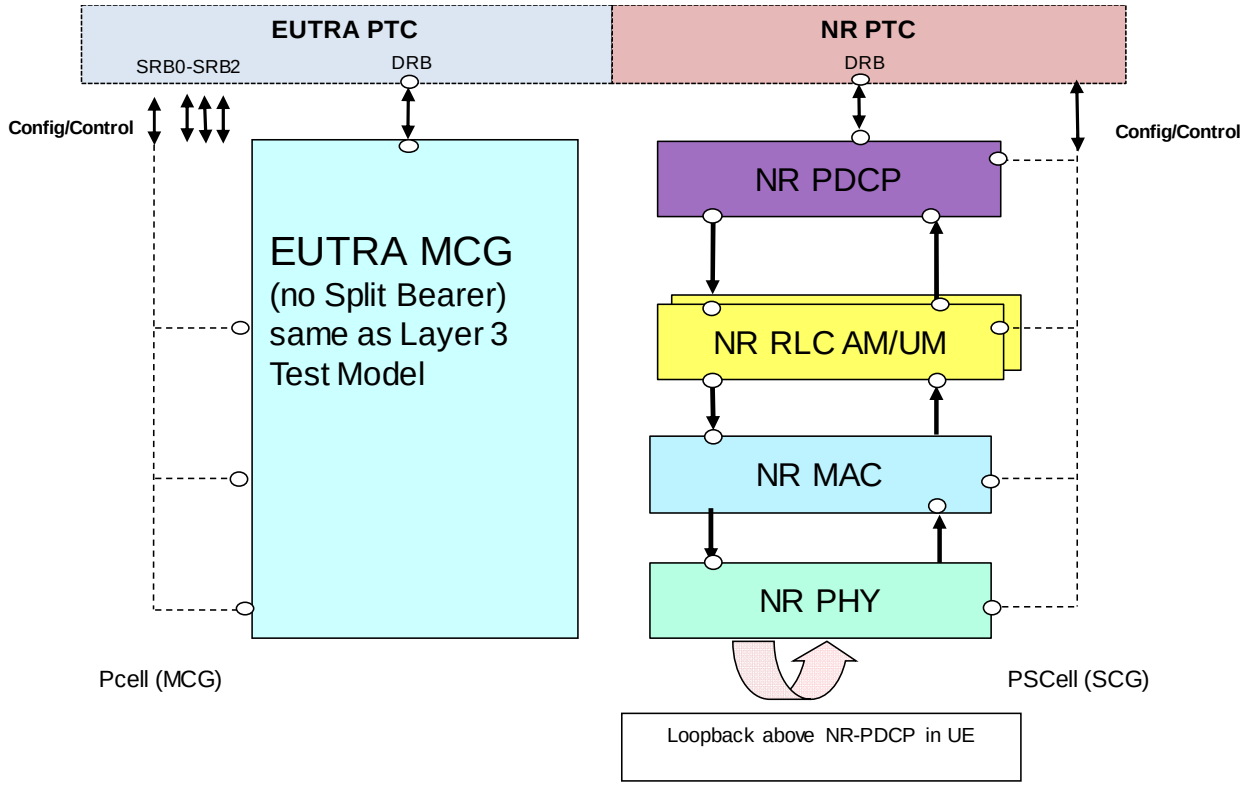


Figure 5.1.2.1-1: Test model for EN-DC PDCP testing (*MN terminated MCG DRB and SN terminated SCG DRB*)

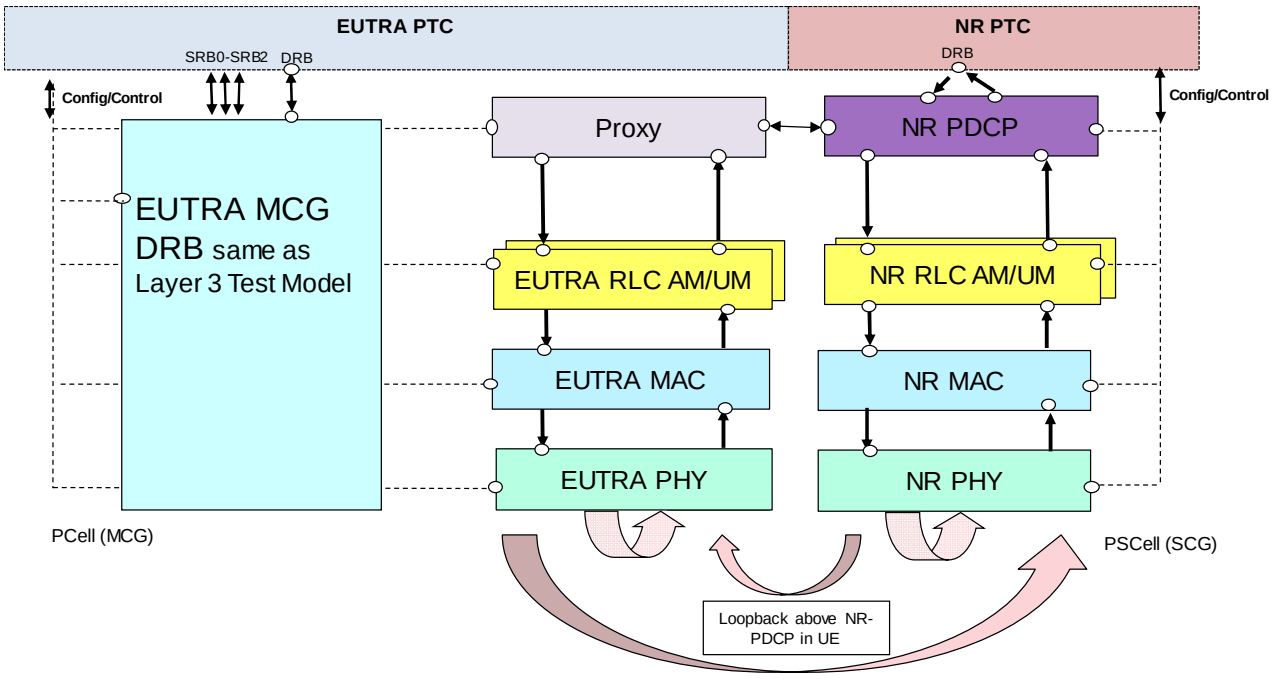


Figure 5.1.2.1-2: Test model for EN-DC PDCP testing (*MCG DRB and split DRB*)

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled as null algorithm and ROHC is not configured.

Test Loop Mode can be active on SCG DRB as shown in Figure 5.1.2.1-1 or active split DRB as shown in Figure 5.1.2.1-2.

NOTE: Test loop Mode activation on MCG DRB with NR-PDCP is not considered in Figure 5.1.2.1-2.

On the SS NR, Layer 1, MAC and RLC are configured in the normal operation. The PDCP is configured in a special mode, where SS does not add any PCDP headers in DL and/or not remove any PDCP headers in UL directions respectively at DRB port on the NR PTC. The TTCN maintains sequence numbers and state variables for the PDCP layer.

On the SS Side the EUTRA MCG layer 1, MAC, RLC is configured in normal operation. They shall perform their functions. In case of split DRB, PDCP layer is configured as Proxy mode, TTCN shall configure EUTRA for EN-DC PDCP testing only when a Test Loop Mode is active on a split DRB.

The SS shall route DL PDCP PDUs from TTCN to PCell and/or PSCell and SS shall indicate that the UL PDCP PDU is received from PCell or PSCell.

Duplication function:

- DL is FFS.
- UL SS shall include routing information for each UL PDCP PDU.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception over system indication port, if configured.

5.1.2.2 RLC

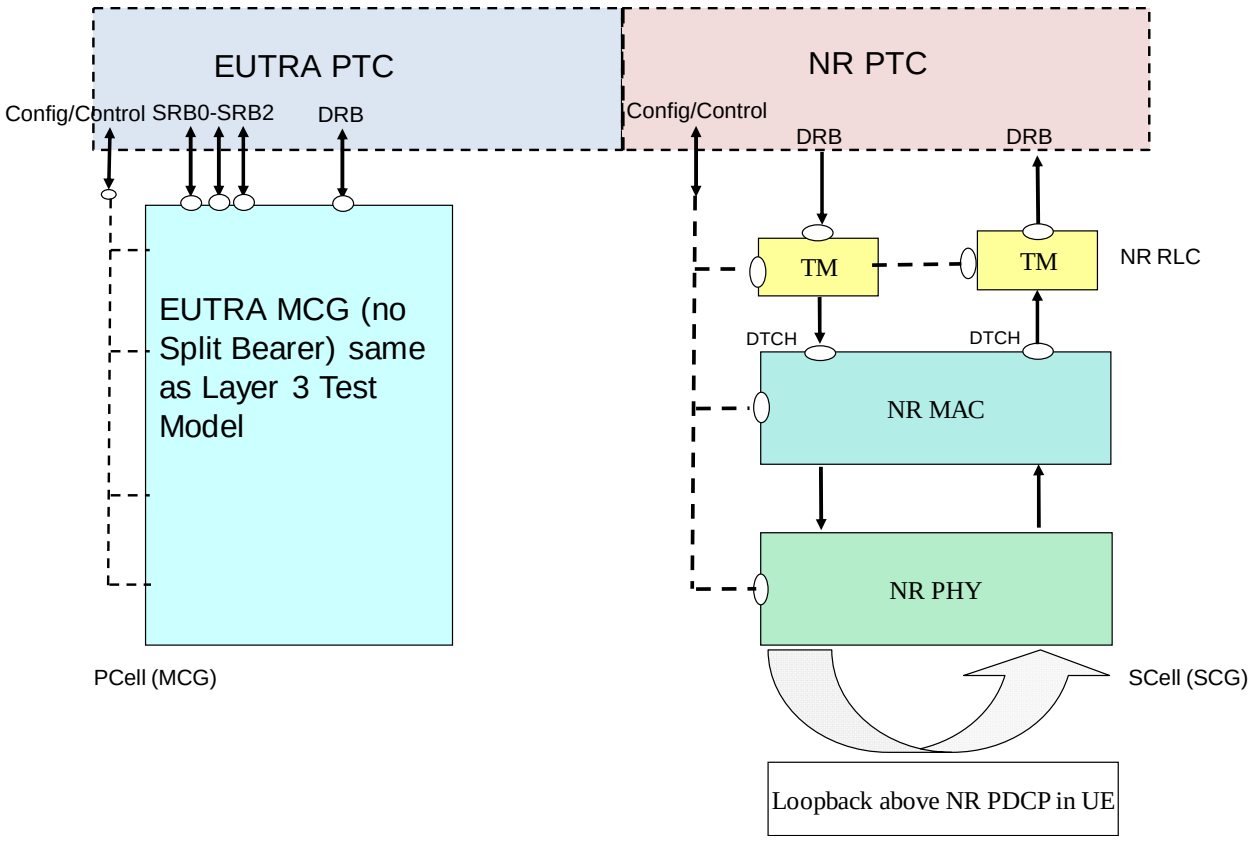


Figure 5.1.2.2-1: Test model for EN-DC RLC AM/UM testing

The PCell is an EUTRA Cell and PSCell is an NR cell on which testing happens. The UE is registered in EUTRA, using SRBs 0-2, and configured for EN-DC operation.

This model is suitable for testing both UM/AM mode of operation of DRBs on UE side.

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled (since mandatory) but with dummy ciphering algorithm, which is equivalent to not using ciphering. ROHC is not configured on UE Side.

On the SS Side, L1 and MAC are configured in the normal way. The RLC of the SCG DRBs is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no PDCP configured on SS NR PTC side. The ports are directly above RLC.

The PDUs, exchanged between TTCN and SS, shall be the final RLC PDUs consisting of RLC and PDCP headers. TTCN code shall take care in DL of building RLC headers and PDCP headers and in UL handle RLC and PDCP headers. TTCN code shall take care of maintaining sequence numbers and state variables for RLC and PDCP layers. If RLC on UE side is in AM mode, TTCN shall take care of generating polls in DL and responding with RLC control PDUs on reception of UL Poll.

5.1.2.3 MAC

5.1.2.3.1 Single NR carrier

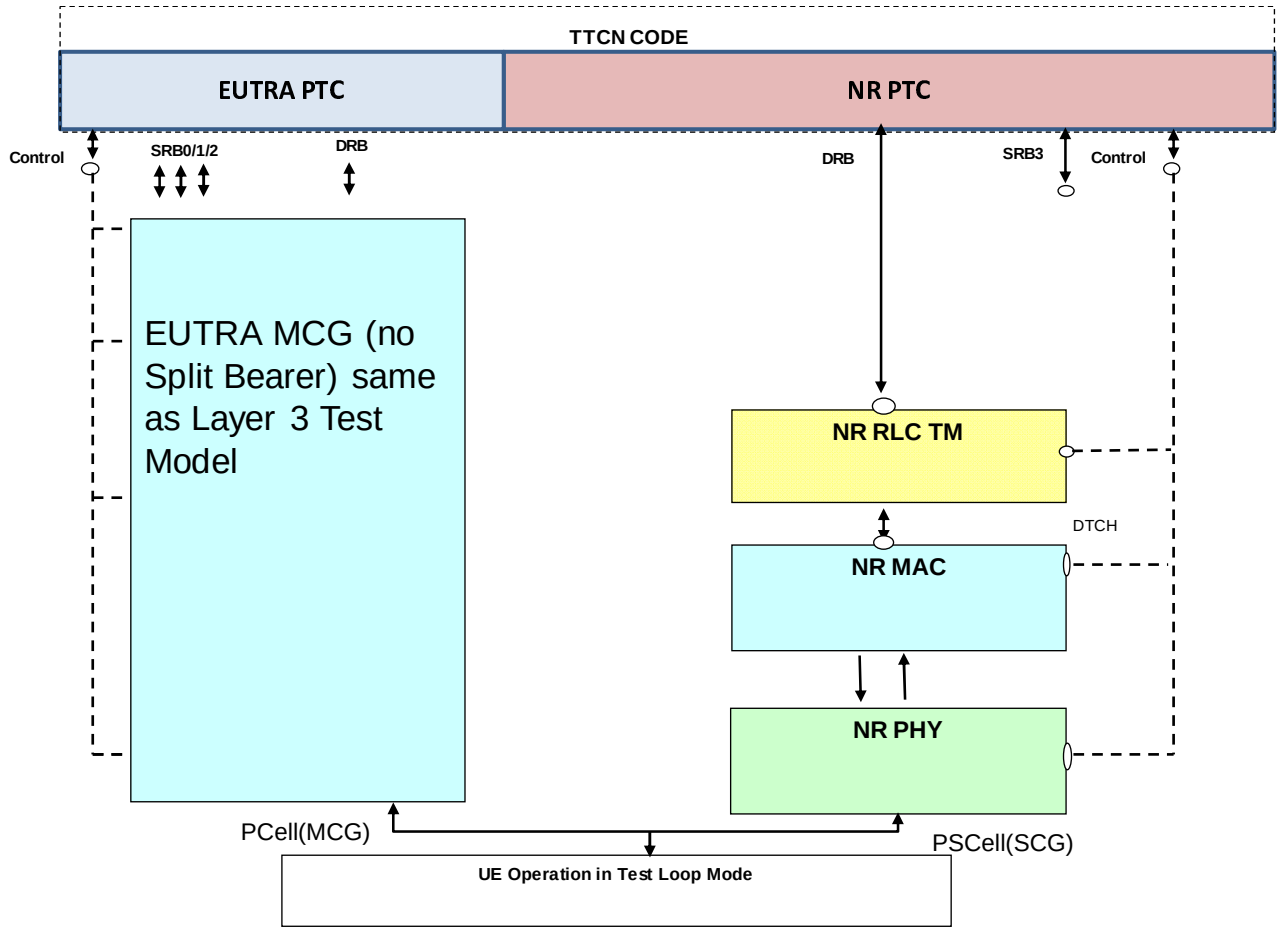


Figure 5.1.2.3.1-1: Test model for EN-DC MAC testing

The UE is configured in Test Loop Mode, to loop back the User Plane data above PDCP layer. On UE side Ciphering is enabled (since Mandatory) but with dummy ciphering algorithm, which is equivalent to not using ciphering. ROHC is not configured on UE Side.

On the SS Side the EUTRA MCG is configured as per the EN-DC Layer 3 test model in normal operation. The EN-DC MAC test model expects no split bearers to be configured.

On the SS NR, Layer 1 is configured in the normal way. NR MAC is configured in a special mode, where it does not add any MAC headers in DL and /or not remove any MAC headers in UL directions respectively at DRB port. In this case, the TTCN shall provide the final MAC PDU, including padding. Except for this, the NR MAC layer shall perform all its other functions. SRB3 if present is configured as in Layer 3 test model in normal operation.

On DRBs the NR RLC is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no NR PDCP configured on SS Side. The ports are directly above NR RLC.

There are two different test modes in which NR MAC header addition/removal can be configured:

1. DL/UL header-transparent mode: no header addition in DL and no header removal in UL.

2. DL only header-transparent mode: no header addition in DL; UL NR MAC is configured in normal mode to remove MAC header and de-multiplex the MAC SDUs according to the logical channel Ids.

If SS NR MAC is configured in DL/UL header-transparent mode, the PDUs, exchanged at the DRB port between TTCN and SS, shall be the final MAC PDUs consisting of MAC, RLC and PDCP headers. TTCN code shall take care in DL of building MAC header, RLC headers and PDCP headers and in UL handle MAC, RLC and PDCP headers. TTCN code shall take care of maintaining sequence numbers and state variables for RLC and PDCP layers. During testing of multiple DRBs at the UE side, it shall still be possible to configure only one DRB on SS side with configuration in the figure 5.1.2.3-1. Other DRBs will not be configured, to facilitate routing of UL MAC PDUs. Multiplexing/de-multiplexing of PDUs meant/from different DRBs shall be performed in TTCN. Since the MAC layer does not evaluate the MAC headers in UL it cannot distinguish between SRB and DRB data in UL. There shall be no SRB3 traffic while MAC is configured in this test mode. The SS MAC shall take care of automatic repetitions/retransmission in UL and DL, based on normal MAC HARQ behaviour.

If SS NR MAC is configured in DL only header-transparent mode, the UL PDUs exchanged at the DRB port between TTCN and SS shall be final RLC PDUs consisting of RLC and PDCP headers. SS shall route these PDUs based on logical channel IDs. In DL, TTCN sends fully encoded MAC PDUs at the DRB port (consisting of MAC, RLC and PDCP headers). In this case TTCN needs to take care of maintaining sequence numbers and state variables for RLC and PDCP layers. Furthermore, in UL and DL the SS MAC layer shall be capable of dealing with SRB3 data (i.e. it shall handle DL RLC PDUs coming from SRB3 RLC layer or de-multiplex UL RLC PDUs to SRB3) as in normal mode. The SS MAC shall take care of automatic repetitions/retransmissions in UL and DL, based on normal MAC HARQ behaviour. TTCN shall ensure that no DL MAC SDUs in normal mode and DL MAC PDUs in test mode are mixed for the same TTI.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception over system indication port, if configured. In a similar way the reception of PRACH preambles is reported by SS over the same port.

5.1.2.3.2 NR carrier aggregation

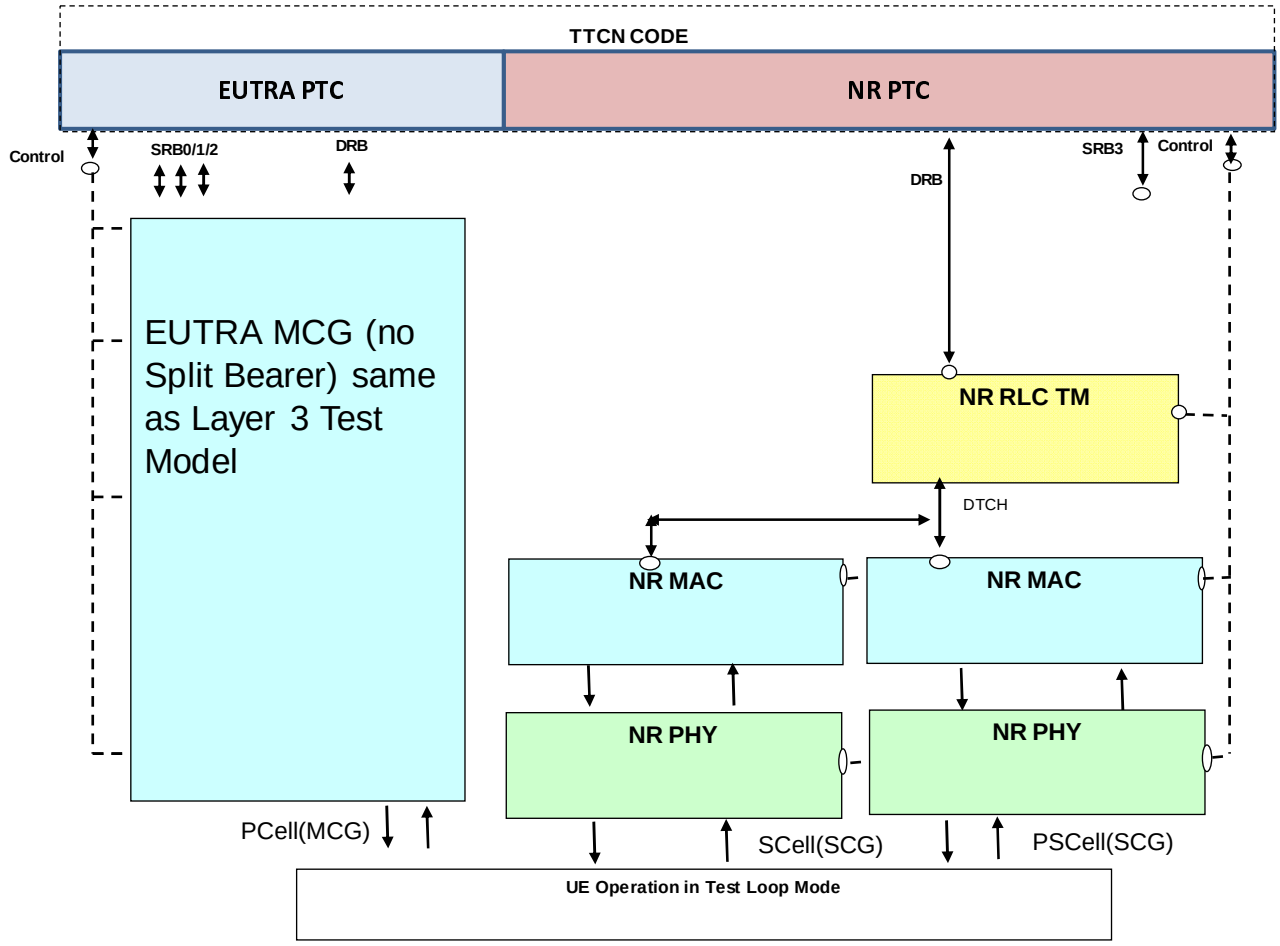


Figure 5.1.2.3.2-1: Test model for EN-DC MAC CA testing

The EN-DC MAC CA test model builds on top of the EN-DC MAC test model, with the differences specified hereafter.

On the SS NR side, in the SCG there is one PSCell and one SCell configured:

- PSCell only: On DRBs the NR RLC is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no NR PDCP configured in the SS. The ports are directly above NR RLC.
- PSCell / SCell: Layer 1 is configured in the normal way. NR MAC is configured in a special mode, where it does not add any MAC headers in DL and /or not remove any MAC headers in UL directions respectively at DRB port. In this case, the TTCN shall provide the final MAC PDU, including padding. Except for this, the MAC layer shall perform all of its other functions.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception in PSCell over system indication port, if configured. In a similar way the reception of PRACH preambles in PSCell / SCell is reported by SS over the same port, if configured.

5.2 NR/5GC

5.2.1 Layer 3

5.2.1.1 Single NR carrier

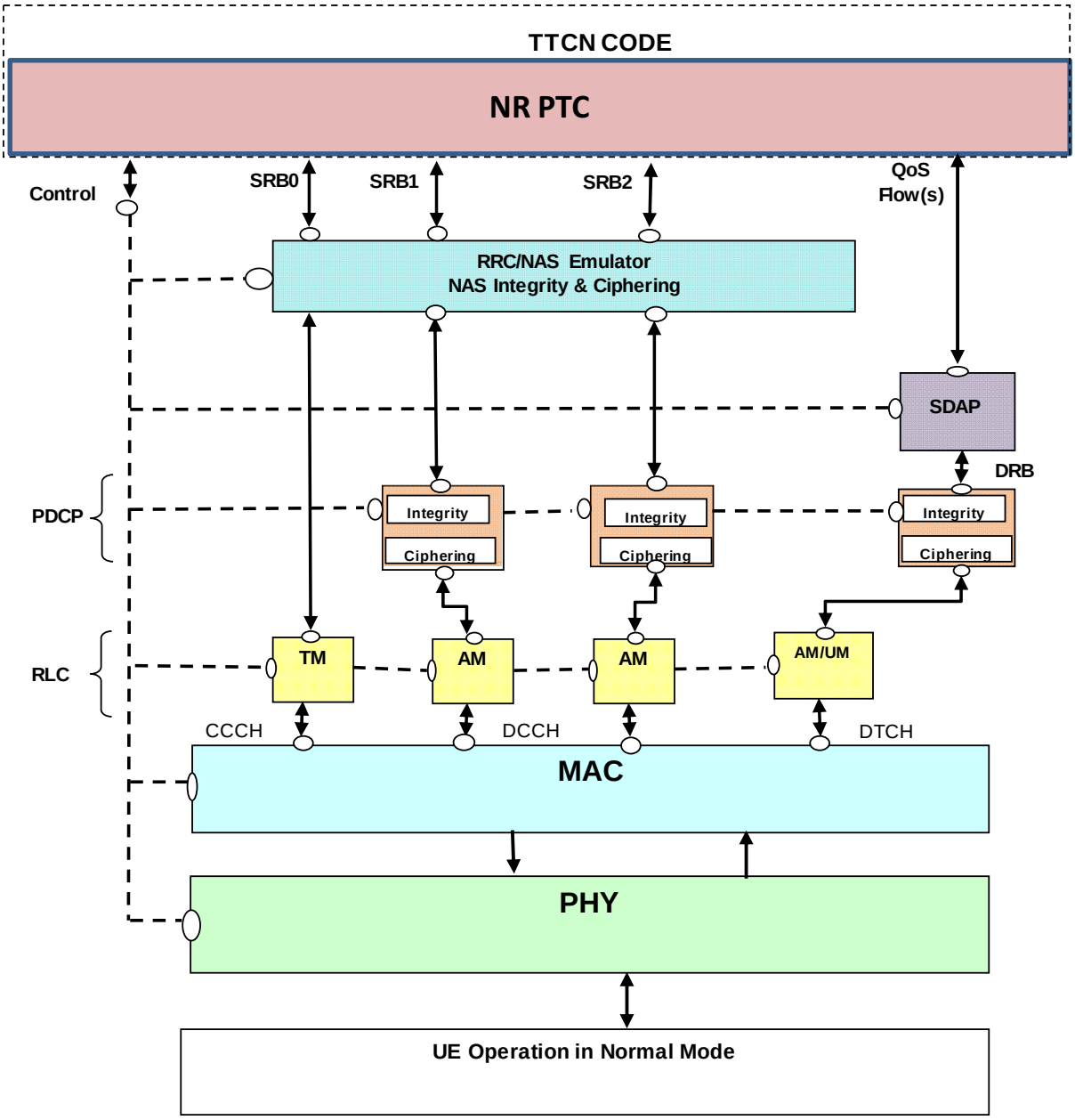


Figure 5.2.1.1-1: Test model for NR/5GC Layer3 testing

The UE is configured in normal mode. On the UE side Ciphering and Integrity (PDCP and NAS) are enabled and ROHC is not configured.

On the SS Side L1, MAC, RLC, PDCP and SDAP are configured in the normal way and shall perform all their functions. For SRB0 the DL and UL port is above RLC. For SRB1 and SRB2 the port is above/below the NR RRC and NAS emulator, which is implemented as a parallel test component. For DRB, the port is above SDAP. PDCP Ciphering/Integrity is enabled. NAS integrity/Ciphering is enabled.

The RRC/NAS emulator for SRB1 and SRB2 shall provide the Ciphering and Integrity functionality for the 5GC NAS messages. In UL, the SS shall report RRC messages, still containing (where appropriate) the secure and encoded NAS message, to the RRC port. In DL, RRC and NAS messages with same timing information shall be embedded in one PDU after integrity and ciphering of the NAS messages.

5.2.1.2 NR carrier aggregation

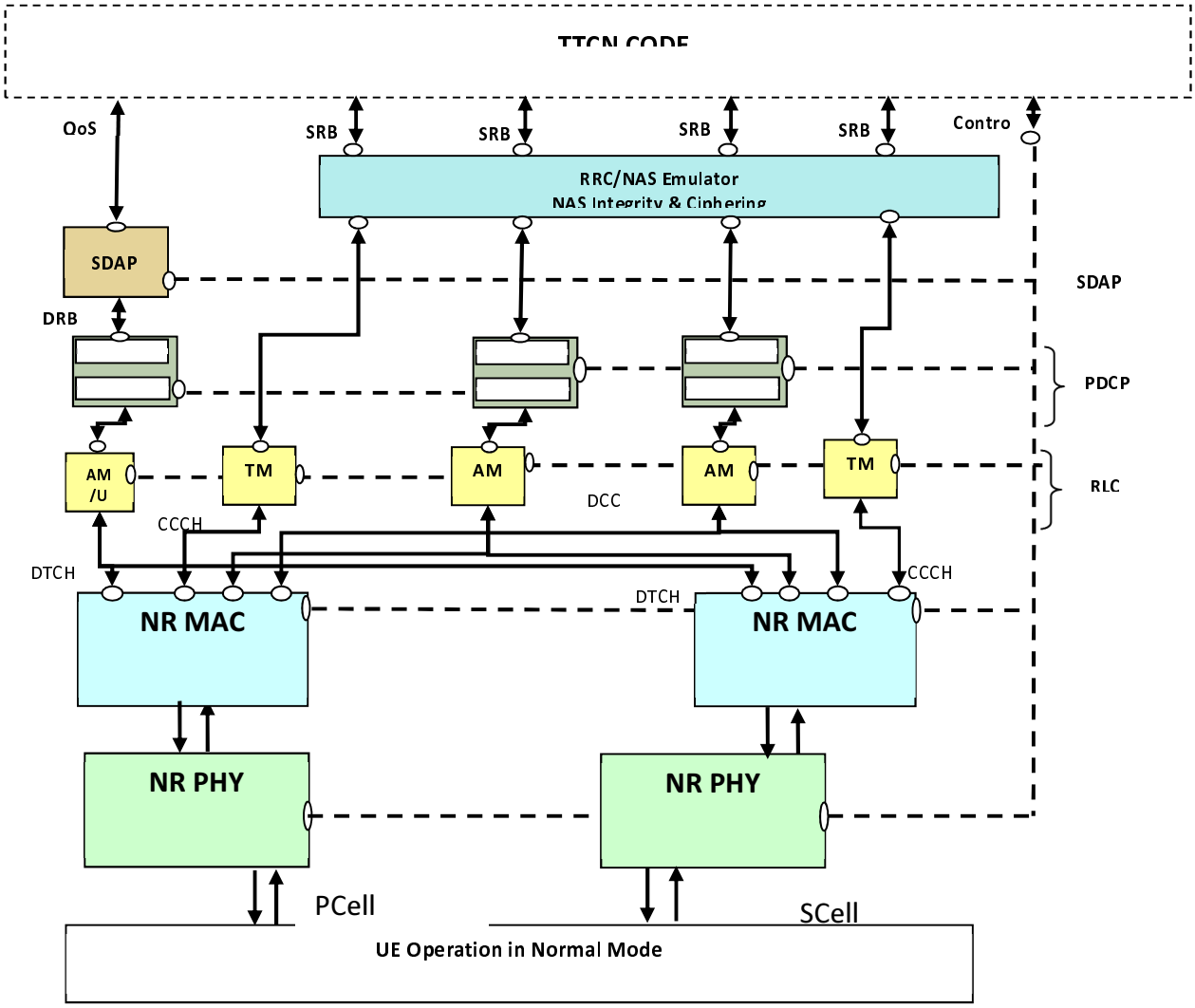


Figure 5.2.1.2-1: Test model for NR/5GC Layer3 CA testing

The NR/5GC Layer3 CA test model builds on top of the NR/5GC Layer3 test model, with the differences specified hereafter.

In the SS side, there is one PCell and one SCell configured:

- PCell: The associated SCell is linked to this PCell to enable the connection of the SCell MAC layer to the PCell RLC/PDCP layers for DCCH/DTCH.
- SCell: PHY and MAC layers are configured in normal way. RLC layer is configured only for BCCH/PCCH/CCCH.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. The SS reports PUCCH scheduling information reception in PCell over system indication port, if configured. In a similar way the reception of PRACH preambles in PCell / SCell is reported by SS over the same port, if configured.

5.2.1.3 NR/E-UTRA Inter-RAT

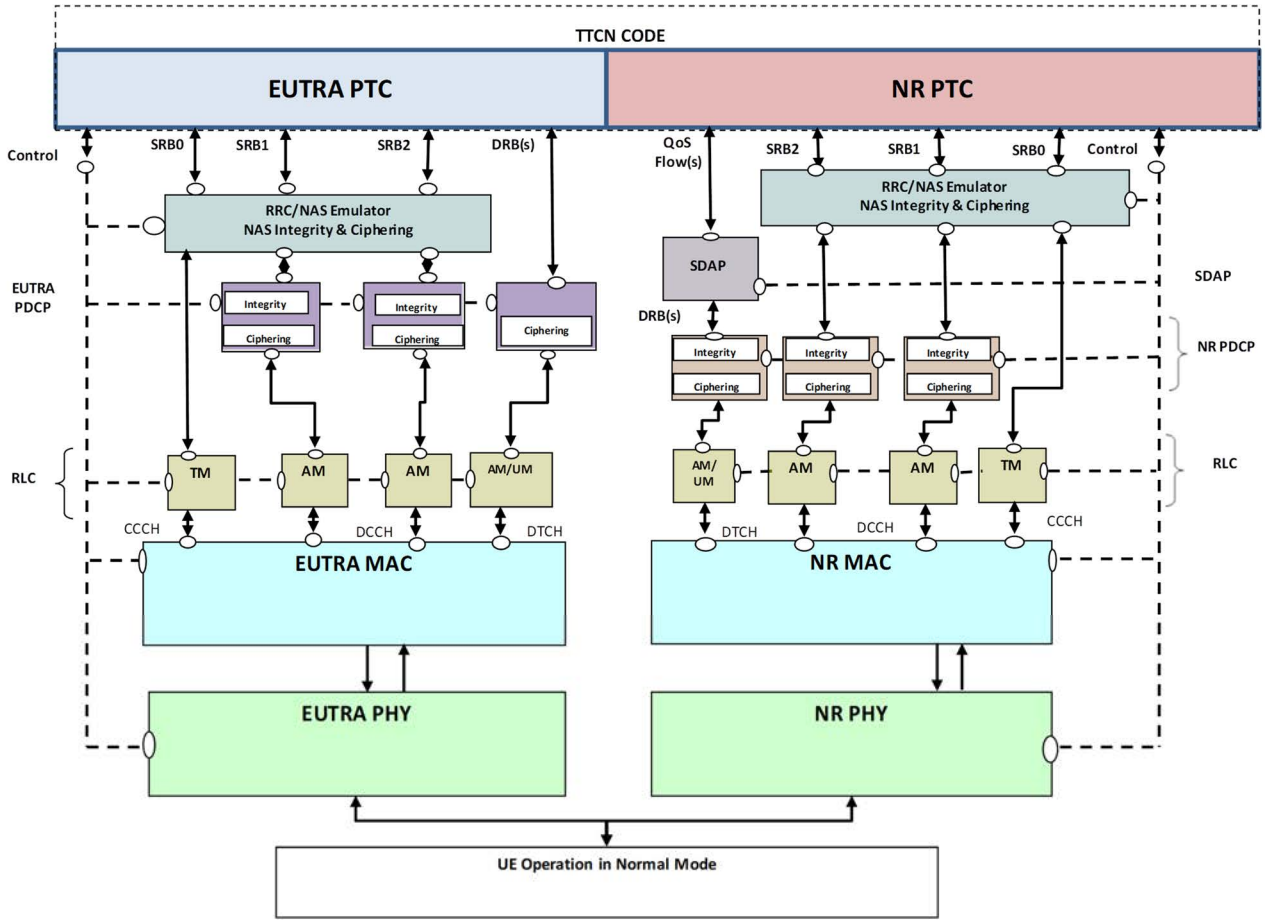


Figure 5.2.1.3-1: Test model for NR/E-UTRA Inter-RAT testing

This test model is only relevant for NR/5GC to/from E-UTRA/EPC inter-RAT and is not applicable to E-UTRA/5GC. The model consists of a dual protocol stack: one for NR and one for E-UTRA. The TTCN implementation for NR and E-UTRA functionalities will be in separate Parallel Test Components.

The SS NR part is the same as the model defined in subclause 5.2.1.1 for NR/5GC L3 testing.

The SS E-UTRA part is the same as the model defined in 36.523-3 [12] clause 4.2.2 for RRC testing.

The UE is configured in normal mode. Ciphering/Integrity (PDCP and NAS) are enabled and ROHC is not configured.

5.2.2 Layer 2

5.2.2.1 SDAP

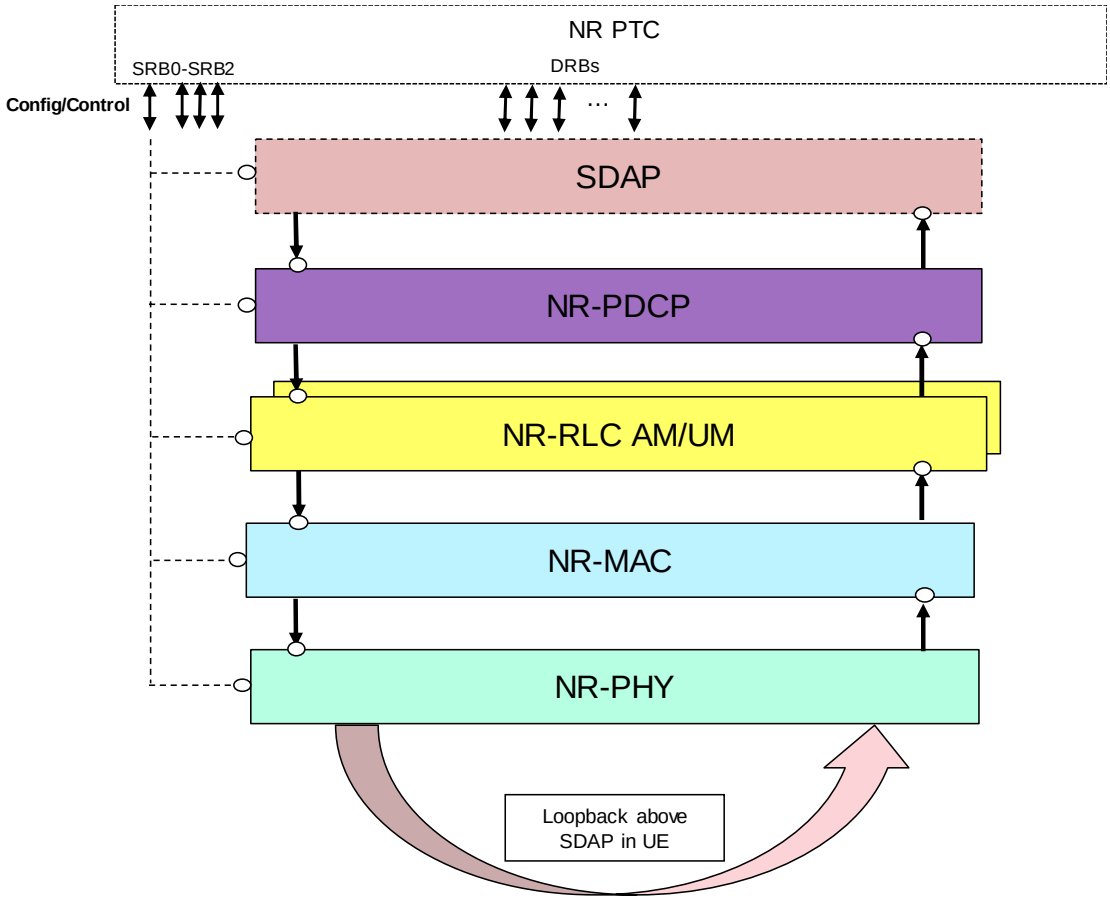


Figure 5.2.2.1-1: Test model for NR/5GC SDAP testing

The UE is configured in Test Loop Mode, to loop back the user domain data above SDAP layer. On UE side Ciphering is enabled with null algorithm and ROHC is not configured.

On the SS, Layer 1, MAC, RLC and PDCP are configured in the normal operation. The SDAP is configured in a special mode, where SS does not add any SDAP header in DL and does not remove any SDAP header in UL at the DRB port on the NR PTC. The TTCN code will take care of the SDAP header handling and of the QoS flow to DRB mapping, i.e. the SS will route DL SDAP PDUs from TTCN to the corresponding DRB.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port.

5.2.2.2 PDCP

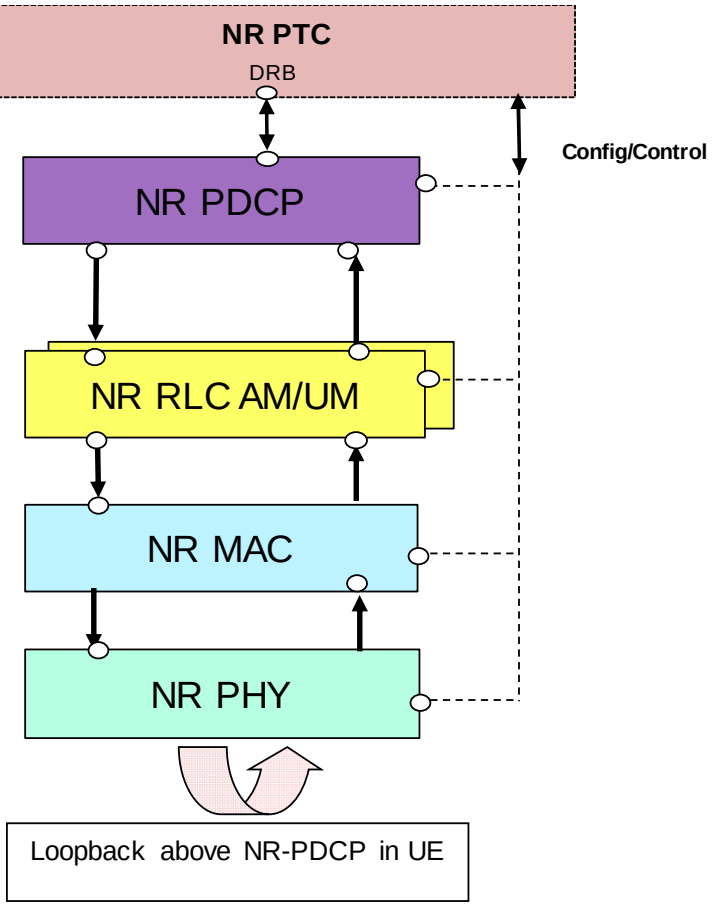


Figure 5.2.2.2-1: Test model for NR/5GC PDCP testing

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled as null algorithm and ROHC is not configured.

On the SS NR, Layer 1, MAC and RLC is configured in the normal operation.

The PDCP is configured in a special mode, where SS does not add any PCDP headers in DL and/or not remove any PDCP headers in UL directions respectively at DRB port on the NR PTC. The TTCN maintains sequence numbers and state variables for the PDCP layer.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception over system indication port, if configured.

5.2.2.3 RLC

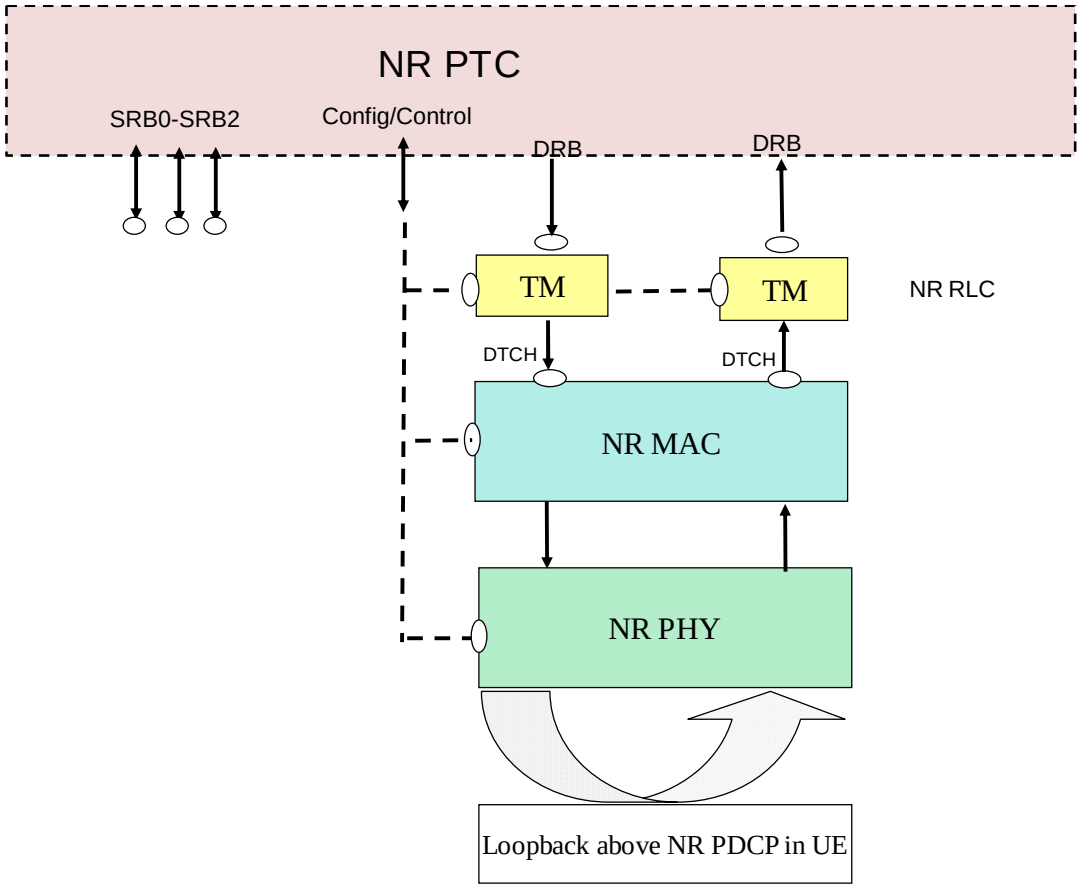


Figure 5.2.2.3-1: Test model for NR/5GC RLC testing

The UE is registered in NR, using SRBs 0-2, and configured for NR/5GC operation.

This model is suitable for testing both UM/AM mode of operation of DRBs on UE side.

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled (since mandatory) but with dummy ciphering algorithm, which is equivalent to not using ciphering. ROHC is not configured on UE Side.

On the SS Side, L1 and MAC are configured in the normal way. The RLC of the DRBs is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no PDCP configured on SS side. The ports are directly above RLC.

The PDUs, exchanged between TTCN and SS, shall be the final RLC PDUs consisting of RLC and PDCP headers. TTCN code shall take care in DL of building RLC headers and PDCP headers and in UL handle RLC and PDCP headers. TTCN code shall take care of maintaining sequence numbers and state variables for RLC and PDCP layers. If RLC on UE side is in AM mode, TTCN shall take care of generating polls in DL and responding with RLC control PDUs on reception of UL Poll.

5.2.2.4 MAC

5.2.2.4.1 Single NR carrier

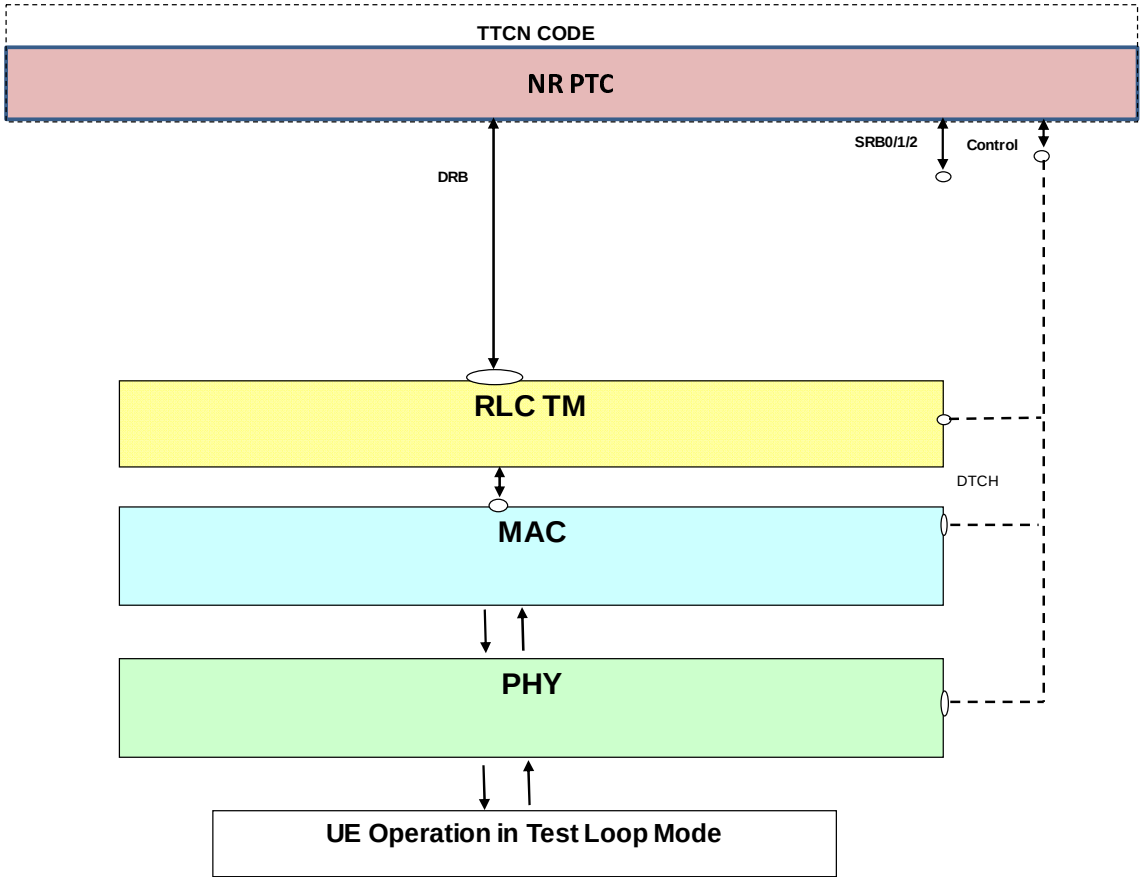


Figure 5.2.2.4.1-1: Test model for NR/5GC MAC testing

The UE is configured in Test Loop Mode A, to loop back the User Plane data above PDCP layer. On UE side Ciphering is enabled (since Mandatory) but with dummy ciphering algorithm, which is equivalent to not using ciphering. ROHC is not configured on UE Side.

On the SS Side the NR MAC test model expects no split bearers to be configured.

On the SS NR, Layer 1 is configured in the normal way. NR MAC is configured in a special mode, where it does not add any MAC headers in DL and /or not remove any MAC headers in UL directions respectively at DRB port. In this case, the TTCN shall provide the final MAC PDU, including padding. Except for this, the NR MAC layer shall perform all its other functions. SRBs are configured as in Layer 3 test model in normal operation.

On DRBs the NR RLC is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no NR PDCP and SDAP configured on SS Side. The ports are directly above NR RLC.

There are two different test modes in which NR MAC header addition/removal can be configured:

1. DL/UL header-transparent mode: no header addition in DL and no header removal in UL.
2. DL only header-transparent mode: no header addition in DL; UL NR MAC is configured in normal mode to remove MAC header and de-multiplex the MAC SDUs according to the logical channel Ids.

If SS NR MAC is configured in DL/UL header-transparent mode, the PDUs, exchanged at the DRB port between TTCN and SS, shall be the final MAC PDUs consisting of MAC, RLC and PDCP headers. TTCN code shall take care in DL of building MAC header, RLC headers and PDCP headers and in UL handle MAC, RLC and PDCP headers. TTCN code shall take care of maintaining sequence numbers and state variables for RLC and PDCP layers. During

testing of multiple DRBs at the UE side, it shall still be possible to configure only one DRB on SS side with configuration in the figure 5.2.2.4-1. Other DRBs will not be configured, to facilitate routing of UL MAC PDUs. Multiplexing/de-multiplexing of PDUs meant/from different DRBs shall be performed in TTCN. Since the MAC layer does not evaluate the MAC headers in UL it cannot distinguish between SRB and DRB data in UL. There shall be no SRB traffic while MAC is configured in this test mode. The SS MAC shall take care of automatic repetitions/retransmission in UL and DL, based on normal MAC HARQ behaviour.

NOTE: There is no need to handle SDAP headers in TTCN for UL/DL as UE Test loop Mode A is above PDCP.

If SS NR MAC is configured in DL only header-transparent mode, the UL PDUs exchanged at the DRB port between TTCN and SS shall be final RLC PDUs consisting of RLC and PDCP headers. SS shall route these PDUs based on logical channel IDs. In DL, TTCN sends fully encoded MAC PDUs at the DRB port (consisting of MAC, RLC and PDCP headers). In this case TTCN needs to take care of maintaining sequence numbers and state variables for RLC and PDCP layers. Furthermore, in UL and DL the SS MAC layer shall be capable of dealing with SRB data (i.e. it shall handle DL RLC PDUs coming from SRB RLC layers or de-multiplex UL RLC PDUs to SRB's) as in normal mode. The SS MAC shall take care of automatic repetitions/retransmissions in UL and DL, based on normal MAC HARQ behaviour. TTCN shall ensure that no DL MAC SDUs in normal mode and DL MAC PDUs in test mode are mixed for the same TTI.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception over system indication port, if configured. In a similar way the reception of PRACH preambles is reported by SS over the same port.

5.2.2.4.2 NR carrier aggregation

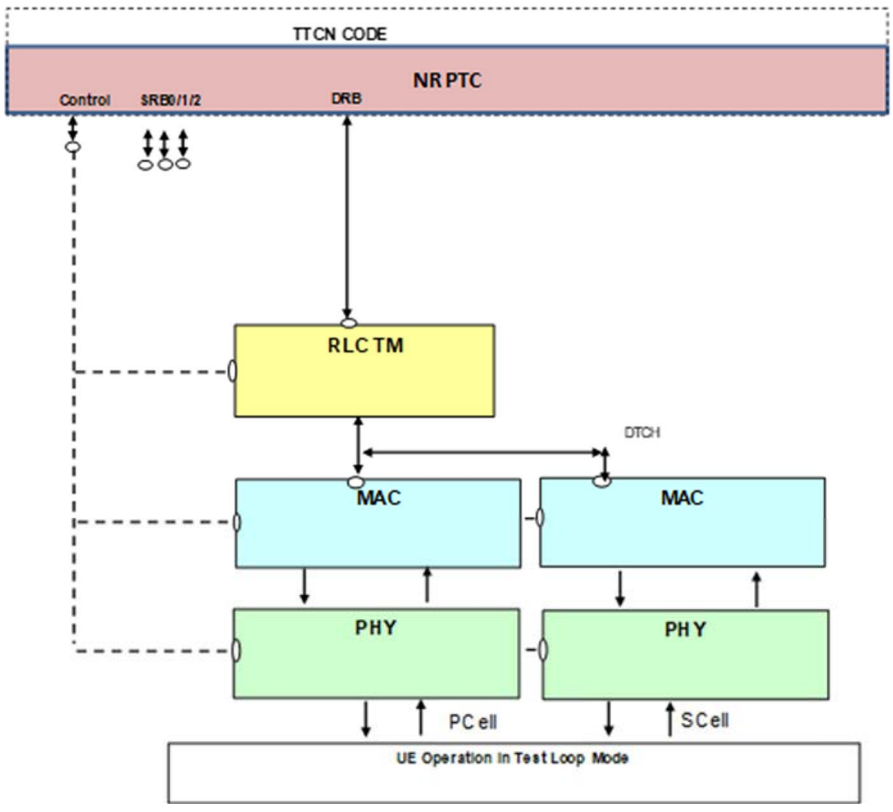


Figure 5.2.2.4.2-1: Test model for NR/5GC MAC CA testing

The NR/5GC MAC CA test model builds on top of the NR/5GC MAC test model, with the differences specified hereafter.

On the SS NR side, there is one PSCell and one SCell configured:

- PCell only: On DRBs the NR RLC is configured in transparent mode. Hence with this configuration PDUs out of SS RLC are same as the SDUs in it. There is no NR PDCP and SDAP configured in the SS. The ports are directly above NR RLC.
- PCell / SCell: Layer 1 is configured in the normal way. NR MAC is configured in a special mode, where it does not add any MAC headers in DL and /or not remove any MAC headers in UL directions respectively at DRB port. In this case, the TTCN shall provide the final MAC PDU, including padding. Except for this, the MAC layer shall perform all of its other functions.

The UL Scheduling Grant and DL Scheduling assignments are configured from TTCN over system control port. SS reports PUCCH scheduling information reception in PCell over system indication port, if configured. In a similar way the reception of PRACH preambles in PCell / SCell is reported by SS over the same port, if configured.

6 System interface

6.1 Upper tester interface

The Upper Tester (UT) interface is the same as specified in TS 36.523-3 [12] clause 5.

6.2 Abstract system primitives

6.2.1 Introduction

The present subclause 6.2 specifies the abstract system primitives (ASPs) used on the system interface to configure and control the SS.

6.2.2 General requirements and assumptions

The requirements and assumptions specified in TS 36.523-3 [12] subclause 6.1 apply to the present document.

6.2.3 E-UTRAN ASP definitions

Please refer to TS 36.523-3 [12] subclause 6.2.

6.2.4 NR ASP definitions

See Annex D.

7 Test methods and design considerations

7.1 Common aspects

7.1.1 Introduction

Subclause 7.1 specifies test methods and design considerations that are common to all 5GS deployment options.

7.1.2 Physical layer aspects

7.1.2.1 Search spaces and DCI

7.1.2.1.1 Parameters

For each search space there are several parameters specifying the location of this search space in the time and frequency domain.

7.1.2.2.1.1 Search space configuration

PDCCH monitoring periodicity	
Comment/description	slot periodicity in time domain
ASN.1 parameter	SearchSpace.monitoringSlotPeriodicityAndOffset
Core spec reference	TS 38.213 [21] clause 10.1
PDCCH monitoring offset	
Comment/description	slot offset
ASN.1 parameter	SearchSpace.monitoringSlotPeriodicityAndOffset
Core spec reference	TS 38.213 [21] clause 10.1
PDCCH monitoring pattern	
Comment/description	first symbol(s) of the control resource set within a slot for PDCCH monitoring; in general a search space starts with first symbol of a slot; the duration is given by the L1 parameter 'CORESET-time-duration'
ASN.1 parameter	SearchSpace.monitoringSymbolsWithinSlot
Core spec reference	TS 38.213 [21] clause 10.1
CORESET time duration	
Comment/description	Duration of a search space in time domain: 1, 2 or 3 symbols
ASN.1 parameter	ControlResourceSet.duration
Core spec reference	TS 38.213 [21] clause 10.1
CORESET frequency domain allocation	
Comment/description	Bitmap specifying the frequency domain allocation of a search space NOTE: The allocations needs to fit into the BWP to which the CORESET belongs
ASN.1 parameter	ControlResourceSet.frequencyDomainResources
Core spec reference	TS 38.213 [21] clause 10.1, TS 38.211 [19] clause 7.3.2.2

7.1.2.1.2 PDCCH search spaces

For each configured DL BWP, the TTCN may configure one or several search spaces.

For each search space, TTCN configures the SS with:

- The configuration of this search space as given to the UE, enabling the SS to determine the PDCCH transmission occasions (same as the UE PDCCH monitoring occasions) and associated CORESET.
  For SearchSpaceZero the configuration according to TS 38.213 [21] clauses 10.1 and 13 is mapped to ASN.1 type SearchSpace to configure the SS; for CORESET#0 the configuration according to TS 38.211 [19] clause 7.3.2.2 is mapped to ASN.1 type ControlResourceSet to configure the SS.

- The CCE aggregation level *L* that the SS shall use for PDCCH transmission on this search space.
  In general an aggregation level of 4 is used for SearchSpaceZero, common and UE-specific search space.

- The priority *P* of this search space that the SS shall consider in its PDCCH candidate selection algorithm.

  - a value of 0 represents the highest priority, a value of 1 the second highest priority and so on.

NOTE: “Search space” is used in terms of TS 38.213 [21] clause 10.1 and a single search space configuration (ASN.1 type ‘SearchSpace’) may contain several search spaces (see NR_BWP_SearchSpaceConfig_Type in Annex D).

7.1.2.1.3 DCI formats

The SS shall support several DCI formats. For each 5GS option, the set of DCI formats to support may be different (see relevant option-specific subclauses).

The transmission of DCI formats may be explicitly requested from TTCN or semi-autonomously handled by the SS. In case of explicit request:

- If the associated timing information is explicit, the TTCN shall ensure that this timing information matches one of the configured PDCCH transmission occasions.
- If the associated timing information is now, the SS shall determine and use the next valid PDCCH transmission occasion.

7.1.2.1.4 PDCCH candidate selection

The SS shall consider search space priorities as configured by TTCN to find appropriate PDCCH candidates for scheduling of DCI formats in case of:

a) Overlapping search spaces:

   - Depending on system configuration and slot number candidates of the different search spaces may be located in same (or overlapping) CCEs.
     - Example: system information is automatically scheduled by the SS and UE-specific data transmission requires scheduling of PDCCH for the same slot and symbols

   => Candidates of the UE-specific search space may collide with actual PDCCH of a common search space (e.g. system information).

b) Within a search space if different search space types are mapped to the same search space configuration.

For every PDCCH assignment (in terms of TS 38.213 [21] clause 10.1) the SS shall apply the PDCCH candidate selection algorithm specified hereafter:

1) For each search space the SS selects the PDCCH candidate with index m(search space, L) = 0

   With (see TS 38.213 [21] subclause 10.1):

   - candidate index m(search space, L) := 0 .. M(search space, L) - 1;
   - M(search space, L): number of PDCCH candidates per CCE aggregation level for the given search space;
   - L: CCE aggregation level

2) If there is an overlapping of the selected candidates, the SS shall:

   - keep the PDCCH candidate of the search space with higher priority *P*,
   - increment m for the search space with lower priority;

3) The SS shall repeat 2) until there is no overlapping anymore.

In the following cases the SS shall raise an error:

i) Collision of PDCCH candidates of search spaces with the same priority,

ii) When a DL transmission or a single UL grant is scheduled with specific TimingInfo and after applying the above rules there is no PDCCH candidate left anymore.
   NOTE: For TimingInfo 'Now' there is no error as the SS can shift the transmission to the next PDCCH occasion

In case of continuous UL grant configuration, the SS shall not raise an error when a grant cannot be scheduled at a specific point in time but skip it, if the grant is configured to be at every occasion, or shift it to the next occasion otherwise.

7.1.2.2 Downlink resource allocation

7.1.2.2.1 Parameters

There are several parameters specifying the resource allocation on PDCCH (see subclause 7.1.2.2.1.1) and PDSCH for a DL transmission. The following sub-clauses summarise the parameters being most relevant for downlink resource allocation from the test model's point of view.

7.1.2.2.1.1 Time domain resource allocation

For time domain resource allocation, either a default PDSCH time domain allocation according to TS 38.214 [22] clause 5.1.2.1.1 is applied or a table (pdsch-AllocationList) is configured via RRC signalling (pdsch-ConfigCommon.pdsch-TimeDomainAllocationList or pdsch-Config.pdsch-TimeDomainAllocationList, see TS 38.331 [16]). This table corresponds to L1 parameter "pdsch-AllocationList" and the entries are referred to by DCI.

pdsch-AllocationList has the following fields:

PDSCH slot offset (K_0)	
Comment/description	Slot offset of PDSCH transmission based on the corresponding PDCCH transmission (DCI) Assuming the same numerology for PDSCH and PDCCH: $K_0 = 0$ PDCCH and corresponding PDSCH transmission are in the same slot $K_0 > 0$ PDCCH and corresponding PDSCH transmission are in different slots
ASN.1 parameter	PDSCH-TimeDomainResourceAllocation.k0
Core spec reference	TS 38.214 [22] clause 5.1.2.1
PDSCH mapping type	
Comment/description	PDSCH mapping type A or B NOTE: In general - at least for early releases - type A is expected to be used by conformance testing (Type B seems to be intended for mini-slots)
ASN.1 parameter	PDSCH-TimeDomainResourceAllocation.mappingType
Core spec reference	TS 38.214 [22] clause 5.1.2.1
Start and length indicator (SLIV)	
Comment/description	The SLIV specifies the starting symbol (S) and the number of symbols (L) of the PDSCH resource assignment according to TS 38.214 [22] clause 5.1.2.1; valid start/length combinations depend on the PDSCH mapping type
ASN.1 parameter	PDSCH-TimeDomainResourceAllocation.startSymbolAndLength
Core spec reference	TS 38.214 [22] clause 5.1.2.1

7.1.2.2.1.2 Frequency domain resource allocation configured at the UE via RRC signalling

Resource allocation type	
Comment/description	Specifies the format of the frequency domain resource assignment field of DCI format 1_1 (resource allocation type 0, resource allocation type 1 or both) NOTE: for DCI format 1_0 this parameter seems to be not relevant.
ASN.1 parameter	PDSCH-Config.resourceAllocation
Core spec reference	TS 38.212 [20] clause 7.3.1.2.2

7.1.2.2.1.3 DCI parameters

Frequency domain resource assignment	
Comment/description	Resource allocation type 0: bitmap indicating resource block groups (RBGs) being allocated to the UE Resource allocation type 1: resource indication value (RIV) indicating start and length of a set of contiguously allocated resource blocks NOTE: for DCI format 1_0 only resource allocation type 1 is applicable (according to TS 38.214 [22] clause 5.1.2.2)
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2, TS 38.214 [22] clause 5.1.2.2
Time domain resource assignment	
Comment/description	Index addressing pre-configured time domain resource allocation (see clause 7.1.2.2.1.1)
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2
VRB-to-PRB mapping	

Comment/description	To distinguish non-interleaved and interleaved allocation of virtual resource blocks in case of resource allocation type 1
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2, TS 38.214 [22] clause 5.1.2.2
Modulation and coding scheme (MCS)	
Comment/description	Modulation and coding scheme according to TS 38.214 [22] clause 5.1.3: The DCI provides the MCS index ($\mathbf{I_{MCS}}$) which refers to the respective tables in clause 5.1.3.1 of TS 38.214 [22]
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.1 and 7.3.1.2.2, TS 38.214 [22] clause 5.1.3
Antenna port configuration	
Comment/description	Configuration of antenna port(s) according to tables 7.3.1.2.2-1/2/3/4 of TS 38.212 [20] for DCI format 1_1: Specifies the number of CDM groups without data and the antenna ports being used for a transmission. The number of CDM groups affects the number of REs which cannot be used for PDSCH transmission according to step 1 of clause 5.1.3.2 in TS 38.214 [22]. The number of antenna ports being used for the DL transmission corresponds to the number of layers υ being used for the respective transport block transmission (1, 2, 3 or 4 layers per transport block). DCI format 1_0 does not have any field for antenna port configuration: TS 38.214 [22] clause 5.1.6.2 specifies that in general the UE shall assume 2 CDM groups i.e. there are no REs available for PDSCH transmission in any symbol where DMRS is sent. Regarding the number of layers υ=1 is assumed for PDSCH transmissions scheduled with DCI format 1_0
Core spec reference	TS 38.212 [20] clauses 7.3.1.2.2, TS 38.214 [22] clause 5.1.3, TS 38.211 [19] clause 7.3.1.3/4

7.1.2.2.2 Timing

The timing information provided by the request ASP for a DL transmission specifies the slot in which the DCI on PDCCH is transmitted scheduling the corresponding PDSCH transmission. The exact timing of the PDSCH transmission is depending on the parameters for time domain resource allocation as described in the previous clause. If the timing information specifies a specific slot it is up to TTCN that an appropriate search space is configured for this slot. The SS shall not schedule the DL transmission otherwise and may raise an error.

In case of TimingInfo indicating “Now” or “Any slot” it is up to the SS to find the appropriate slot for scheduling of the DCI. The SS shall not use slots in which SS/PBCH blocks are scheduled.
NOTE: The restriction for slots containing SS/PBCH can be removed when there is clarification in core specs (e.g. TS 38.214 [22]) how “rate matching around” SS/PBCH blocks is reflected in the calculation of the transport block size (see clause 7.1.2.2.4).

In case of TimingInfo not being “Now” TTCN shall ensure that the data is scheduled at least 100ms in advance. Furthermore, it is up to the test case prose to avoid any overlapping of PDSCH and PDCCH transmissions in time domain and it is up to TTCN implementation to address an appropriate slot for which the TBS size determination is well-defined according to clause 7.1.2.2.4; the SS shall raise an error otherwise.

Figures 7.1.2.2.2-1 and 7.1.2.2.2-2 illustrate the timing for $K_0 = 0$ and $K_0 > 0$.

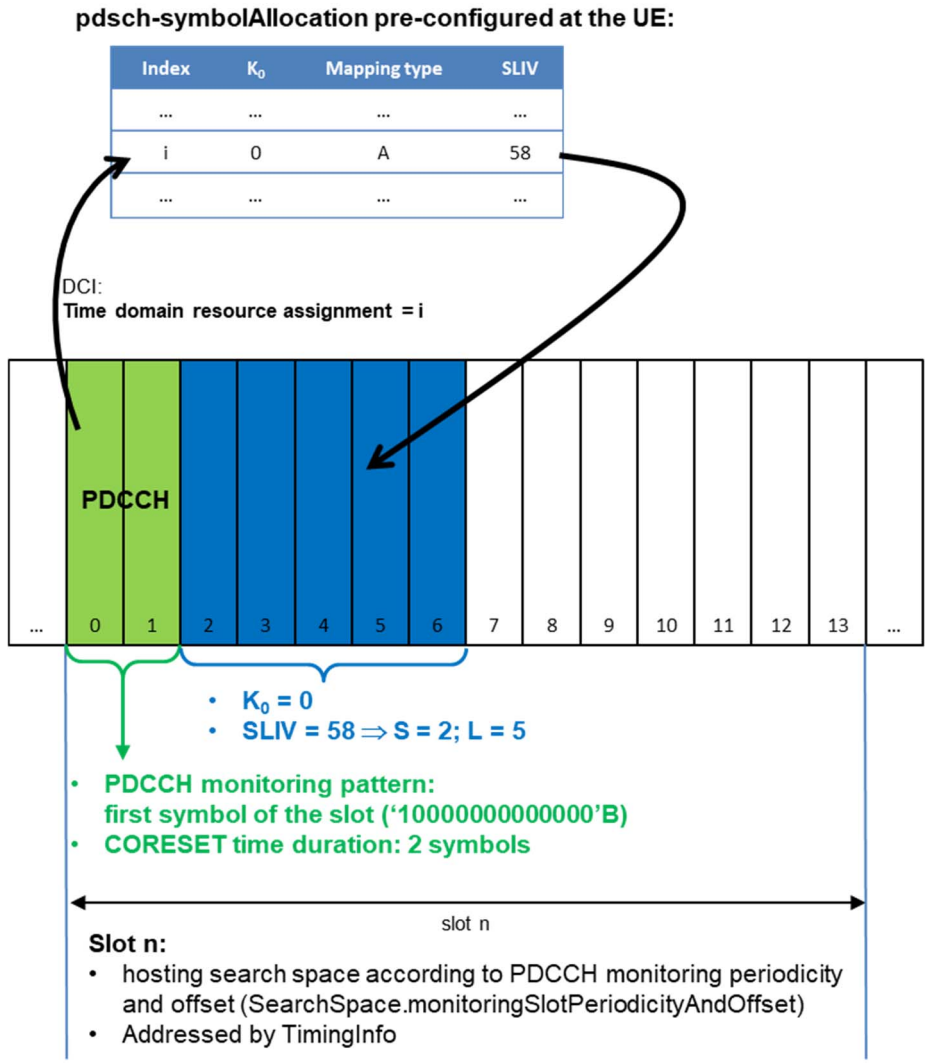


Figure 7.1.2.2.2-1: Example for time domain resource allocation for K_0 = 0

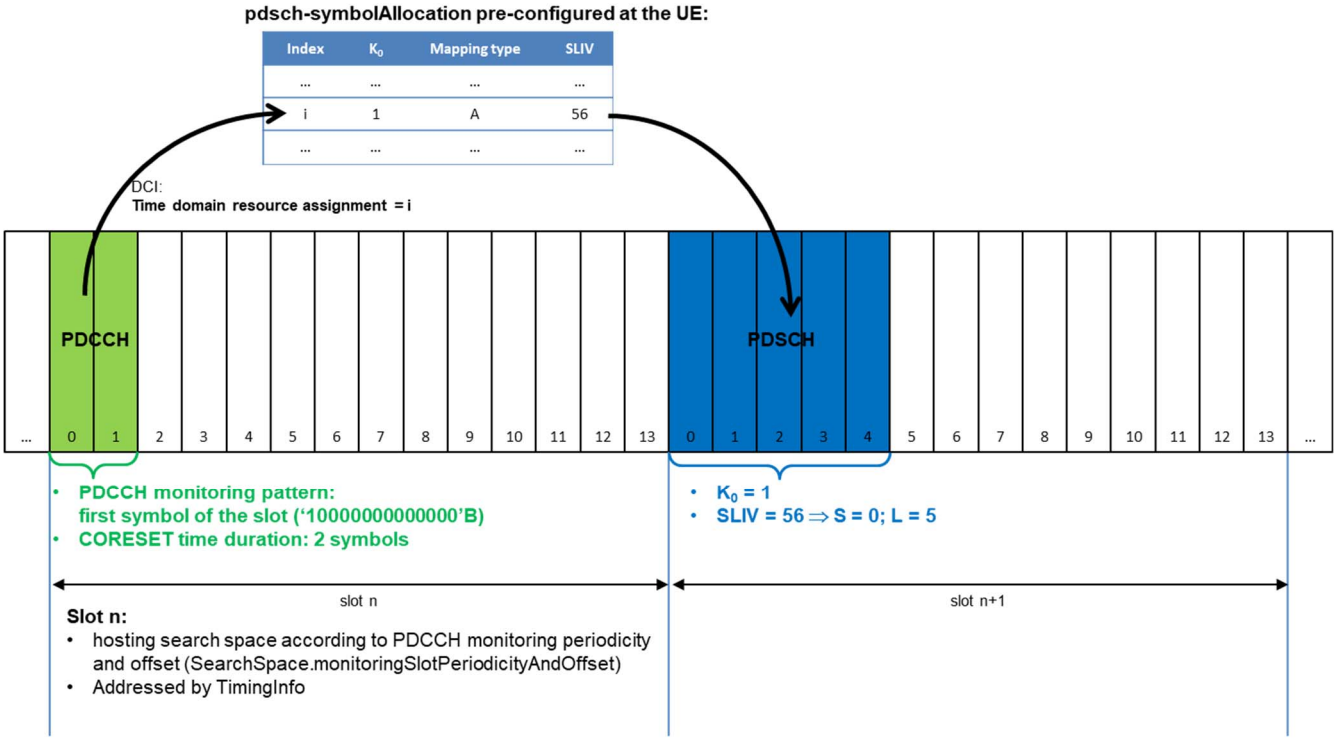


Figure 7.1.2.2.2-2: Example for time domain resource allocation for $K_0 > 0$

7.1.2.2.3 DL scheduling scheme

Different kinds of PDSCH transmissions need to be scheduled:

- System information (SI: SIB1 and other system information)
- Paging
- Random access response (RAR)
- DCCH/DTCH transmissions

The scheduling needs to be done so that there is no overlapping in frequency or time domain.

In general there are different ways to do the scheduling:

a) Multiplexing in frequency domain of a single BWP

b) Multiplexing in time domain of a single BWP (at slot or at symbol level)

c) Use of different BWPs: e.g. initial BWP for SI, RAR, Paging + dedicated BWP for DCCH/DTCH

d) Combinations of the above

In frequency domain the different kinds of PDSCH transmissions may use different resource allocation types (TS 38.214 [22] clause 5.1.2.2):

- Resource allocation (RA) type 0: Bitmap-based allocation of Resource Block Groups (RBGs):
  Applicable only for DCI format 1_1 ⇒ not applicable for scheduling of SI, Paging and RAR
- Resource allocation (RA) type 1, non-interleaved: continuous allocation of RBs with one-by-one mapping of virtual resource blocks (VRBs) to physical resource blocks (PRBs).
- Resource allocation (RA) type 1, interleaved: continuous allocation of RBs with interleaved VRB-to-PRB mapping according to TS 38.211 [19] clause 6.3.1.7.

7.1.2.2.3.1 DL scheduling scheme: Frequency domain multiplexing, RA type1, non-interleaved

This scheduling scheme multiplexes the different kinds of PDSCH transmissions in the frequency domain of a single BWP by exclusively using resource allocation type 1 with non-interleaved VRB-to-PRB mapping. Assuming the resource blocks being numbered from 0 to N_{BWP}-1 (with N_{BWP} being the size of the BWP) the following allocation is done:

Table 7.1.2.2.3.1-1: Resource allocation for frequency domain multiplexing, RA type1, non-interleaved

Kind of PDSCH transmission (Note 1)	Resource block allocation (Note 2)	
	RB_{start}	$L_{RBs,max}$ (Note 2)
System information	0	7
Paging (Note 3)	7	N_{BWP}-7
Random access response (Note 3)	7	N_{BWP}-7
DCCH/DTCH transmissions (Note 3)	7	N_{BWP}-7
NOTE 1: In context of a generic 5G test model it is not relevant whether or not there is SI and Paging for a given deployment option (e.g. EN-DC). NOTE 2: $L_{RBs} \leq L_{RBs,max}$ with L_{RBs}: number of resource blocks being eventually used for a particular transmission. NOTE 3: In general Paging, Random access response and DCCH/DTCH transmissions are mutual exclusive and therefore share the same allocation		

In order to achieve a test case behaviour being independent from the frequency channel bandwidth N_{BWP} is limited to the minimum value of 24 RBs in accordance to Table 5.3.2-1 of TS 38.101-1/2 [5, 6].

In general PDCCH and corresponding PDSCH transmissions are in the same slot ($K_0 = 0$).

7.1.2.2.4 Transport block size determination

TS 38.214 [22] clause 5.1.3.2 describes the transport block size (TBS) determination from the UE's point of view: the UE calculates the TBS depending on several parameters. From a test model's point of view appropriate values need to be found for the parameters to achieve a given TBS.

There are two modes specified for DL scheduling:

- automatic mode
- explicit mode

In explicit mode all parameters for the TBS determination are provided by TTCN, i.e. it is up to the TTCN implementation to find proper values. In automatic mode TTCN only provides RB_{start} and $L_{RBs,max}$ and it is up to the SS to determine the values of L_{RBs} and I_{MCS} to achieve the TBS which is needed for a particular DL transmission.

The SS shall apply the rules as described in clause 7.1.2.2.4.2.

7.1.2.2.4.1 Parameters affecting TBS determination

The following parameters need to be considered for TBS determination:

Table 7.1.2.2.4.1-1: Parameters affecting TBS determination

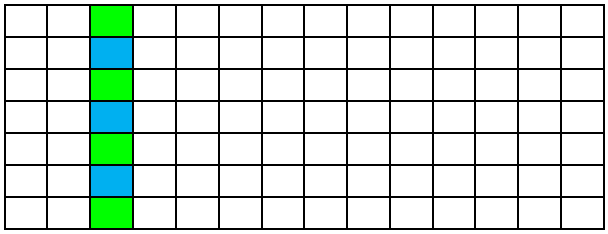
Parameter	Comment/Description	Reference
Number of RBs in frequency domain	Indicated by DCI	Clause 7.1.2.2.1.3
Number of symbols in time domain	Pre-configured at UE, selected by DCI; corresponds to “PDSCH duration” TS 38.211 [19] clause 7.4.1.1.2	Clause 7.1.2.2.1.1
MCS index I_{MCS}	Indicated by DCI: Modulation Order $\mathbf{Q_m}$, Target code Rate **R**	Clause 7.1.2.2.1.3; TS 38.214 [22] Table 5.1.3.1-1 and 5.1.3.1-2
Number of layers υ	The number of layers being used for transmission of a transport block can be derived from the antenna port configuration provided by DCI format 1_1 taking into account the layer mapping according to TS 38.211 clause 7.3.1.3. For DCI format 1_1 in general $\upsilon = 1$ according to TS 38.508-1 [5] Table 4.3.6.1.2.2-1. For DCI format 1_0 $\upsilon = 1$ is assumed (in accordance to TS 38.214 [22] clause 5.1.6.2 specifying antenna port 1000 to be used for DMRS).	TS 38.214 [22] clause 5.1.1.1 and 5.1.6.2, TS 38.211 [19] clause 7.3.1.4, TS 38.212 [20] clause 7.3.1.2.2 and tables 7.3.1.2.2-1/2/3/4
PDSCH mcs-Table	Pre-configured at the UE via RRC signalling: PDSCH-Config.mcs-Table := {qam64, qam256}; indicates which MCS table to be applied when DL transmission is scheduled with C-RNTI NOTE: qam256 is applicable only when DCI format 1_1 is used.	TS 38.214 [22] clause 5.1.3.1
Number of REs per PRB	Number of REs per PRB which are applicable for the PDSCH transmission	Table 7.1.2.2.4.1-2
Rate matching	TS 38.214 [22] clause 5.1.3.2 does not specify how rate matching needs to be considered for TBS determination ⇒ at least for early implementations slots containing SS/PBCH block transmission shall not be used for PDSCH transmissions and further rate matching is assumed not to be configured via RRC signalling	TS 38.214 [22] clause 5.1.4

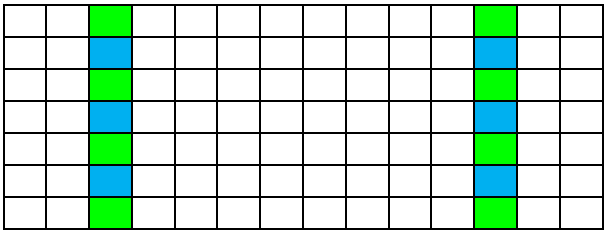
Table 7.1.2.2.4.1-2: Parameters affecting number of REs allocated for PDSCH per PRB

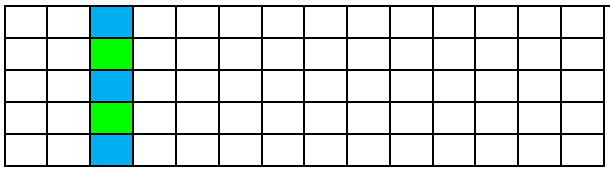
Parameter	Comment/Description	Reference
PDSCH mapping type	Type A or B	Clause 7.1.2.2.1.1; TS 38.211 [19] clause 7.4.1.1.2
dmrs-Type	DMRS Configuration type 1 or 2 as indicated to the UE by DMRS-DownlinkConfig.dmrs-Type	TS 38.211 [19] clause 7.4.1.1.2
dmrs-AdditionalPosition	Number of additional DMRS positions: For DCI format 1_1 as indicated to the UE by DMRS-DownlinkConfig.dmrs-AdditionalPosition 0, 1, 2 or 3 additional positions. For DCI format 1_0 according to TS 38.214 [22] clause 5.1.6.2 the UE shall assume dmrs-AdditionalPosition='pos2'	TS 38.211 [19] clause 7.4.1.1.2 and tables 7.4.1.1.2-3/4
maxLength	Number of OFDM symbols used for DMRS: For DCI format 1_1 as indicated to the UE by DMRS-DownlinkConfig.maxLength: Single or double symbol DM-RS. For DCI format 1_0 according to TS 38.214 [22] clause 5.1.6.2 single symbol DM-RS is applied.	TS 38.211 [19] clause 7.4.1.1.2 and table 7.4.1.1.2-5
number of CDM groups without data	The maximum number of CDM groups without data depends on the DMRS Configuration type (dmrs-Type): type 1: up to 2 CDM groups (TS 38.211 [19] Table 7.4.1.1.2-1) type 2: up to 3 CDM groups (TS 38.211 [19] Table 7.4.1.1.2-2) For DCI format 1_1 the number of CDM groups without data for a single transmission is determined by the antenna port configuration provided in the DCI (TS 38.212 [20] tables 7.3.1.2.2-1/2/3/4) For DCI format 1_0 according to TS 38.214 [22] clause 5.1.6.2 for mapping type A and PDSCH duration > 2 the UE shall assume that the number of DM-RS CDM groups without data is 2 (what results in PDSCH not being present in any symbol carrying DM-RS)	TS 38.211 [19] clause 7.4.1.1.2, TS 38.212 [20] clause 7.3.1.2.2 and tables 7.3.1.2.2-1/2/3/4, TS 38.214 [22] clause 5.1.3.2 and 5.1.6.2
xOverhead	Number of REs used for additional overhead as indicated to the UE by PDSCH-ServingCellConfig.xOverhead: 0, 6, 12, 18 REs	TS 38.214 [22] clause 5.1.3.2
PDSCH duration	Number of symbols allocated for the PDSCH transmission	Clause 7.1.2.2.1.1

Table 7.1.2.2.4.1-3 gives examples for the position of DMRS within a resource block depending on different parameters, with DMRS CDM group 0 shown in blue and DMRS CDM group 1 (if any) shown in green. For DCI format 1_0 and PDSCH mapping type A the UE assumes both CDM groups to be used; for DCI format 1_1 the number of DMRS CDM groups without data depends on the antenna port configuration of the DCI: In case of dmrs-Type=1, maxLength=1 and only one code word TS 38.212 [20] table 7.3.1.2.2-1 is applied and '0000'B (as specified in TS 38.508-1 [5] table 4.3.6.1.2.2-1) corresponds one DRMS CDM group at port 1000 which results in the REs shown in blue.

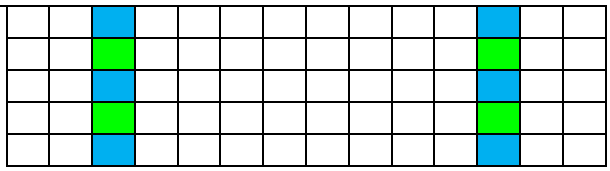
Table 7.1.2.2.4.1-3: Examples for the position of DMRS in an RB with PDSCH mapping type A, DMRS configuration type 1, maxLength=1, dmrs-AdditionalPosition=2



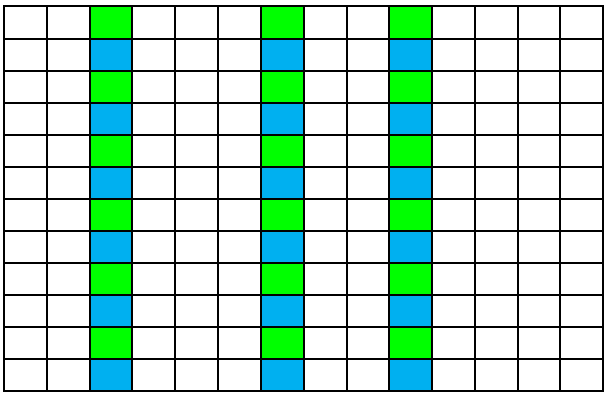




DL-DMRS-add-pos = 0:
k = 4n + 2k' + Δ; k' = 0, 1; Δ = 0, 1
$l_0 = 2$



DL-DMRS-add-pos = 1, PDSCH duration = 13, 14:
k = 4n + 2k' + Δ; k' = 0, 1; Δ = 0, 1
$l_0 = 2$, $l_1 = 11$



DL-DMRS-add-pos = 2, PDSCH duration = 10, 11, 12:
k = 4n + 2k' + Δ; k' = 0, 1; Δ = 0, 1
$l_0 = 2$, $l_1 = 6$, $l_2 = 9$

For PDSCH mapping type A and single-symbol DMRS according to TS 38.211 [19] Table 7.4.1.1.2-3 the number $N_{\text{Symbols with DMRS}}$ of symbols with DMRS per resource block is as shown in table 7.1.2.2.4.1-4.

Table 7.1.2.2.4.1-4: Number of symbols with DMRS per resource block

PDSCH duration	dmrs-AdditionalPosition			
	0	1	2	3
2	1	1	1	1
3				
4				
5				
6				
7				
8		2	2	2
9				
10			3	3
11				
12				4
13				
14				

Assuming DMRS configuration type 1, maxLength=1, Xoh-PDSCH=0 and no rate matching, depending on the number of CDM groups without data, this results in the number of REs for DMRS per PRB including the overhead of the DMRS CDM groups without data as shown in Table 7.1.2.2.4.1-5.

Table 7.1.2.2.4.1-5: Number of REs for DMRS per PRB including the overhead of the DMRS CDM groups without data for DMRS configuration type 1, maxLength=1, Xoh-PDSCH=0, no rate matching

	dmrs-AdditionalPosition	PDSCH duration	Number of REs for DMRS	
DCI format 1_1 indicating one DMRS CDM group without data according to TS 38.212 [20] Table 7.3.1.2.2-1	0 (NOTE 1)	any	6	$6 * N_{Symbols\ with\ DMRS}$
	1 (NOTE 1)	< 8	6	
		≥ 8	12	
DCI format 1_0	2 (NOTE 2)	< 8	12	$12 * N_{Symbols\ with\ DMRS}$
		8, 9	24	
		> 9	36	
NOTE 1: TS 38.508-1 [5] table 4.6.3-36 specifies pos0 or pos1 NOTE 2: pos2 for DCI format 1_0 according to TS 38.214 clause 5.1.6.2				

7.1.2.2.4.2 Automatic mode - Determination of TBS and corresponding I_{MCS} and L_{RBs}

In automatic mode, for each PDSCH transmission, the SS shall autonomously select a TBS and a L_{RBs} / I_{MCS} pair for this TBS.

Common requirements for TBS determination:

The SS shall follow the below rules to determine the TBS for a PDSCH transmission:

- The SS shall maximise the data being sent in a single transmission (i.e. the SS shall not do RLC segmentation without need);
- The SS shall minimise padding (i.e. the SS shall not use a TBS greater than needed);
- If the maximum TBS for a given configuration is not sufficient to carry all data then:
  - if the RLC layer configuration at the SS allows segmentation for the given bearer then:
    - the SS shall apply RLC segmentation with minimised number of segments;
  - else:
    - the SS shall raise an error.

L_{RBs} / I_{MCS} pair determination:

Using the selected TBS, the SS shall apply the following rules:

- When the TBS can be achieved with more than one L_{RBs} / I_{MCS} pairs the SS shall choose the L_{RBs} / I_{MCS} pairs with maximum L_{RBs};
- When there is more than one L_{RBs} / I_{MCS} pair with maximum L_{RBs} the pair with minimum I_{MCS} shall be chosen.

The SS implementation shall comply to the above requirements and be based on the following assumptions (unless stated otherwise for a specific table):

- Number of layers $\upsilon = 1$
- PDSCH mapping type A
- dmrs-Type: type1
- maxLength: single symbol DM-RS
- xOverhead = 0

Further details are left up to SS implementation.

7.1.2.2.4.3 Explicit mode - Determination of I_{MCS} and L_{RBs} for given TBS

In explicit mode, for a PDSCH scheduled by a PDCCH with CRC scrambled by C-RNTI, it is up to the TTCN to determine the values of I_{MCS} and L_{RBs} to achieve the TBS specified in a test case prose.

Annex B.1 may be used to select a valid pair of $\{L_{RBs}; I_{MCS}\}$. The NR TBS table to be used is based on the TS 38.508-1 [5] default configurations outlined in Tables 7.1.2.2.4.3-1 and 7.1.2.2.4.3-2 below.

Table 7.1.2.2.4.3-1: TS 38.508-1 [5] default configurations for DCI format 1_0 affecting DL scheduling

Parameter	Value	Reference(s)
MCS index table	table 5.1.3.1-1 (MCS index table 1)	TS 38.214 [22] clause 5.1.3.1 with DCI format 1_0
dmrs-AdditionalPosition	2	Table 7.1.2.2.4.1-2 with DCI format 1_0
number of CDM groups	2	Table 7.1.2.2.4.1-2 with DCI format 1_0, mapping type A and PDSCH duration > 2
PDSCH duration	12 (mapping type A)	TS 38.508-1 [5] Tables 4.6.3-76 (*PDSCH-ConfigCommon*) and 4.6.3-78 (*PDSCH-TimeDomainResourceAllocationList*) and DCI format with “Time domain resource assignment”=0

Table 7.1.2.2.4.3-2: TS 38.508-1 [5] default configurations for DCI format 1_1 affecting DL scheduling

Parameter	Value	Reference(s)
MCS index table	table 5.1.3.1-1 (MCS index table 1)	TS 38.214 [22] clause 5.1.3.1 with DCI format 1_1 and mcs-Table=qam64 as according to TS 38.508-1 [5] Tables 4.6.3-75
dmrs-AdditionalPosition	1 (FR1) 0 (FR2)	TS 38.508-1 [5] Table 4.6.3-36 (DMRS-DownlinkConfig)
number of CDM groups	1	according to antenna port configuration (TS 38.508-1 [5] Table 4.3.6.1.2.2-1)
PDSCH duration	12 (mapping type A)	TS 38.508-1 [5] Tables 4.6.3-76 (*PDSCH-ConfigCommon*) and 4.6.3-78 (*PDSCH-TimeDomainResourceAllocationList*) and DCI format with “Time domain resource assignment”=0

7.1.2.3 Uplink grant

7.1.2.3.1 General principles and grant allocation types

Uplink grants assignments for NR follow similar principles as for LTE (TS 36.523-3 [12] clause 7.2).

7.1.2.3.1.1 PUCCH synchronisation in connected mode

To prevent the UE from doing RACH procedure for purpose of PUCCH synchronisation the SS gets configured to maintain PUCCH synchronisation at UE by periodically sending a MAC PDU containing the MAC control element 'Timing Advance Command'. The period as configured by TTCN is set to 80 % of the ‘*timeAlignmentTimer*' value configured at UE.

As in general the PUCCH synchronisation is not time critical, the SS shall choose the next possible occasion for sending of the Timing Advance Command from expiry of the period onward (i.e. the SS shall not raise an error when sending of the Timing Advance Command is not possible at the calculated end of the period).

7.1.2.3.1.2 Grant allocation types

In general PUCCH synchronisation is configured at the SS for the different grant allocation types when the UE is in connected mode.

7.1.2.3.1.2.1 Grant allocation by RACH procedure

The UE gets assigned an uplink grant by the Random Access Response message being configured at the SS: Per default an UL grant as according to Table 7.1.2.3.3-1 is configured by TTCN.

7.1.2.3.1.2.2 Grant allocation type 1: Uplink grant triggered by SR

The SS gets configured to automatically assign an uplink grant when requested by the UE with a Scheduling Request (SR). The size of this UL grant is configured by TTCN, i.e. there is no requirement for SS implementation to determine the grant size but the configured value shall be used regardless of how much data the UE wants to send. The SS shall assign the UL grant within less than 10ms after it has received the scheduling requests.

7.1.2.3.1.2.3 Grant allocation type 2: Periodic uplink grant

The SS gets configured to assign uplink grants periodically irrespective of any Scheduling Request sent by the UE. The configuration specifies:

- the uplink grant size
- the periodicity: once, several times, continuous
- the period in number of slots (e.g. every slot, every second slot, etc.)

The first uplink grant transmitted is as specified in the explicit timing information. If timing information is "now" the SS selects the first suitable subframe for UL transmission.

The SS shall not assign any additional uplink grant due to a Scheduling Request sent by the UE.

7.1.2.3.1.2.4 Grant allocation type 3: Single uplink grant

Special case of Grant allocation type 2: Uplink grant is assigned only once.

7.1.2.3.1.2.5 Grant allocation type 4: Periodic uplink grant triggered by SR

Combination of Grant allocation type 1 and 2: Periodic uplink grant according to clause 7.1.2.3.1.2.3 is triggered by a Scheduling Request sent by the UE.

7.1.2.3.2 Determination of explicit uplink grants

7.1.2.3.2.1 Parameters

Similar as for the downlink the UE gets preconfigured with parameters for time and frequency domain and a particular UL transmission is addressed by DCI:

1. Time domain resource allocation:
   Similar parameters are defined for UL as for DL (see clause 7.1.2.2.1.1, TS 38.214 [22] clause 6.1.2.1).
2. Frequency domain resource allocation:
   Similar as for the DL there is resource allocation type 0 and 1 for the UL (see clause 7.1.2.2.1.2, TS 38.214 [22] clause 6.1.2.2).
   Uplink resource allocation type 1 is assumed to be used for signalling conformance testing.
3. DCI parameters:
   Similar parameters are defined for UL as for DL (see clause 7.1.2.2.1.3, TS 38.212 [20] clauses 7.3.1.1.1 and 7.3.1.1.2, TS 38.214 [22] clause 6.1).

In detail for a particular uplink grant the parameters listed in tables 7.1.2.3.2.1-1 and 7.1.2.3.2.1-2 need to be considered.

Table 7.1.2.3.2.1-1: Parameters affecting TBS determination

Parameter	Comment/Description	Reference
Number of RBs in frequency domain	Indicated by DCI	
Number of symbols in time domain	Pre-configured at UE, selected by DCI; corresponds to “Duration in symbols” TS 38.211 [19] clause 6.4.1.1.3	
MCS index I_{MCS}	Indicated by DCI: Modulation Order $\mathbf{Q_m}$, Target code Rate **R**	TS 38.214 [22] clause 6.1.4.1; TS 38.214 [22] Table 5.1.3.1-1, 5.1.3.1-2, 6.1.4.1-1
Number of layers **υ**	The number of layers being used for transmission of a transport block can be derived from the precoding information and the antenna port configuration provided by DCI format 0_1. For DCI format 0_1 in general υ = 1 according to TS 38.508-1 [5] Table 4.3.6.1.1.2-1. For DCI format 0_0 υ = 1 is assumed.	TS 38.214 [22] clause 6.1.1.1, TS 38.211 [19] clause 6.3.1.5, TS 38.212 [20] clause 7.3.1.1.2 and tables Table 7.3.1.1.2-2..5
PUSCH Parameters mcs-Table, mcs-TableTransformPrecoder, transformPrecoder	Pre-configured at the UE via RRC signalling: PUSCH-Config.mcs-Table := {qam64, qam256}; PUSCH-Config.mcs-TableTransformPrecoder := {qam64, qam256}; PUSCH-Config.transformPrecoder := {enabled, disabled}; indicates which MCS table to be applied NOTE: qam256 is applicable only when DCI format 0_1 is used.	TS 38.214 [22] clause 6.1.4.1
Support of pi/2 BPSK modulation	In case of transformPrecoder==enabled and mcs-TableTransformPrecoder,==qam64 the first two entries of TS 38.214 [22] Table 6.1.4.1-1 depend on whether or not the UE supports pi/2 BPSK modulation.	TS 38.214 [22] clause 6.1.4.1
Number of REs per PRB	Number of REs per PRB which are applicable for the PUSCH transmission	Table 7.1.2.3.2.1-2

Table 7.1.2.3.2.1-2: Parameters affecting number of REs allocated for PUSCH per PRB

Parameter	Comment/Description	Reference
PUSCH mapping type	Type A or B	TS 38.211 [19] clause 6.4.1.1.3
dmrs-Type	DMRS Configuration type 1 or 2 as indicated to the UE by DMRS-UplinkConfig.dmrs-Type	TS 38.211 [19] clause 6.4.1.1.3
dmrs-AdditionalPosition	Number of additional DMRS positions: For DCI format 0_1 as indicated to the UE by DMRS-UplinkConfig.dmrs-AdditionalPosition: 0, 1, 2 or 3 additional positions. For DCI format 0_0 according to TS 38.214 [22] clause 6.2.2 the UE shall assume dmrs-AdditionalPosition='pos2' when frequency hopping is disabled and dmrs-AdditionalPosition='pos1' when frequency hopping is enabled.	TS 38.211 [19] clause 6.4.1.1.3and tables 6.4.1.1.3-3/4, TS 38.214 [22] clause 6.2.2
maxLength	Number of OFDM symbols used for DMRS: For DCI format 0_1 as indicated to the UE by DMRS-UplinkConfig.maxLength: Single or double symbol DM-RS. For DCI format 0_0 according to TS 38.214 [22] clause 6.2.2 single symbol DM-RS is applied.	TS 38.211 [19] clause 6.4.1.1.3 and table 6.4.1.1.3-5, TS 38.214 [22] clause 6.2.2
number of CDM groups without data	The maximum number of CDM groups without data depends on the DMRS Configuration type (dmrs-Type): type 1: up to 2 CDM groups (TS 38.211 [19] Table 6.4.1.1.3-1) type 2: up to 3 CDM groups (TS 38.211 [19] Table 6.4.1.1.3-2) For DCI format 0_1 the number of CDM groups without data for a single transmission is determined by the antenna port configuration provided in the DCI (TS 38.212 [20] tables 7.3.1.1.2-6..23) For DCI format 0_0 according to TS 38.214 [22] clause 6.2.2 for PUSCH duration > 2 the UE shall assume that the number of DM-RS CDM groups without data is 2 (what results in PUSCH not being present in any symbol carrying DM-RS); for PUSCH duration = 2 the number of DM-RS CDM groups without data is 1.	TS 38.211 [19] clause 6.4.1.1.3, TS 38.212 [20] clause 7.3.1.1.2 and tables 7.3.1.1.2-6..23, TS 38.214 [22] clause 6.1.4.2 and 6.2.2
xOverhead	Number of REs used for additional overhead as indicated to the UE by PUSCH-ServingCellConfig.xOverhead: 0, 6, 12, 18 REs	TS 38.214 [22] clause 6.1.4.2
PUSCH duration	Number of symbols allocated for the PUSCH transmission by DCI	

The number of REs for DMRS and PDSCH per PRB is determined in the same way for UL as for DL (TS 38.211 [19] clause 7.4.1.1.2) ⇒ The same values are applicable for UL and DL (see Table 7.1.2.2.4.1-4).

7.1.2.3.2.2 Determination of I_{MCS} and L_{RBs} for given TBS

Uplink grant assignments are fully controlled by TTCN, i.e. it is up to the TTCN to determine the values of I_{MCS} and L_{RBs} to achieve the TBS specified in a test case prose.

Annex B.2 may be used to select a valid pair of $\{L_{RBs}; I_{MCS}\}$, based on the following assumptions (unless stated otherwise for a specific table):

- Number of layers $\upsilon = 1$
- PUSCH mapping type A (as according to PUSCH-TimeDomainResourceAllocationList and PUSCH-Config in TS 38.508-1 [5])
- dmrs-Type: type1

- maxLength: single symbol DM-RS
- xOverhead = 0

The NR TBS tables for uplink grants in annex B.2 are based on the TS 38.508-1 [5] default configurations outlined in Tables 7.1.2.3.2.2-1 and 7.1.2.3.2.2-2 below.

Table 7.1.2.3.2.2-1: TS 38.508-1 [5] default configurations for DCI format 0_0 affecting UL scheduling

Parameter	Value	Reference(s)
MCS index table	table 5.1.3.1-1 (MCS index table 1)	TS 38.214 [22] clause 6.1.4.1 with DCI format 0_0, transform precoding disabled as per TS 38.508-1 [5] Table 4.6.3-97 (*RACH-ConfigCommon.msg3-transformPrecoder*)
dmrs-AdditionalPosition	2	Table 7.1.2.3.2.1-2 with DCI format 0_0, no frequency hopping as per TS 38.508-1 [5] Table 4.3.6.1.1.1-1
number of CDM groups	2	Table 7.1.2.3.2.1-2 with DCI format 0_0, transform precoding disabled as per TS 38.508-1 [5] Table 4.6.3-97 (*RACH-ConfigCommon.msg3-transformPrecoder*)
PUSCH duration in symbols	14	TS 38.508-1 [5] Tables 4.6.3-90 (PUSCH-ConfigCommon) and 4.6.3-93 (PUSCH-TimeDomainResourceAllocationList) and DCI format with “Time domain resource assignment”=0

Table 7.1.2.3.2.2-2: TS 38.508-1 [5] default configurations for DCI format 0_1 affecting UL scheduling

Parameter	Value	Reference(s)
MCS index table	table 5.1.3.1-1 (MCS index table 1)	TS 38.214 [22] clause 6.1.4.1 with DCI format 0_1, transform precoding disabled as per TS 38.508-1 [5] Table 4.6.3-89 (*PUSCH-Config.transformPrecoder*)
dmrs-AdditionalPosition	1 (FR1) 0 (FR2)	TS 38.508-1 [5] Table 4.6.3-37 (DMRS-UplinkConfig)
number of CDM groups	1	according to antenna port configuration (TS 38.508-1 [5] Table 4.3.6.1.1.2-1)
PUSCH duration in symbols	14	TS 38.508-1 [5] Tables 4.6.3-90 (*PUSCH-ConfigCommon*) and 4.6.3-93 (*PUSCH-TimeDomainResourceAllocationList*) and DCI format with “Time domain resource assignment”=0

NOTE: Configuration according to Table 7.1.2.3.2.2-2 with PUSCH duration of 14 symbols and one CDM group results in the same TBS sizes for dmrs-AdditionalPosition=0 and dmrs-AdditionalPosition=1 as according to step 1 of TS 38.214 [22] clause 5.1.3.2 the number of resource elements allocated for PDSCH per resource block is limited by 156.
⇒ The transport block sizes corresponding to Table 7.1.2.3.2.2-2 are the same for FR1 and FR2.

7.1.2.3.3 Default grants

In general test cases for layer 3 and above do not need test case specific grants but use default grants as listed in table 7.1.2.3.3-1.

Table 7.1.2.3.3-1: Default grants

Purpose	Grant size (NOTE 1) or $\{L_{RBs}\ I_{MCS}\}$ pair	Comment
Scheduling of Random Access Msg3, initial access	256 bits (NOTE 2)	grant provided by Random Access Response (Msg2)
Scheduling of Random Access Msg3, handover	48 bits (NOTE 2, 3)	grant provided by Random Access Response (Msg2)
Random Access Msg4 for C-RNTI based CBRA for synchronisation (e.g. ENDC)	$L_{RBs} = 1$, $I_{MCS} = 0$	minimum grant (24 or 32 bits)
Random Access Msg4 for C-RNTI based CBRA for handover	128 bits (NOTE 4)	initial UL grant after handover
Default USS grant	$L_{RBs} = 24$, $I_{MCS} = 9$ (NOTE 5)	default grant: e.g. for test cases with main focus on control plane signalling

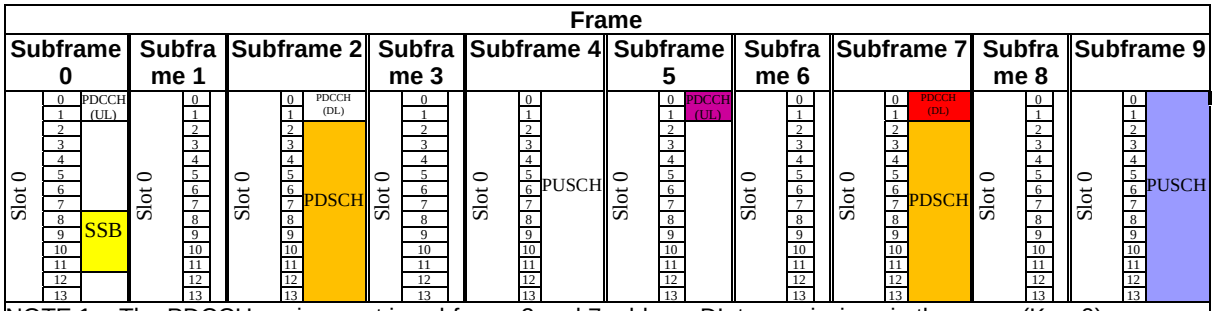
NOTE 1: In general for a given grant size TTCN uses the $\{L_{RBs}\ I_{MCS}\}$ pair according to annex B.2.
NOTE 2: According to TS 38.213 [21] subclause 8.3, the RAR UL grant is always interpreted according to DCI format 0_0, so contents of Table 7.1.2.3.2.2-1 apply.
NOTE 3: Minimum grant which can be assigned by the Random Access Response: The grant is sufficient to convey C-RNTI (3 bytes) and short BSR (2 bytes) or long BSR (minimum of 3 bytes). Even with short BSR there is not enough space to convey any segment of the RRCReconfigurationComplete (at least 6 bytes: 2 bytes MAC header + 3 bytes RLC header + 1 byte payload).
NOTE 4: Initial grant of RA procedure big enough to completely convey the RRCReconfigurationComplete (10 bits). This requires a minimum of 13 bytes (2 bytes MAC header + 3 bytes RLC header + 6 bytes PDCP header + 2 bytes payload). Additionally an optional PHR MAC element (3 bytes) needs to be considered since the PHR has higher priority than the MAC SDU. Any further user data would require a minimum of 6 additional bytes (2 bytes MAC header + 3 bytes RLC header + 1 byte payload, it is assumed that if UE has any data to transmit that will be on AM DRB).
NOTE 5: Applicable only when MCS index table 5.1.3.1-1 or 6.1.4.1-1 is configured to be used for UL grants (e.g. in case of mcs-Table = qam256, a different I_{MCS} value needs to be defined)

7.1.2.4 Data scheduling

As according to TS 38.508-1[5] the SSB periodicity is set to 20ms, TTCN configures the SS to broadcast the SSB burst in half-frame 0 of frames with even SFN.

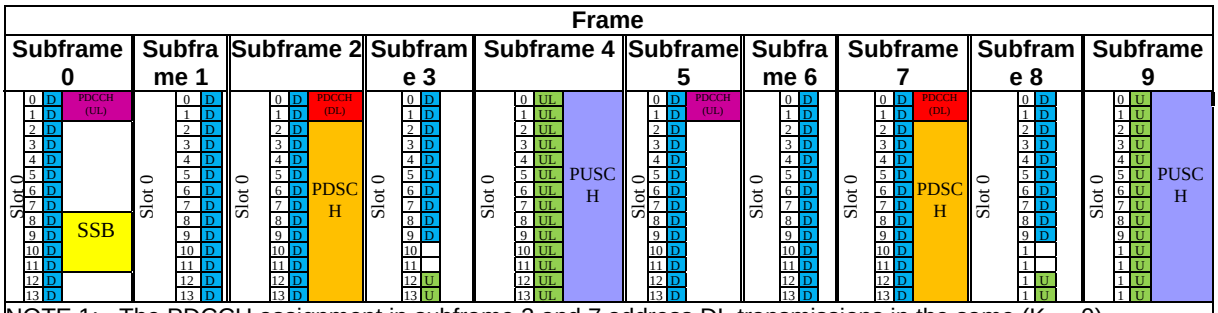
For scheduling of DL data or UL Grant, when timing information is explicit, the timing provided by TTCN corresponds to the time at which the SS shall transmit to the UE the PDCCH carrying the DCI message. The data scheduling applied by TTCN is specified in Tables 7.1.2.4-1 to 7.1.2.4-4.

Table 7.1.2.4-1: Data scheduling for FR1: FDD, SCS=15kHz



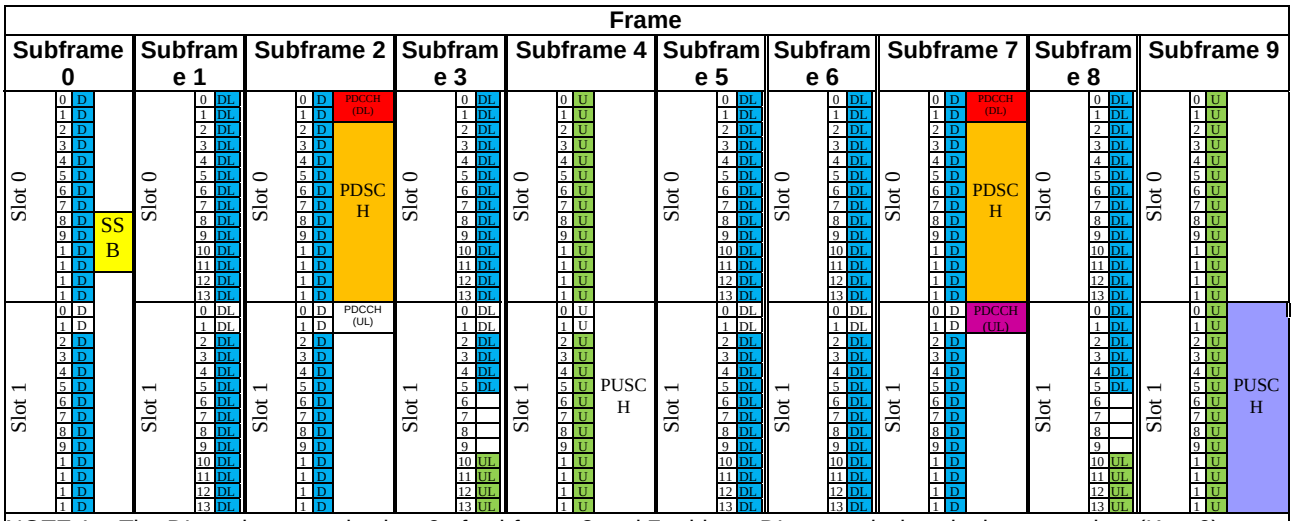
NOTE 1: The PDCCH assignment in subframe 2 and 7 address DL transmissions in the same (K_0 = 0).
NOTE 2: The UL grants in subframe 0 and 5 address UL transmissions in subframe 4 and 9 respectively (K_2 = 4).

Table 7.1.2.4-2: Data scheduling for FR1: TDD, SCS=15kHz



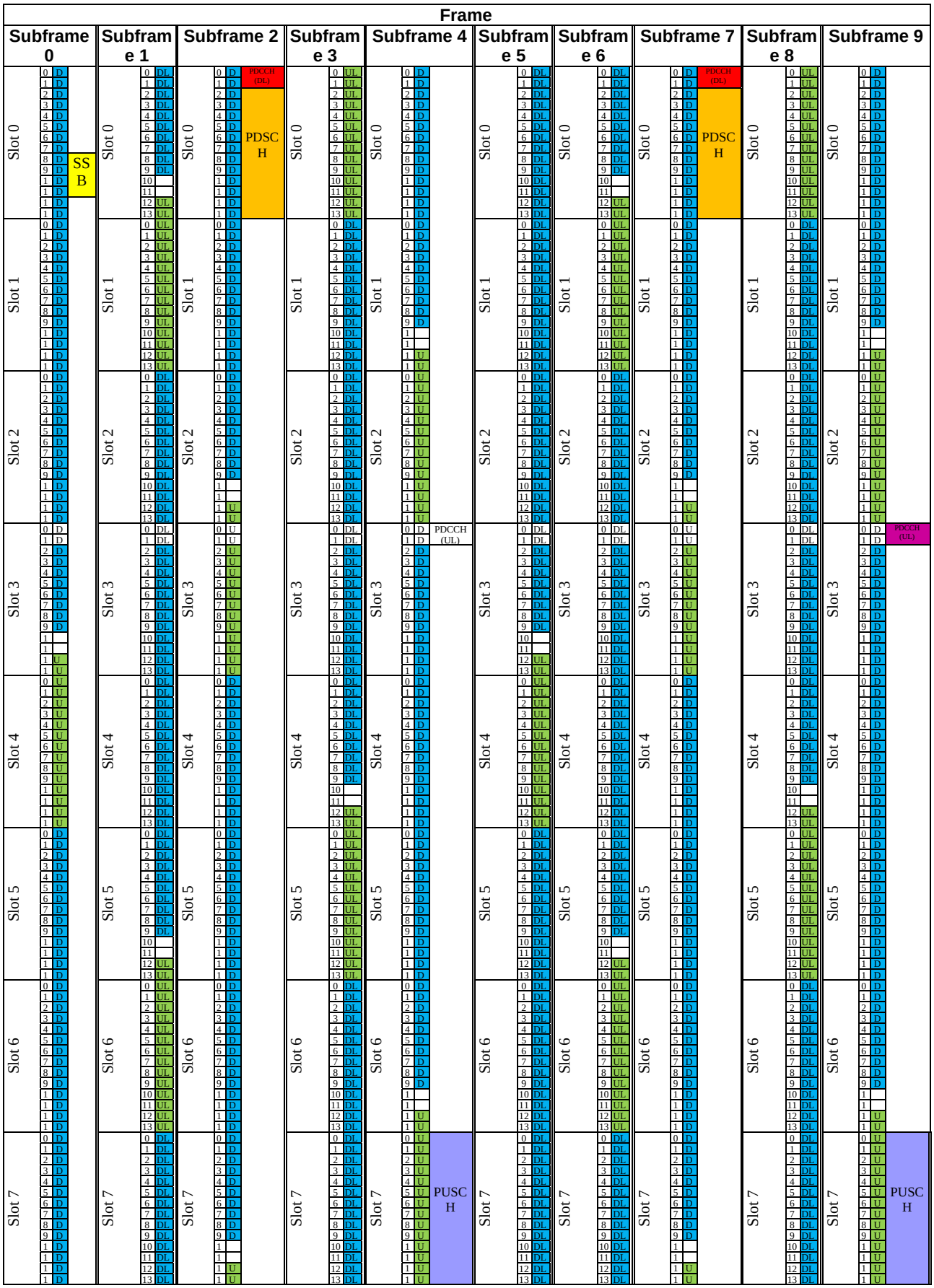
NOTE 1: The PDCCH assignment in subframe 2 and 7 address DL transmissions in the same (K_0 = 0).
NOTE 2: The UL grants in subframe 0 and 5 address UL transmissions in subframe 4 and 9 respectively (K_2 = 4).

Table 7.1.2.4-3: Data scheduling for FR1: TDD, SCS=30kHz



NOTE 1: The DL assignments in slots 0 of subframe 2 and 7 address DL transmissions in the same slots (K_0 = 0).
NOTE 2: The UL grants in slots 1 of subframe 2 and 7 address UL transmissions in slot 1 of subframe 4 and 9 respectively (K_2 = 4).

Table 7.1.2.4-4: Data scheduling for FR2



NOTE 1: The DL assignments in slots 0 of subframe 2 and 7 address DL transmissions in the same slots ($K_0 = 0$).
NOTE 2: The UL grants in slots 3 of subframe 4 and 9 address UL transmissions in slot 7 of the same subframe ($K_2 = 4$).

7.1.3 System information

TTCN provides the MIB message to the SS as a structured ASN.1 type using a control ASP (NR_SYSTEM_CTRL_REQ). The SS shall:

- set the *systemFrameNumber* in the MIB to the 6 MSBs of the current SFN. A dummy value is provided by TTCN. The SS shall convey the 4 LSBs of the current SFN in the PBCH transport block. The SS shall fulfil current SFN mod 80 = 0.
- encode the MIB ASN.1 message as specified in Table 8.1-1.
- transmit the encoded MIB message periodically as specified in TS 38.331 [16]. For each transmission, the SS shall update *systemFrameNumber* value as specified above.

7.1.4 Cell(s) handling

7.1.4.1 Multi-cells environment

The same principles and rules are applied as according to clause 7.4.5 of TS 36.523-3 [12] to both E-UTRA and NR cells.

7.1.4.2 Cell power change

The same principles and rules are applied as according to clause 7.4.2 of TS 36.523-3 [12].

7.1.5 Timing aspects

7.1.5.1 SS time

The SS shall provide one system time common across all RATs and cells being configured in a test case. The timing of each configured cell is specified as an offset to this common system time.

7.1.5.2 Cell(s) timing

The timing of E-UTRA cells is specified in TS 36.523-3 [12] subclause 7.4.3.1.

The DL timing of each NR cell is specified in Table 7.1.5.2-1.

Table 7.1.5.2-1: DL timing parameters of simulated NR cells

NR cell Id	H-SFN-offset (note1)	SFN-offset (note2)	Tcell (note3)	Tc-offset (note4)
NR Cell 1	0	0	0	0
NR Cell 2	0	124	0	0
NR Cell 3	0	257	0	0
NR Cell 4	0	1000	0	0
NR Cell 6	0	657	0	0
NR Cell 10	0	129	0	0
NR Cell 11	0	957	0	0
NR Cell 12	0	1015	0	0
NR Cell 13	0	890	0	0
NR Cell 14	0	680	0	0
NR Cell 23	0	383	0	0
NR Cell 28	0	890	0	0
NR Cell 29	0	680	0	0
NR Cell 30	0	1015	0	0
NR Cell 31	0	52	0	0

NOTE1: H-SFN-offset corresponds to the offset applied on H-SFN as defined for E-UTRA. It shall be set to 0 for an NR cell.
NOTE2: SFN-offset corresponds to the offset applied on system frame number (0 .. 1023).
NOTE3: Tcell corresponds to the timing offset in T_s. T_s = 1/(15000 * 2048) as for E-UTRA.
NOTE4: Tc-offset corresponds to the timing offset in T_c. $\kappa = T_s/T_c = 64$ with T_c = 1/(480000 * 4096). See TS 38.211 [19] subclause 4.1 and TS 36.211 [23] subclause 4).

The UL timing of each NR cell is configured as an offset (timing advance) to its DL timing. By default, the timing advance is initialised to 0 (unless specifically specified otherwise in the test case prose).

7.2 EN-DC

7.2.1 Introduction

Subclause 7.2 specifies test methods and design considerations that are specific to EN-DC.

7.2.2 Physical layer aspects

7.2.2.1 Search spaces and DCI

For EN-DC test cases, TTCN provides the DCI configuration only for the following PDCCH search spaces on the active DL BWP:

- Type1-PDCCH common search space: used for the Random Access procedure on the NR cell, and
- UE specific search space (UL and DL): used for data exchange in RRC_CONNECTED state on the NR cell.
  - For the default NR cell operation, TTCN configures DCI formats 0_0 and 1_0 in the SS.

7.2.3 System information

For EN-DC only MIB is configured and broadcast. SIB1 (RMSI) and Other SI are not configured.

7.2.4 Bearers

From a 3GPP network perspective, each bearer (MCG, SCG and split bearer) can be terminated either in MN or in SN.

From a EN-DC Test Model and PTC architecture perspective however, there is no dependency between the PTC on which the NR PDCP of a bearer is configured and the type of bearer (MN terminated or SN terminated), e.g. an SCG bearer may have its NR PDCP configured on the NR PTC and act as a MN terminated bearer.

7.2.5 Random Access procedure

In EN-DC, when *reconfigurationWithSync* is indicated by RRC signalling, the UE performs a Random Access procedure, which is either contention free (CFRA) or contention based (CBRA) with C-RNTI based contention resolution. This is distinguished by whether or not *RACH-ConfigDedicated* is provided in the *reconfigurationWithSync* field of *CellGroupConfig*.

TTCN configures the SS accordingly, and in case of CBRA with C-RNTI based contention resolution, the UE gets a temporary C-RNTI being different than the C-RNTI the UE has got already and the UE gets an UL grant as according to Table 7.1.2.3.3-1.

7.2.6 PSCell change

7.2.6.1 Sequence of EN-DC NR inter-cell PSCell change

In general, the NR inter-cell PSCell change is done without activation time, i.e. the timing information for configuration of the SS and sending of the *RRCConnectionReconfiguration* is ‘Now'.

1. NR Target Cell: Configuration of SRB3 (if necessary) and DRBs
2. Transfer of the PDCP Count for DRBs and SRB3 (if necessary) from NR source to NR target cell:
   a) NR Source Cell: Get PDCP COUNT.
   b) NR Target Cell: Set PDCP COUNT.

NOTE 1: No further sending/receiving of DRB data before the PSCell change is done.

NOTE 2: For AM DRBs the PDCP count is maintained. For SRB3 (if applied) and UM DRBs, the PDCP count is maintained or reset depending on the *RRCConnectionReconfiguration* message content.

3. NR Target Cell: Inform the SS about the PSCell change and about the source cell id.
4. NR Target Cell: Configure RACH procedure either dedicated or C-RNTI based.
5. NR Target Cell: Activate security.
6. NR Target Cell: Configure UL grant configuration ("OnSR", default grant).

NOTE 3: Unless explicitly specified UL grant configuration keeps configured as per default at the NR source cell.

7. E-UTRA Cell: Send *RRCConnectionReconfiguration*.
8. E-UTRA Cell: Receive *RRCConnectionReconfigurationComplete*.
9. NR Target Cell: Inform the SS about completion of the PSCell change (e.g. to trigger PDCP STATUS REPORT PDU).
10. NR Source Cell: Release SRB3 (if necessary) and DRBs.

Editor’s note: DRX and measurement gap configurations are currently not included. FFS

7.2.6.2 Sequence of EN-DC NR intra-cell PSCell change

For EN-DC NR intra-cell PSCell change dedicated timing information is used: the sequence starts at time T with sending of the *RRCConnectionReconfiguration*. T is set to 300 ms in advance of the handover.

1. NR Cell before T: Get PDCP count for DRBs and SRB3 (if applied).
2. E-UTRA Cell at T: Send *RRCConnectionReconfiguration*.

3. NR Cell at T: Release SRB3 (if necessary) and DRBs.
4. NR Cell at T: Configure RACH procedure either dedicated or C-RNTI based.
5. NR Cell at T + 5ms: (Re-)configure SRB3 (if necessary) and DRBs.
6. NR Cell at T + 5ms: Restore the PDCP counts

NOTE 1: For AM DRBs the PDCP count is maintained. For SRB3 (if applied) and UM DRBs, the PDCP count is maintained or reset depending on the *RRCConnectionReconfiguration* message content.

7. NR Cell at T + 5ms: Re-establish security.
8. E-UTRA Cell (after step 2): Receive *RRCConnectionReconfigurationComplete*.
9. NR Cell (after step 6): Re-configure RACH procedure as for initial access.

Editor's note: DRX and measurement gap configurations are currently not included. FFS

7.2.6.3 UL grants used in RA procedure during EN-DC NR PSCell change

An UL grant is assigned to the UE by the RAR and in case of CBRA with C-RNTI based contention resolution, another UL grant, as initial grant, is assigned for contention resolution. The default Random Access procedure specified in clause 7.2.5 is applied.

7.3 NR/5GC

7.3.1 Introduction

Subclause 7.3 specifies test methods and design considerations that are specific to NR/5GC.

7.3.2 Physical layer aspects

7.3.3 System information

7.3.3.1 General SS requirements

TTCN provides the complete system information and scheduling information to the SS as a structured ASN.1 type using a single control ASP (NR_SYSTEM_CTRL_REQ). The following rules apply:

- The system information is sent to SS using the asn.1types. The SS shall encode each SI message as specified in Table 8.1-1 and add the necessary padding bits as specified in TS 38.331 [16], clause 8.5.
- The SS shall start scheduling all system information from the same SFN.
- The scheduling information sent to SS is the same as the scheduling information sent to the UE. For each SI message, the slotOffset list in NR_SYSTEM_CTRL_REQ indicates the exact point in time in the SI-window at which SS shall transmit of the related SI to the UE.

7.3.3.2 Scheduling information

The maximum number of resource blocks as defined in table 7.3.3.2-1 are used to broadcast the system information.

Table 7.3.3.2-1: Maximum number of resource blocks

	Maximum number of resource blocks assigned	Number of symbols assigned
SIB1	7	12
for all SIs	7	12

The slot offset values defined in Table 7.3.3.2-1A are used for all SI messages with their respective SI-window.

Table 7.3.3.2-1A: SubframeOffset values

Configuration	subframeOffset list
FR1 FDD & TDD SCS=15kHz	{5, 6, 15, 16}
FR1 TDD SCS=30kHz	{5, 6}
FR2 TDD SCS=120kHz	{5}

All System Information messages are sent only once within the SI-window and redundancy version 0 is selected.

SIB1 is broadcasted in slot#1 in frames with even SFN.

Tables 7.3.3.2-2 to 7.3.3.2-4 give the SFN's and subframe numbers in which the MIB, SIB1 and other SIs are actually scheduled as per default parameters for si-WindowLength s80 for FR1 and s160 for FR2, periodicity for SI are defined in TS 38.508-1 [5].

Table 7.3.3.2-2: MIB, SIB1 and SI scheduling for FR1: FDD and TDD, SCS=15kHz

SFN	Frame									
0	Subframe 0	Subframe 1	Subframe 2	Subframe 3	Subframe 4	Subframe 5	Subframe 6	Subframe 7	Subframe 8	Subframe 9
	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0 SI1	SI0 SI1	SI0	SI0	SI0
1	SI0	SI0	SI0	SI0	SI0	SI0 SI1	SI0 SI1	SI0	SI0	SI0
2	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
3	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
4	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
5	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
6	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
7	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
8	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0 SI2	SI0 SI2	SI0	SI0	SI0
9	SI0	SI0	SI0	SI0	SI0	SI0 SI2	SI0 SI2	SI0	SI0	SI0
10	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
11	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
12	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
13	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
14	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
15	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
16	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0 SI3	SI0 SI3	SI0	SI0	SI0
17	SI0	SI0	SI0	SI0	SI0	SI0 SI3	SI0 SI3	SI0	SI0	SI0
18	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
19	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
20	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
21	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
22	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
23	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
24	SI0 MIB	SI0 SIB1	SI0	SI0	SI0	SI0 SI4	SI0 SI4	SI0	SI0	SI0
25	SI0	SI0	SI0	SI0	SI0	SI0 SI4	SI0 SI4	SI0	SI0	SI0

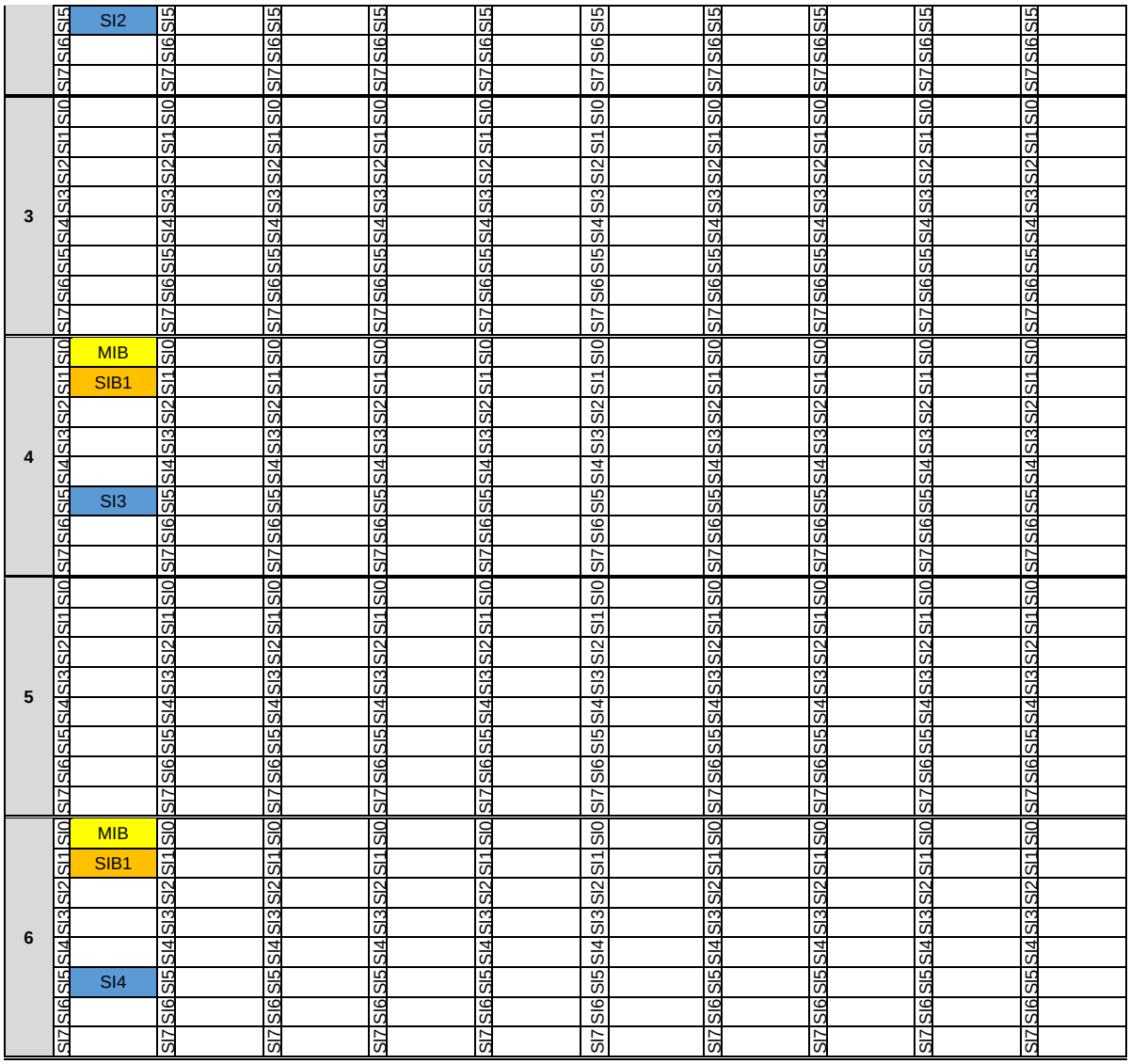
Table 7.3.3.2-3: MIB, SIB1 and SI scheduling for FR1 TDD, SCS=30kHz

SFN	Frame									
0	Subframe 0	Subframe 1	Subframe 2	Subframe 3	Subframe 4	Subframe 5	Subframe 6	Subframe 7	Subframe 8	Subframe 9

	SI0	MIB	SI0		SI0		SI0	SI1	SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo	SI1	SIo		SIo		SI1		SI1		SI1		SI1		SI1	
1	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
2	SI0	MIB	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo		SIo		SIo		SI1		SI1		SI1		SI1		SI1	
3	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
4	SI0	MIB	SI0		SI0		SI0	SI2	SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo	SI2	SIo		SIo		SI1		SI1		SI1		SI1		SI1	
5	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
6	SI0	MIB	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo		SIo		SIo		SI1		SI1		SI1		SI1		SI1	
7	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
8	SI0	MIB	SI0		SI0		SI0	SI3	SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo	SI3	SIo		SIo		SI1		SI1		SI1		SI1		SI1	
9	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
10	SI0	MIB	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo		SIo		SIo		SI1		SI1		SI1		SI1		SI1	
11	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
12	SI0	MIB	SI0		SI0		SI0	SI4	SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo	SI4	SIo		SIo		SI1		SI1		SI1		SI1		SI1	
13	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	
14	SI0	MIB	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1	SIB1	SIo		SIo		SIo		SIo		SI1		SI1		SI1		SI1		SI1	
15	SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0		SI0	
	SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1		SI1	

Table 7.3.3.2-4: MIB, SIB1 and SI scheduling for FR2: TDD, SCS=120kHz

SFN	Frame									
	Subframe 0	Subframe 1	Subframe 2	Subframe 3	Subframe 4	Subframe 5	Subframe 6	Subframe 7	Subframe 8	Subframe 9
0	SI0 MIB	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
	SI1 SIB1	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1
	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2
	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3
	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4
	SI5 SI1	SI5	SI5	SI5	SI5	SI5	SI5	SI5	SI5	SI5
	SI6	SI6	SI6	SI6	SI6	SI6	SI6	SI6	SI6	SI6
	SI7	SI7	SI7	SI7	SI7	SI7	SI7	SI7	SI7	SI7
1	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1
	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2
	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3
	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4
	SI5	SI5	SI5	SI5	SI5	SI5	SI5	SI5	SI5	SI5
	SI6	SI6	SI6	SI6	SI6	SI6	SI6	SI6	SI6	SI6
	SI7	SI7	SI7	SI7	SI7	SI7	SI7	SI7	SI7	SI7
2	SI0 MIB	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0	SI0
	SI1 SIB1	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1	SI1
	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2	SI2
	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3	SI3
	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4	SI4



7.3.3.3 System information modification

For system information modification, the same rules as defined in clause 7.3.3.1 and 7.3.3.2 are applied.

The SFN for the start of modification period is calculated by TTCN. The modified system information and the calculated SFN are provided in the ASP NR_SYSTEM_CTRL_REQ. When the cell is switched off, 'activateNow' is used.

The updated SI other than ETWS and CMAS, is broadcasted in the modification period following the one where SI change indication is transmitted. The updated SI for ETWS and CMAS is broadcasted in the same modification period as the one where SI change indication is transmitted. Short message indications are transmitted as follows:

- When UE is in RRC_IDLE or in RRC_INACTIVE, a single Short Message indication is transmitted in UE paging occasions of the modification period. With the default values provided in TS 38.508-1[5], this results in 4 Short Messages transmitted by SS during the modification period.

- When UE is in RRC_CONNECTED, Short Message indications are transmitted in every paging occasions of each frame throughout the modification period. With the default values provided in TS 38.508-1[5], this results in 128*4*2 Short Messages transmitted by SS during the modification period.

7.3.3.4 Request for on demand system information

In case PRACH preamble (Msg1) is used for indication of requested other SI:

- TTCN configures SS with the SI-RequestConfig as provided to UE in SIB1 and SS shall monitor these PRACH resources.
- TTCN configures SS to report PRACH preambles and to transmit Random Access Response (Msg2) as response to Msg1 but not to handle contention resolution.
- TTCN may reconfigure SS to stop broadcasting a specific SI from the start of a modification period and may reconfigure SS to restart broadcasting the SI from the start of a repetition period.

Editor's note: Timing to restart broadcasting SI depends on the timing of the test case prose. FFS

In case Msg3 is used for indication of requested other SI:

- TTCN configures the SS to transmit a Msg4 with Contention Resolution Identity upon receipt of *RRCSystemInfoRequest* (Msg3).
- TTCN may reconfigure SS to stop broadcasting a specific SI from the start of a modification period and may reconfigure SS to restart broadcasting the SI from the start of a repetition period.

Editor's note: Timing to restart broadcasting SI depends on the timing of the test case prose. FFS

7.3.4 Paging and Short Message

SS can be configured with a DCI including Short Messages. In that case, when SS is triggered to transmit a *Paging* message, the Short Message indication shall be included in the DCI.

SS can be triggered to transmit Short Messages alone, this is achieved in TTCN with the DciTrigger type. SS is triggered to send the *Paging* message or a Short Message indication at a calculated Paging Occasion provided in the activation time and optionally a list slot offsets when multiple paging occasions are applied. Discontinuous Reception (DRX) is applied for the transmission of a *Paging* message or a Short Message indication to the UE in the RRC_IDLE or RRC_INACTIVE states. The paging frame calculation is according to TS 38.304 [24] clause 7. The following default values are provided in TS 38.508-1[5]:

- defaultPagingCycle = 128
- Ns = one
- N = two
- PF_Offset = 1

When these default values are applied, the Paging Frame calculation is:

- Paging Frame: (SFN +1) mod 128 =64*(UE_ID mod 2) so depending on UE_ID, the Paging Frame is set to 63 or 127 of the paging cycle.

When UE is in RRC_IDLE or RRC_INACTIVE and when PDCCH monitoring occasions with default association is applied, the Paging Occasion is set to slot#2 of the Paging Frame.

When UE is in RRC_CONNECTED and when PDCCH monitoring occasions with default association is applied, the Paging Occasion is set to slot#1 and slot#2 of the Paging Frame.

7.3.5 RRC connection control

7.3.5.1 Early contention resolution

When the contention based RACH procedure is being executed (RRC connection establishment, RRC reconfiguration or RRC connection resume), in general the UE Contention Resolution Identity MAC CE and the DL RRC PDU on DL CCCH (*RRCSetup*/*RRCReject*/*RRCSystemInfoRequest*) or DL DCCH (*RRCResume*) are sent in one MAC PDU (RA Msg4). This is achieved by pre-configuring the SS (before the start of the RRC procedure) to send the encoded DL message and UE Contention Resolution Identity MAC CE in one MAC PDU.

There are cases however where it is necessary to send the DL CCCH or DL DCCH message separately from RA Msg4, this is implemented in TTCN using the test case attribute EarlyContentionResolution:

- RRC connection establishment: when *RRCSetup* message is part of the test purpose,
- RRC connection reject: when *RRCReject* message is part of the test purpose,
- RRC connection resume: when *RRCResume* message is part of the test purpose,
- Special cases: e.g. when no contention resolution shall be sent according to the test purpose.

7.3.5.2 RRC connection release sequence

According to TS 38.331 [19], clause 5.3.8.3, after reception of the *RRCRelease* message the UE may either wait 60 ms or for indication of acknowledgement from lower layer. After the *RRCRelease* message there are cases where the UE may immediately come up with an *RRCSetupRequest* message. This requires scheduled release of resources at the SS:

1. At T: Send *RRCRelease*, stop UL grants.
2. At T + 5ms: Release security.
3. At T + 10ms: Release DRX configuration at the SS.
4 At T + 15ms: Release measurement gap configuration at the SS.
5. At T + 55ms: Release SRBs and DRBs.
6. At T + 60ms: (Re-)configure SRBs.
7. Delay of 840ms (NOTE)

T is set to 300ms in advance of *RRCRelease*.

NOTE: The delay ensures that the UE is camping on the serving cell again to avoid side effects e.g. due to subsequent power level changes. It does not affect any sending of messages by the UE. The delay 840 ms is chosen to ensure the UE is re-camping on the cell and has read relevant system information (MIB, SIB1 and all other SIs).

7.3.5.3 Handover

7.3.5.3.1 Sequence of intra-NR inter-cell handover

In general, the intra-NR inter-cell handover is done without activation time, i.e. the timing information for configuration of the SS and sending of the *RRCReconfiguration* is ‘Now'.

The sequence may be interrupted if other events need to be handled. E.g. when a Mobility procedure is performed in the target cell and there are procedures left to be executed on the source cell.

1. Target Cell: Configuration of DRBs
2. Transfer of the PDCP Count for AM DRBs and SRBs (if applied) from source to target cell:
   a) Source Cell: Get PDCP COUNT.
   b) Target Cell: Set PDCP COUNT.

NOTE 1: No further sending/receiving of DRB data before the HO is done.

NOTE 2: For AM DRBs the PDCP count is maintained, for UM DRBs the PDCP count is reset. For SRBs, the PDCP count is maintained or reset depending on the *RRCReconfiguration* message content.

3. Target Cell: Inform the SS about the HO and about the source cell id.
4. Target Cell: Configure RACH procedure either dedicated or C-RNTI based.
5. Target Cell: Activate security.
6. Target Cell: Configure DRX (if necessary).

7. Source Cell: Stop periodic TA.

NOTE 3: Unless explicitly specified UL grant configuration keeps configured as per default at the source cell.

8. Target Cell: Configure UL grant configuration ("OnSR", periodic TA is not started).
9. Source Cell: Send *RRCReconfiguration*.
10. Target Cell: Receive *RRCReconfigurationComplete*.
11. Target Cell: Start periodic TA.
12. Target Cell: Inform the SS about completion of the HO (e.g. to trigger PDCP STATUS REPORT PDU).
13. Target Cell: Re-configure RACH procedure as for initial access.
14. Target Cell: Configure measurement gap configuration (if necessary).
15. Source Cell: Reset SRBs and release DRBs.
16. Source Cell: Release DRX and MeasGapConfig configuration.

Editor's note: DRX and measurement gap configurations are currently FFS

7.3.5.3.2 Sequence of intra-NR intra-cell handover

For intra-NR intra-cell handover dedicated timing information is used: the sequence starts at time T with sending of the *RRCReconfiguration*. T is set to 300 ms in advance of the handover.

1. Before T: Get PDCP count for AM DRBs and SRBs (if applied).
2. At T: Send *RRCReconfiguration*.
3. At T + 5ms: Release SRBs and DRBs.
4. At T + 5ms: Configure RACH procedure either dedicated or C-RNTI based.

NOTE 1: Since the RACH procedure may require a new C-RNTI to be used it cannot be configured before sending out the *RRCReconfiguration*.

5. At T + 5ms: Release MeasGapConfig configuration.
6. At T + 10ms: (Re-) configure SRBs and DRBs.
7. At T + 10ms: Set PDCP COUNT for AM DRBs and SRBs (if applied).

NOTE 2: For AM DRBs the PDCP count is maintained while for UM DRBs the PDCP count is reset. For SRBs, the PDCP count is maintained or reset depending on the *RRCReconfiguration* message content.

8. At T + 10ms: Re-establish security, disable TA transmission.
9. (after step 7) Receive *RRCReconfigurationComplete*.
10. (after step 8) Re-configure RACH procedure as for initial access, enable TA transmissions.

Editor's note: DRX and measurement gap configurations are currently FFS

7.3.5.3.3 UL grants used in RA procedure during handover

An UL grant is assigned to the UE by the RAR and in case of CBRA with C-RNTI based contention resolution another UL grant, as initial grant, is assigned for contention resolution.

When UL data is pending, the UE will try to put as much data into given grants as possible, i.e. it will segment the user data and send it e.g. with the initial grant if possible. To avoid this segmentation of user data, the grant assigned by RAR and the initial grant during handover are set according to Table 7.1.2.3.3-1.

8 Other SS requirements with TTCN-3 impact

8.1 Codec requirements

The SS shall comply with the requirements specified in TS 36.523-3 [12] subclause 8.1. In addition, the SS shall also comply with the codec requirements specified in Table 8.1-1.

Table 8.1-1: Codec requirements

Type definitions	Codec requirements	Encoding rule in TTCN-3
NR ASN.1 types used for RRC signalling	shall comply to TS 38.331 [16] subclause 8.3	UNALIGNED_PER_OctetAligned

8.2 External function definitions

The SS shall implement the external functions specified in TS 36.523-3 [12] subclause 8.2.

The following external functions shall also be implemented by the SS.

TTCN-3 External Function		
Name	**fx_NG_NasIntegrityAlgorithm**	
Description	Apply integrity protection algorithm on a given octetstring	
Parameters	NAS PDU	octetstring according to TS 24.501 [26], clause 4.4.3.3 this shall include octet 7 to n of the security protected NAS message, i.e. the sequence number IE and the NAS message IE
	Integrity Algorithm	4 bits as defined in TS 24.501 [26], clause 9.11.3.34
	$KNAS_{int}$	Integrity key
	NAS COUNT	as documented in TS 24.501 [26]
	BEARER Id	fix value of '00000'B for 3GPP access and '00001'B for non-3GPP access
	Direction	UL: 0 DL: 1 (acc. to TS 33.501 [25], clause D.3.1)
Return Value	Message Authentication Code (4 octets)	

TTCN-3 External Function		
Name	**fx_NG_NasCiphering**	
Description	Apply ciphering on a given octetstring	
Parameters	NAS PDU	octetstring
	Ciphering Algorithm	4 bits as defined in TS 24.501 [26], clause 9.11.3.34
	$KNAS_{enc}$	Ciphering Key
	NAS COUNT	as documented in TS 24.501 [26]
	BEARER Id	fix value of '00000'B for 3GPP access and '00001'B for non-3GPP access
Return Value	ciphered octet string	

TTCN-3 External Function		
Name	**fx_NG_NasDeciphering**	
Description	Apply deciphering on a given octetstring	
Parameters	ciphered NAS PDU	octetstring
	Ciphering Algorithm	4 bits as defined in TS 24.501 [26], clause 9.11.3.34
	$KNAS_{enc}$	Ciphering Key
	NAS COUNT	as documented in TS 24.501 [26]
	BEARER Id	fix value of '00000'B for 3GPP access and '00001'B for non-3GPP access
Return Value	deciphered octet string	

TTCN-3 External Function		
Name	**fx_EAP_KeyDerivationFunction**	
Description	The PRF' function for Hashing algorithms as defined in RFC 5448 [27] clause 3.4.1. The SHA-256 encoding algorithm is used as KEY Description Function	
Parameters	KDF	KDF_HMAC_SHA_256 (no other KDF defined yet)
	Key	bit key
	String	string being constructed acc. to5448 [27] clause 3.3
Return Value	1664 bit derived key	

9 IXIT proforma

9.1 Introduction

The partial IXIT proforma contained in the present document is provided for completion, when the related Abstract Test Suite(s) is(are) to be used against the Implementation Under Test (IUT).

The completed partial IXIT will normally be used in conjunction with the completed ICS, as it adds precision to the information provided by the ICS.

9.2 E-UTRA and EPC PIXIT

The PIXITs specified in TS 36.523-3 [12] subclause 9.1 apply. Additional PIXITs are also specified in Table 9.2-1.

Table 9.2-1: EUTRA_NR PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_ENDC_BandCombination	ENDC_BandCombination_Type	DC_1A_n28A		Band combination for EN-DC test case
px_ENDC_SecondayBandCombination	ENDC_BandCombination_Type	DC_1A_n77A		Secondary band combination for EN-DC test case

9.3 NR and 5GC PIXIT

Table 9.3-1: NR PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_NR_PrimaryBand	FreqBandIndicatorNR	1		NR primary band
px_NR_PrimaryBandDeltas	DeltaValues_Type			Δ(f) in dB for NR primary band test frequencies NRf1, NRf2, NRf3 and NRf4 (see Notes 2, 3)
px_NR_SecondaryBand	FreqBandIndicatorNR	2		NR secondary band
px_NR_SecondaryBandDeltas	DeltaValues_Type			Δ(f) in dB for NR secondary band test frequencies NRf1, NRf2, NRf3 and NRf4 (see Notes 2, 3)
px_NR_CipheringAlgorithm	CipheringAlgorithm	nea2		Ciphering Algorithm (see Note 1)
px_NR_IntegrityProtAlgorithm	IntegrityProtAlgorithm	nia2		Integrity Algorithm (see Note 1)
NOTE 1: Unless specified otherwise in the test case prose, the null algorithm shall not be used for verification. NOTE 2: Δ(f) is defined in TS 38.508-1 [5] subclause 6.1.3.4. NOTE 3: For some NR bands, less than 4 test frequencies are defined, see TS 38.508-1 [5] subclause 6.2.3.				

Table 9.3-2: 5GC PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_NAS_5GC_AuthenticationType	NAS_5GC_AKA_Type	AKA_5G	AKA_5G, AKAP_EAP	NAS 5GC Authentication type
px_NAS_5GC_XRES_Length	integer	16		NAS 5GC XRES length, in octets, used in Authentication
px_NAS_5GC_CipheringAlgorithm	B4_Type	'0010'B		NAS 5GC Ciphering Algorithm (see Note 1)
px_NAS_5GC_IntegrityProtAlgorithm	B4_Type	'0010'B		NAS 5GC Integrity Algorithm (see Note 1)
NOTE 1: Unless specified otherwise in the test case prose, the null algorithm shall not be used for verification.				

10 Postambles

10.1 Introduction

The purpose of the present clause 10 is to specify the postambles used to bring the UE to a well-defined state regardless of the UE state at the termination of main test body or of the SS conditions and values of the system information inherited from the test.

10.2 EN-DC

The postambles specified in TS 36.523-3 [12] subclause 10.3 are also applicable to EN-DC test cases.

10.3 NR/5GC

10.3.1 UE postamble states and procedures

In order to bring the UE to the switched/powered off state, a procedure needs to be executed, which depends on the UE state at the end of test case body. The UE postamble start states and associated procedures are shown in figure 10.3.1-1.

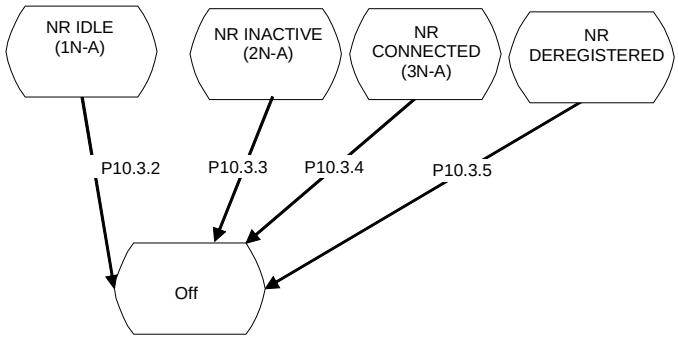


Figure 10.3.1-1: UE postamble states and procedures for NR/5GC

10.3.2 Switch/Power off procedure in State 1N-A

Table 10.3.2-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	Test procedure for Switch off / Power off in RRC_IDLE as specified in 38.508-1 [5] subclause 4.9.6.1	-	-

10.3.3 Switch/Power off procedure in State 2N-A

Table 10.3.3-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	Test procedure for Switch off / Power off in RRC_INACTIVE as specified in 38.508-1 [5] subclause 4.9.6.2		

10.3.4 Switch/Power off procedure in State 3N-A

Table 10.3.4-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	Test procedure for Switch off / Power off in RRC_CONNECTED as specified in 38.508-1 [5] subclause 4.9.6.3	-	-

10.3.5 Switch/Power off procedure in NR DEREGISTERED

Table 10.3.5-1: Switch/Power off procedure

Step	Procedure	Message Sequence	
		U - S	Message
1	Test procedure for Switch off / Power off in State DEREGISTERED as specified in 38.508-1 [5] subclause 4.9.6.4	-	-

Annex A (normative): Test Suites

This annex references the approved Test Suites, which accompany the present document. The Test Suites have been produced using the Testing and Test Control Notation version 3 (TTCN-3) according to ES 201 873 [4].

A.1 Baseline of specifications

Table A.1-1 lists the core specifications and test specifications, which the delivered Test Suites are based upon.

Table A.1-1: References of the test and core specifications

Type	Specification	Release	Version
Core specifications	TS 38.321 [13]	Note 1	Note 2
	TS 38.322 [14]	Note 1	Note 2
	TS 38.323 [15]	Note 1	Note 2
	TS 36.331 [17]	Note 1	Note 2
	TS 38.331 [16]	Note 1	Note 2
	TS 24.301 [18]	Note 1	Note 2
Test specifications	TS 36.508 [10]	Note 2	Note 2
	TS 36.509 [11]	Note 1	Note 2
	TS 38.508-1 [5]	Note 2	Note 2
	TS 38.508-2 [6]	Note 2	Note 2
	TS 38.509 [7]	Note 1	Note 2
	TS 38.523-1 [8]	Note 2	Note 2
	TS 38.523-2 [9]	Note 2	Note 2
NOTE 1: Latest release available, up to the release number of the present document. NOTE 2: Latest available.			

A.2 5GS Test Suites

A.2.1 EN-DC Test Suites

Table A.2.1-1 lists all approved test cases.

For a given test case, the following variants are distinguished (if applicable):

- FR1: FR1 NR frequency band in the NR cell(s).

- FR2: FR2 NR frequency band in the NR cell(s).

An "X" in columns FR1 or FR2 indicates the test case is approved for the respective variant.

Table A.2.1-1: EN-DC TTCN test cases

Test case	Description	FR1	FR2
7.1.2.2.1.ENDC	UM RLC / Segmentation and reassembly / 6-bit SN / Segmentation Info (SI) field	X	
7.1.2.2.2.ENDC	UM RLC / Segmentation and reassembly / 12-bit SN / Segmentation Info (SI) field	X	X
7.1.2.3.1.ENDC	AM RLC / 12-bit SN/Segmentation and reassembly / Segmentation Info (SI) field	X	
8.2.1.1.1.ENDC	UE capability transfer / Success / EN-DC	X	X
8.2.2.4.1.ENDC	PSCell addition, modification and release / SCG DRB / EN-DC	X	X
8.2.2.5.1.ENDC	PSCell addition, modification and release / Split DRB / EN-DC	X	X
8.2.2.9.1.ENDC	Bearer Modification / Uplink data path / Split DRB Reconfiguration / EN-DC	X	X
8.2.3.1.1.ENDC	Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / EN-DC	X	

8.2.3.3.1.ENDC	Measurement configuration control and reporting / Inter-RAT measurements / Periodic reporting / Measurement of NR cells / EN-DC	X	
8.2.3.4.1.ENDC	Measurement configuration control and reporting / Event A1 / Measurement of NR PSCell / EN-DC	X	
8.2.3.5.1.ENDC	Measurement configuration control and reporting / Event A2 / Measurement of NR PSCell / EN-DC	X	
8.2.3.6.1.ENDC	Measurement configuration control and reporting / Event A3 / Measurement of Neighbor NR cell / Intra-frequency measurements / EN-DC	X	
8.2.3.7.1.ENDC	Measurement configuration control and reporting / Event A4 / Measurement of Neighbor NR cell / Intra-frequency measurements / EN-DC	X	
8.2.3.8.1.ENDC	Measurement configuration control and reporting / Event A5 / Measurement of Neighbor NR cell / Intra-frequency measurements / EN-DC	X	
8.2.3.12.1.ENDC	Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of NR cells / EN-DC	X	
8.2.5.1.1.ENDC	Radio link failure / PSCell addition failure - random access problem / EN-DC	X	X
8.2.5.2.1.ENDC	Radio link failure / PSCell out of sync indication / Radio link failure / EN-DC	X	X
8.2.5.3.1.ENDC	Radio link failure / rlc-MaxNumRetx failure / EN-DC	X	X
8.2.5.4.1.ENDC	Reconfiguration failure / SCG change failure / EN-DC	X	X
10.2.1.1.ENDC	Default EPS bearer context activation	X	X
10.2.1.2.ENDC	Dedicated EPS bearer context activation	X	X

A.2.2 NR5GC Test Suites

Table A.2.2-1 lists all approved test cases.

For a given test case, the following variants are distinguished (if applicable):

- FR1: FR1 NR frequency band in the NR cell(s).
- FR2: FR2 NR frequency band in the NR cell(s).

An "X" in columns FR1 or FR2 indicates the test case is approved for the respective variant.

Table A.2.2-1: NR5GC TTCN test cases

Test case	Description	FR1	FR2
8.1.1.1.1.NR5GC	RRC / Paging for connection / Multiple paging records	X	
8.1.1.2.1.NR5GC	RRC connection establishment / Return to idle state after T300 expiry	X	
8.1.3.1.1.NR5GC	Measurement configuration control and reporting / Intra NR measurements / Event A1 / Event A2	X	
9.1.2.1.NR5GC	NAS security mode command	X	X
9.1.5.2.2.NR5GC	Periodic registration update / Accepted	X	X
9.1.5.2.4.NR5GC	Mobility registration update / The lower layer requests NAS signalling connection recovery	X	X
9.1.6.1.1.NR5GC	UE-initiated de-registration / switch off / Abnormal / De-registration and 5GMM common procedure collision	X	X

Annex B: NR TBS tables

B.1 Downlink TBS (normative)

The tables in this clause are depending on parameters provided by RRC signalling as described in subclause 7.1.2.2.4.1. L_{RBs} is limited according to the DL scheduling scheme in subclause 7.1.2.2.3.

B.1.1 Downlink TBS using MCS index table 5.1.3.1-1

B.1.1.1 Downlink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 0, number of CDM groups = 1

Table B.1.1.1-1: Void

Table B.1.1.1-2: Void

Table B.1.1.1-3: TBS for PDSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 0, number of CDM groups = 1, PDSCH-duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	576	11	2	2216	12	9	5760	10	23
40	1	1	608	14	1	2280	16	7	5888	14	19
48	1	2	640	15	1	2408	17	7	6016	17	16
64	2	0	672	16	1	2472	15	8	6144	8	28
80	2	1	704	5	7	2536	6	19	6272	15	19
96	3	0	736	17	1	2600	16	8	6400	17	18
104	2	2	768	11	3	2664	13	11	6656	16	19
120	3	1	808	15	2	2728	15	9	6784	11	24
128	4	0	848	16	2	2792	17	8	6912	15	20
136	1	7	888	17	2	2856	14	11	7040	17	19
152	3	2	928	11	4	2976	16	9	7296	16	20
160	5	0	984	14	3	3104	17	9	7424	15	21
168	4	1	1032	15	3	3240	16	11	7552	14	22
176	1	9	1064	4	13	3368	14	12	7680	11	26
192	6	0	1128	16	3	3496	17	11	7808	17	20
208	5	1	1160	17	3	3624	12	14	7936	16	21
224	7	0	1192	5	12	3752	16	12	8064	15	22
240	2	6	1224	12	5	3840	13	14	8456	17	21
256	8	0	1256	15	4	3904	11	16	8712	16	22
272	4	3	1288	9	7	3968	17	12	9224	17	22
288	9	0	1320	13	5	4032	7	23	9480	13	27
304	7	1	1352	16	4	4096	14	14	9992	17	23
320	10	0	1416	17	4	4224	16	13	10248	14	27
336	8	1	1480	14	5	4352	13	15	10504	17	24
352	11	0	1544	15	5	4480	17	13	10760	14	28
368	7	2	1608	13	6	4608	14	15	11016	15	27
384	12	0	1672	16	5	4736	16	14	11272	17	25
408	6	3	1736	17	5	4864	13	18	11528	15	28
432	13	0	1800	11	8	4992	17	14	11784	16	27
456	14	0	1864	15	6	5120	7	27	12040	17	26
480	15	0	1928	5	18	5248	16	15	12296	16	28
504	12	1	2024	16	6	5376	13	19	12552	17	27
528	16	0	2088	17	6	5504	12	20	13064	17	28
552	17	0	2152	15	7	5632	17	15			

B.1.1.2 Downlink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 1, number of CDM groups = 1

Table B.1.1.2-1: Void

Table B.1.1.2-2: Void

Table B.1.1.2-3: TBS for PDSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 1, number of CDM groups = 1, PDSCH-duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	552	11	2	2280	13	9	6016	15	19
40	1	1	576	14	1	2408	17	7	6144	17	18
48	1	2	608	15	1	2472	16	8	6272	10	25
56	2	0	640	16	1	2536	13	11	6400	16	19
64	1	3	672	5	7	2600	9	14	6528	15	20
72	1	4	704	17	1	2664	17	8	6656	14	21
80	2	1	736	9	4	2728	14	11	6784	17	19
88	3	0	768	15	2	2792	16	9	6912	11	25
96	2	2	808	16	2	2856	10	14	7040	16	20
112	1	6	848	17	2	2976	17	9	7168	15	21
120	4	0	888	11	4	3104	16	11	7296	10	28
128	2	3	928	14	3	3240	11	14	7424	17	20
144	3	2	984	15	3	3368	17	11	7552	16	21
152	5	0	1032	16	3	3496	12	14	7680	15	22
160	4	1	1064	9	6	3624	16	12	7808	14	23
168	1	9	1128	17	3	3752	13	14	8064	17	21
184	6	0	1160	10	6	3824	17	12	8192	16	22
192	4	2	1192	15	4	3840	7	23	8456	14	24
208	5	1	1224	9	7	3904	9	20	8712	17	22
224	7	0	1256	8	8	3968	14	14	8968	16	23
240	8	0	1288	16	4	4032	16	13	9224	13	27
256	5	2	1320	3	20	4096	13	15	9480	17	23
272	9	0	1352	17	4	4224	17	13	9736	14	27
288	7	1	1416	14	5	4352	13	16	9992	15	26
304	10	0	1480	15	5	4480	16	14	10248	17	24
320	8	1	1544	13	6	4608	13	18	10504	15	27
336	11	0	1608	16	5	4736	15	15	10760	17	25
352	7	2	1672	17	5	4864	17	14	11016	15	28
368	12	0	1736	15	6	4992	14	18	11272	16	27
384	6	3	1800	13	7	5120	16	15	11528	17	26
408	13	0	1864	16	6	5248	12	20	11784	16	28
432	14	0	1928	14	7	5376	17	15	12040	17	27
456	11	1	2024	17	6	5504	10	23	12552	17	28
480	15	0	2088	15	7	5632	14	19			
504	16	0	2152	16	7	5760	17	16			
528	17	0	2216	10	12	5888	10	24			

B.1.1.3 Downlink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 2, number of CDM groups = 2, modulation order <= 2

NOTE: The major purpose of the tables in this clause is to cope with PDSCH transmissions being restricted to Q_m <= 2 (QPSK) like PDSCH transmissions being scheduled with P-RNTI, RA-RNTI, SI-RNTI (see TS 38.214 clause 5.1.3.1 [22]).

Table B.1.1.3-1: Void

Table B.1.1.3-2: Void

Table B.1.1.3-3: TBS for PDSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 2, number of CDM groups = 2, modulation order <= 2, PDSCH-duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	128	4	1	256	4	4	504	4	8
32	1	1	136	1	9	272	5	3	552	7	5
40	1	2	144	6	0	288	7	2	576	6	6
48	2	0	152	3	3	320	6	3	640	5	8
64	2	1	160	5	1	336	3	7	672	7	6
72	3	0	176	7	0	368	7	3	736	5	9
80	2	2	184	2	6	384	6	4	768	6	8
88	1	6	192	6	1	408	5	5	808	7	7
96	4	0	208	5	2	432	3	9	888	7	8
104	2	3	224	7	1	456	7	4	1032	7	9
120	5	0	240	6	2	480	6	5			

B.1.1.4 Downlink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 2, number of CDM groups = 2

Table B.1.1.4-1: Void

Table B.1.1.4-2: Void

Table B.1.1.4-3: TBS for PDSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 2, number of CDM groups = 2, PDSCH-duration = 12

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	456	14	1	1800	16	7	4736	17	16
32	1	1	480	9	3	1864	13	9	4864	15	19
40	1	2	504	15	1	1928	17	7	4992	17	18
48	2	0	528	16	1	2024	16	8	5120	10	25
64	2	1	552	7	5	2088	13	11	5248	16	19
72	3	0	576	17	1	2152	17	8	5376	15	20
80	2	2	608	15	2	2216	14	11	5504	17	19
88	1	6	640	12	3	2280	16	9	5760	16	20
96	4	0	672	16	2	2408	15	11	5888	14	22
104	2	3	704	17	2	2472	17	9	6016	17	20
120	5	0	736	14	3	2536	16	11	6272	16	21
128	4	1	768	8	6	2600	14	12	6400	14	23
136	1	9	808	15	3	2664	13	13	6528	11	28
144	6	0	848	16	3	2728	17	11	6656	17	21
152	3	3	888	11	5	2792	12	14	6784	15	23
160	5	1	928	17	3	2856	11	15	6912	12	27
176	7	0	984	15	4	2976	16	12	7168	17	22
184	2	6	1032	16	4	3104	17	12	7296	16	23
192	6	1	1064	11	6	3240	11	18	7424	13	27
208	8	0	1128	17	4	3368	16	13	7680	17	23
224	9	0	1160	12	6	3496	17	13	7808	16	24
240	6	2	1192	15	5	3624	14	15	8064	14	27
256	10	0	1224	13	6	3752	16	14	8192	17	24
272	11	0	1256	6	13	3824	9	22	8456	14	28
288	7	2	1288	16	5	3840	14	16	8712	17	25
304	12	0	1320	14	6	3904	15	15	8968	15	28
320	8	2	1352	17	5	3968	17	14	9224	16	27
336	13	0	1416	15	6	4032	7	27	9480	17	26
352	14	0	1480	13	7	4096	16	15	9736	17	27
368	11	1	1544	16	6	4224	13	19	10248	17	28
384	15	0	1608	17	6	4352	17	15			
408	16	0	1672	15	7	4480	16	16			
432	17	0	1736	12	9	4608	14	19			

B.1.2 Void

B.2 Uplink TBS (informative)

The tables in this clause are depending on parameters provided by RRC signalling as described in subclause 7.1.2.3.2. L_{RBs} is limited to the minimum value of N_{BWP}=24 in accordance to Table 5.3.2-1 of TS 38.101-1/2 [5, 6].

For selection of the **L_{RBs} / I_{MCS}** pair for a particular TBS, the same criteria are applied, as specified for the DL in subclause 7.1.2.2.4.2 paragraph '**L_{RBs} / I_{MCS}** pair determination'.

B.2.1 Uplink TBS using MCS index table 5.1.3.1-1

B.2.1.1 Uplink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 0, number of CDM groups = 1

Table B.2.1.1-1: TBS for PUSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 0, number of CDM groups = 1, PUSCH-duration = 14

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	848	23	0	3496	19	8	8192	22	15
40	1	1	888	24	0	3624	22	7	8456	21	16
56	1	2	928	19	1	3752	23	7	8712	23	15
72	2	0	984	20	1	3824	8	19	8968	24	15
88	2	1	1032	21	1	3840	24	7	9224	23	16
104	3	0	1064	22	1	3904	19	9	9480	24	16
112	2	2	1128	23	1	3968	15	12	9736	23	18
136	3	1	1160	24	1	4032	22	8	9992	21	19
144	4	0	1192	20	2	4096	20	9	10248	24	18
152	2	3	1224	16	3	4224	23	8	10504	22	19
160	1	7	1256	21	2	4352	24	8	10760	23	19
176	5	0	1288	22	2	4480	22	9	11016	18	22
184	4	1	1320	17	3	4608	20	11	11272	24	19
208	1	9	1352	23	2	4736	23	9	11528	19	22
224	6	0	1416	24	2	4864	21	11	11784	23	20
240	5	1	1480	19	3	4992	24	9	12040	20	22
256	7	0	1544	20	3	5120	13	17	12296	24	20
272	2	6	1608	21	3	5248	23	11	12552	19	23
288	8	0	1672	14	5	5376	18	13	12808	23	21
304	4	3	1736	22	3	5504	24	11	13064	20	23
320	2	7	1800	23	3	5632	19	13	13320	22	22
336	9	0	1864	24	3	5760	22	12	13576	24	21
352	6	2	1928	20	4	5888	20	13	13832	21	23
368	10	0	2024	21	4	6016	23	12	14088	23	22
384	8	1	2088	22	4	6144	13	19	14344	22	23
408	11	0	2152	23	4	6272	24	12	14600	24	22
432	12	0	2216	19	5	6400	19	14	14856	21	24
456	6	3	2280	24	4	6528	22	13	15112	23	23
480	13	0	2408	21	5	6656	20	14	15624	22	24
504	14	0	2472	18	6	6784	23	13	15880	24	23
528	11	1	2536	22	5	6912	8	28	16136	23	24
552	15	0	2600	19	6	7040	21	14	16392	22	25
576	12	1	2664	23	5	7168	24	13	16896	24	24
608	16	0	2728	20	6	7296	13	21	17424	23	25
640	17	0	2792	24	5	7424	22	14	17928	24	25
672	18	0	2856	21	6	7552	19	16	18432	23	26
704	19	0	2976	18	7	7680	23	14	18960	24	26
736	20	0	3104	22	6	7808	21	15	19968	24	27
768	21	0	3240	23	6	7936	20	16	21000	24	28
808	22	0	3368	24	6	8064	24	14			

Table B.2.1.1-2: Void

B.2.1.2 Uplink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 1, number of CDM groups = 1

Table B.2.1.2-1: TBS for PUSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 1, number of CDM groups = 1, PUSCH-duration = 14

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
32	1	0	848	23	0	3496	19	8	8192	22	15
40	1	1	888	24	0	3624	22	7	8456	21	16
56	1	2	928	19	1	3752	23	7	8712	23	15
72	2	0	984	20	1	3824	8	19	8968	24	15
88	2	1	1032	21	1	3840	24	7	9224	23	16
104	3	0	1064	22	1	3904	19	9	9480	24	16
112	2	2	1128	23	1	3968	15	12	9736	23	18
136	3	1	1160	24	1	4032	22	8	9992	21	19
144	4	0	1192	20	2	4096	20	9	10248	24	18
152	2	3	1224	16	3	4224	23	8	10504	22	19
160	1	7	1256	21	2	4352	24	8	10760	23	19
176	5	0	1288	22	2	4480	22	9	11016	18	22
184	4	1	1320	17	3	4608	20	11	11272	24	19
208	1	9	1352	23	2	4736	23	9	11528	19	22
224	6	0	1416	24	2	4864	21	11	11784	23	20
240	5	1	1480	19	3	4992	24	9	12040	20	22
256	7	0	1544	20	3	5120	13	17	12296	24	20
272	2	6	1608	21	3	5248	23	11	12552	19	23
288	8	0	1672	14	5	5376	18	13	12808	23	21
304	4	3	1736	22	3	5504	24	11	13064	20	23
320	2	7	1800	23	3	5632	19	13	13320	22	22
336	9	0	1864	24	3	5760	22	12	13576	24	21
352	6	2	1928	20	4	5888	20	13	13832	21	23
368	10	0	2024	21	4	6016	23	12	14088	23	22
384	8	1	2088	22	4	6144	13	19	14344	22	23
408	11	0	2152	23	4	6272	24	12	14600	24	22
432	12	0	2216	19	5	6400	19	14	14856	21	24
456	6	3	2280	24	4	6528	22	13	15112	23	23
480	13	0	2408	21	5	6656	20	14	15624	22	24
504	14	0	2472	18	6	6784	23	13	15880	24	23
528	11	1	2536	22	5	6912	8	28	16136	23	24
552	15	0	2600	19	6	7040	21	14	16392	22	25
576	12	1	2664	23	5	7168	24	13	16896	24	24
608	16	0	2728	20	6	7296	13	21	17424	23	25
640	17	0	2792	24	5	7424	22	14	17928	24	25
672	18	0	2856	21	6	7552	19	16	18432	23	26
704	19	0	2976	18	7	7680	23	14	18960	24	26
736	20	0	3104	22	6	7808	21	15	19968	24	27
768	21	0	3240	23	6	7936	20	16	21000	24	28
808	22	0	3368	24	6	8064	24	14			

Table B.2.1.2-2: Void

B.2.1.3 Void

B.2.1.4 Void

B.2.1.5 Uplink TBS using MCS index table 5.1.3.1-1, dmrs-AdditionalPosition = 2, number of CDM groups = 2

Table B.2.1.5-1: TBS for PUSCH using MCS index table 5.1.3.1-1 with dmrs-AdditionalPosition = 2, number of CDM groups = 2, PUSCH-duration = 14

TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}	TBS	L_{RBs}	I_{MCS}
24	1	0	672	21	0	2856	21	7	7552	24	15
40	1	1	704	23	0	2976	22	7	7680	15	22
48	1	2	736	24	0	3104	23	7	7808	23	16
56	2	0	768	19	1	3240	24	7	7936	22	18
64	1	3	808	20	1	3368	19	9	8064	24	16
72	1	4	848	21	1	3496	22	8	8192	23	18
80	2	1	888	22	1	3624	23	8	8456	21	19
88	3	0	928	23	1	3752	24	8	8712	24	18
96	2	2	984	24	1	3824	17	12	8968	19	21
112	1	6	1032	20	2	3840	22	9	9224	23	19
120	4	0	1064	21	2	3904	20	11	9480	24	19
128	2	3	1128	22	2	3968	14	14	9736	22	20
144	3	2	1160	23	2	4032	23	9	9992	23	20
152	5	0	1192	24	2	4096	21	11	10248	20	22
160	4	1	1224	19	3	4224	24	9	10504	24	20
168	1	9	1256	8	8	4352	13	16	10760	21	22
184	6	0	1288	20	3	4480	23	11	11016	23	21
192	4	2	1320	3	20	4608	24	11	11272	22	22
208	5	1	1352	21	3	4736	21	12	11528	24	21
224	7	0	1416	22	3	4864	22	12	11784	23	22
240	8	0	1480	18	4	4992	20	13	12040	20	24
256	5	2	1544	23	3	5120	23	12	12296	24	22
272	9	0	1608	24	3	5248	21	13	12552	21	24
288	7	1	1672	21	4	5376	24	12	12808	23	23
304	10	0	1736	15	6	5504	22	13	13064	22	24
320	8	1	1800	22	4	5632	20	14	13320	24	23
336	11	0	1864	23	4	5760	23	13	13576	20	26
352	7	2	1928	24	4	5888	10	24	13832	23	24
368	12	0	2024	20	5	6016	24	13	14088	22	25
384	6	3	2088	21	5	6144	18	16	14344	24	24
408	13	0	2152	22	5	6272	22	14	14600	23	25
432	14	0	2216	19	6	6400	19	16	14856	22	26
456	11	1	2280	23	5	6528	23	14	15368	24	25
480	15	0	2408	24	5	6656	21	15	15624	23	26
504	16	0	2472	18	7	6784	24	14	16136	24	26
528	17	0	2536	22	6	6912	22	15	16896	24	27
552	18	0	2600	19	7	7040	21	16	17424	24	28
576	14	1	2664	23	6	7168	20	18			
608	19	0	2728	20	7	7296	23	15			
640	20	0	2792	24	6	7424	22	16			

Table B.2.1.5-2: Void

B.2.2 Void

B.2.3 Void

Annex C (informative): Style guide and design principles

C.1 Style guide

The style guide specified in TS 36.523-3 [12] Annex B applies to the present document.

C.2 Design principles

The design principles specified in TS 36.523-3 [12] Annex B apply to the present document.

Annex D (normative): TTCN-3 definitions

D.0 Introduction

The present Annex D specifies the TTCN-3 type definitions used at the system interface to configure and control the SS.

In case of discrepancy between the content of the present Annex D and the equivalent TTCN-3 definitions / semantic requirements found in the TTCN modules provided as attachments to the present specification, the latter shall take precedence.

NOTE: This annex is automatically generated from the TTCN-3 modules provided as attachment to the present specification and containing the listed TTCN-3 type definitions,

D.1 NR_ASP_TypeDefs

Type definitions for configuration of the system simulator;
Common design principles:
Semantics of OMIT: unless specified otherwise, for all TTCN-3 type definitions used in ASPs omit means "keep as it is" =>
- on initial configuration in general all fields shall be provided
- no default values for fields are foreseen
- if necessary non-existence of information shall be explicitly configured
  (e.g. with a union of "no configuration" and "configuration parameters"
- fields within structures imported from the core spec are excepted from this rule
- if a sub-structure is explicitly excluded from this rule all fields and sub-fields shall be fully specified for each (re-)configuration

D.1.1 ASN1_Container

Definitions containing ASN.1 types for backward compatibility

NR_ASN1_UL_AM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_UL_AM_RLC_Type**	
Comment		
R15	UL_AM_RLC	

NR_ASN1_DL_AM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_DL_AM_RLC_Type**	
Comment		
R15	DL_AM_RLC	

NR_ASN1_UL_UM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_UL_UM_RLC_Type**	
Comment		
R15	UL_UM_RLC	

NR_ASN1_DL_UM_RLC_Type

TTCN-3 Union Type		
Name	**NR_ASN1_DL_UM_RLC_Type**	
Comment		
R15	DL_UM_RLC	

NR_ASN1_PDSCH_Config_Type

TTCN-3 Union Type		
Name	**NR_ASN1_PDSCH_Config_Type**	
Comment		
R15	PDSCH_Config	

NR_ASN1_PDSCH_ConfigCommon_Type

TTCN-3 Union Type		
Name	**NR_ASN1_PDSCH_ConfigCommon_Type**	
Comment		
R15	PDSCH_ConfigCommon	

NR_ASN1_SPS_Config_Type

TTCN-3 Union Type		
Name	**NR_ASN1_SPS_Config_Type**	
Comment		
R15	SPS_Config	

NR_ASN1_CSI_ResourceConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_CSI_ResourceConfig_Type**	
Comment		
R15	CSI_ResourceConfig	

NR_ASN1_TDD_UL_DL_ConfigCommon_Type

TTCN-3 Union Type		
Name	**NR_ASN1_TDD_UL_DL_ConfigCommon_Type**	
Comment		
R15	TDD_UL_DL_ConfigCommon	

NR_ASN1_TDD_UL_DL_SlotConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_TDD_UL_DL_SlotConfig_Type**	
Comment		
R15	TDD_UL_DL_SlotConfig	

NR_ASN1_FrequencyInfoDL_Type

TTCN-3 Union Type		
Name	**NR_ASN1_FrequencyInfoDL_Type**	
Comment		
R15	FrequencyInfoDL	

NR_ASN1_FrequencyInfoUL_Type

TTCN-3 Union Type		
Name	**NR_ASN1_FrequencyInfoUL_Type**	
Comment		
R15	FrequencyInfoUL	

NR_ASN1_BWP_UplinkCommon_Type

TTCN-3 Union Type		
Name	**NR_ASN1_BWP_UplinkCommon_Type**	
Comment		
R15	BWP_UplinkCommon	

NR_ASN1_BWP_UplinkDedicated_Type

TTCN-3 Union Type		
Name	**NR_ASN1_BWP_UplinkDedicated_Type**	
Comment		
R15	BWP_UplinkDedicated	

NR_ASN1_RACH_ConfigDedicated_Type

TTCN-3 Union Type		
Name	**NR_ASN1_RACH_ConfigDedicated_Type**	
Comment		
R15	RACH_ConfigDedicated	

NR_ASN1_SI_RequestConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_SI_RequestConfig_Type**	
Comment		
R15	SI_RequestConfig	

NR_ASN1_PDSCH_ServingCellConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_PDSCH_ServingCellConfig_Type**	
Comment		
R15	PDSCH_ServingCellConfig	

NR_ASN1_PUSCH_ServingCellConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_PUSCH_ServingCellConfig_Type**	
Comment		
R15	PUSCH_ServingCellConfig	

NR_ASN1_SearchSpace_Type

TTCN-3 Union Type		
Name	**NR_ASN1_SearchSpace_Type**	
Comment		
R15	SearchSpace	

NR_ASN1_ControlResourceSet_Type

TTCN-3 Union Type		
Name	**NR_ASN1_ControlResourceSet_Type**	
Comment		
R15	ControlResourceSet	

NR_ASN1_BWP_Type

TTCN-3 Union Type		
Name	**NR_ASN1_BWP_Type**	
Comment		
R15	BWP	

NR_ASN1_DRX_Config_Type

TTCN-3 Union Type		
Name	**NR_ASN1_DRX_Config_Type**	
Comment		
R15	DRX_Config	

NR_ASN1_MeasGapConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_MeasGapConfig_Type**	
Comment		
R15	MeasGapConfig	

NR_ASN1_MAC_CellGroupConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_MAC_CellGroupConfig_Type**	
Comment		
R15	MAC_CellGroupConfig	

NR_ASN1_PhysicalCellGroupConfig_Type

TTCN-3 Union Type		
Name	**NR_ASN1_PhysicalCellGroupConfig_Type**	
Comment		
R15	PhysicalCellGroupConfig	

NR_ASN1_RateMatchPattern_Type

TTCN-3 Union Type		
Name	**NR_ASN1_RateMatchPattern_Type**	
Comment		
R15	RateMatchPattern	

NR_ASN1_RateMatchPatternLTE_CRS_Type

TTCN-3 Union Type		
Name	**NR_ASN1_RateMatchPatternLTE_CRS_Type**	
Comment		
R15	RateMatchPatternLTE_CRS	

D.1.2 System_Configuration

Formal ASP Definitions for system configuration

NR_SystemRequest_Type

TTCN-3 Union Type		
Name	**NR_SystemRequest_Type**	
Comment		
Cell	NR_CellConfigRequest_Type	configure/release a cell
CellAttenuationList	NR_CellAttenuationList_Type	power attenuation for one or several cells; all cells included in the list shall be changed at the same time; all cells in the list shall reach the new cell power within a maximum of 100ms (10 frames) as according to TS 38.523-3 clause 7.1.4.2 NOTE: In the common ASP part the CellId shall be set - to the cell the timing information refers to if activation time shall be applied - to nr_Cell_NonSpecific when there is no activation time
RadioBearerList	NR_RadioBearerList_Type	configure/release one or several SRBs and/or DRBs at an SpCell NOTE: RBs are not configured in an SCell
EnquireTiming	Null_Type	get current timing information for the given cell
AS_Security	NR_AS_Security_Type	StartRestart/Release of AS security
SystemIndCtrl	NR_System_IndicationControl_Type	to configure SS to generate system indications
PdcpCount	NR_PDCP_CountReq_Type	to set or enquire PDCP COUNT for one or more RBs
DciTrigger	NR_DCI_Trigger_Type	to trigger a specific DCI to be transmitted on PDCCH (e.g. PDCCH order)
Paging	NR_PagingTrigger_Type	to trigger SS to send paging at the given paging occasion (as calculated in TTCN) NOTE: The SS shall use the DCI configuration as provided by NR_PcchConfig_Type; the DCI may or may not carry a short message but it in any case it shall indicate presence
MacCommandTrigger	NR_MAC_ControlElementDL_Type	to trigger a specific MAC control element to be transmitted to the UE
L1_TestMode	NR_L1_TestMode_Type	to Set L1/MAC in special Test modes e.g. DL CRC etc. per default (at initial configuration) no test mode is activated
PdcpHandoverControl	NR_PDCP_HandoverControlReq_Type	to inform the target cell about the handover (or PSCell change) procedure.

NR_SystemConfirm_Type

TTCN-3 Union Type		
Name	**NR_SystemConfirm_Type**	
Comment	confirmations for system configuration; in general to be sent after the configuration has been done	
Cell	Null_Type	(no further parameters from SS)
CellAttenuationList	Null_Type	(no further parameters from SS) NOTE 1: the confirmation shall be sent when all cells have changed power levels NOTE 2: for the CellId in the common ASP part the same rules are applied as for the SYSTEM REQ
RadioBearerList	Null_Type	(no further parameters from SS)
EnquireTiming	Null_Type	the cell's timing information is contained in the TimingInfo of the ASP's common part
AS_Security	Null_Type	(no further parameters from SS)
SystemIndCtrl	Null_Type	(no further parameters from SS)
PdcpCount	NR_PDCP_CountCnf_Type	as response to 'Get' a list is returned containing COUNT information for the requested RBs
DciTrigger	Null_Type	(no further parameters from SS)
MacCommandTrigger	Null_Type	(no further parameters from SS)
L1_TestMode	Null_Type	confirmation for L1 test mode
PdcpHandoverControl	Null_Type	confirmation for PDCP handover control

NR_SystemIndication_Type

TTCN-3 Union Type		
Name	**NR_SystemIndication_Type**	
Comment		
Error	charstring	indicates an error situation in SS; is not explicitly handled in TTCN but causes an INCONC due to default behaviour; an additional error code can be signalled in the common part of the ASP; SS shall raise an error when in TS 38.523-3 or in any other ASP definitions
RlcDiscardInd	NR_RlcDiscardInd_Type	indicates discarded PDUs
MAC	NR_MAC_ControlElementUL_Type	indicates MAC control element being receive from the UE
RachPreamble	NR_RachPreamble_Type	RACH preamble being sent by the UE
SchedReq	Null_Type	indication for scheduling request sent by the UE
UL_HARQ	HARQ_Type	to report the UL HARQ as received on PUCCH or PUSCH for corresponding DL transmission
HarqError	NR_HarqError_Type	indicates detection of HARQ error: 1. HARQ CRC error for UL data 2. HARQ NACK from the UE unless SS is configured to report HARQ ACK/NACK

D.1.3 Cell_Configuration

Specific Info for Cell Configuration Primitive

D.1.3.1 Cell_Configuration_Common

NR_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_NR_CellAttenuation_Off	NR_Attenuation_Type	{Off:=true}	

Cell_Configuration_Common: Basic Type Definitions

TTCN-3 Basic Types		
NR_InitialAttenuation_Type	NR_Attenuation_Type (tsc_NR_CellAttenuation_Off)	Attenuation restricted to 'Off'

NR_CellConfigRequest_Type

TTCN-3 Union Type		
Name	**NR_CellConfigRequest_Type**	
Comment		
AddOrReconfigure	NR_CellConfigInfo_Type	for cell configuration: CellId : identifier of the cell to be configured RoutingInfo : 'None' TimingInfo : 'Now' for initial configuration; specific TimingInfo may be used for reconfiguration ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)
Release	Null_Type	to remove a cell completely - CellId : identifier of the cell to be released; nr_Cell_NonSpecific, in case all cells shall be released RoutingInfo : 'None' TimingInfo : 'Now' ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)

NR_CellConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_CellConfigInfo_Type**		
Comment	common information for initial cell configuration or reconfiguration; in case of reconfiguration omit means 'keep configuration as it is'		
StaticResourceConfig	NR_SS_StaticCellResourceConfig_Type	opt	mandatory for the initial configuration; to be omitted afterwards
CellConfigCommon	NR_CellConfigCommon_Type	opt	common configuration parameters which are not specific to physical layer (or any other layer)
PhysicalLayer	NR_CellConfigPhysicalLayer_Type	opt	Physical layer configuration: physical channels, signals and BWPs for UL and DL; DCI
BcchConfig	NR_BcchConfig_Type	opt	configuration of BCCH/BCH; SS is triggered to configure RLC/MAC accordingly; BCCH data on the PDSCH is distinguished by the SI-RNTI PBCH: MIB; PDSCH: scheduling and resource allocation; SIBs
PcchConfig	NR_PcchConfig_Type	opt	configuration of PCCH/PCH; SS is triggered to configure RLC/MAC accordingly; PCCH data on the PDSCH is distinguished by the P-RNTI (needed even to modify SI => shall be configured for CELL_BROADCASTING)
RachProcedureConfig	NR_RachProcedureConfig_Type	opt	to configure the SS's behaviour for the RACH procedure; may be omitted at initial configuration e.g. in case that the cell shall not have an uplink; NOTE: there is no way to explicitly remove the RACH procedure configuration after it has been configured for a cell
CcchDcchDtchConfig	NR_CcchDcchDtchConfig_Type	opt	Parameters related to CCCH/DCCH/DTCH in UL and DL
ServingCellConfig	NR_ServingCellConfig_Type	opt	To be configured at initial configuration of a cell: for non-CA scenarios it shall be either 'SpCell' or 'None' ('None' applies for pure neighbouring cells)

NR_SS_StaticCellResourceConfig_Type

TTCN-3 Record Type			
Name	**NR_SS_StaticCellResourceConfig_Type**		
Comment	capabilities af a cell according to the initial condition of a test case, to allow resource management at SS implementation; !!!! NR-PROSE: NR-equivalent of 36.508 clauses 6.3.3 and 6.3.4 to be added to 38.508 !!!!		
CellCapability	NR_CellCapability_Type		common cell capability
CarrierAggregation	NR_CellInitialCAConfig_Type		Initial configuration of a cell in context of carrier aggregation

NR_CellCapability_Type

TTCN-3 Enumerated Type	
Name	**NR_CellCapability_Type**
Comment	capabilities of a cell acc. to the initial condition of a test case !!!! NR-TBD: reference to 38.508 !!!!
broadcastOnlyCell	no detection of RACH preambles required; cell is only broadcasting
minimumUplinkCell	detection of RACH preambles required but not any further RX capability
fullCell	full TX and RX capabilities

NR_CellInitialCAConfig_Type

TTCN-3 Enumerated Type	
Name	**NR_CellInitialCAConfig_Type**
Comment	static information about the cell's initial role for carrier aggregation, not being changed during a test case; may be used for resource management at the SS; !!!! NR-TBD: reference to 38.508 !!!!
SpCell	Cell can be used as SpCell during a test case (primary cell of a master or secondary cell group; TS 37.340 clause 3.1); normal case i.e. applicable even when SpCell is the only cell of the cell group
Scell_Active	Carrier Aggregation: Cell is added as SCell to a cell group and may get activated during a test case
Scell_Inactive	Carrier Aggregation: Cell is added as SCell to a cell group but will never get activated during the test case
None	e.g. when a cell is not used for connected mode during a test case (pure nighbouring cell)

NR_CellConfigCommon_Type

TTCN-3 Record Type			
Name	**NR_CellConfigCommon_Type**		
Comment	common configuration parameters which are not specific to physical layer (or any other layer)		
C_RNTI	RNTI_Value_Type	opt	(pre-)configured C-RNTI used by physical layer and by MAC layer; affects scrambling of PDSCH/PUSCH and CRC of PDCCH(s); shall be used implicitly in RACH procedure (i.e. as CE in RAR)
CellTimingInfo	CellTimingInfo_Type	opt	
InitialCellPower	NR_InitialCellPower_Type	opt	reference cell power for the RS of each antenna in DL NOTE 1: the power of the RS of an antenna may be reduced by antenna specific configuration NOTE 2: in general the power may be adjusted on a per resource element basis => all physical channel/signal power settings shall be adjusted relatively to the RS; if there are more than one TX antennas each one may have its own attenuation; independently from those relative power settings the cell power can easily be adjusted by just changing the reference power

NR_Attenuation_Type

TTCN-3 Union Type		
Name	**NR_Attenuation_Type**	
Comment	attenuation of the reference power	
Value	integer (0..149)	cell power reference power reduced by the given attenuation (value is in dB); corresponds to AbsoluteCellPower_Type
Off	Null_Type	=< -145dBm according to TS 38.508-1 Table 6.2.2.1-3

NR_InitialCellPower_Type

TTCN-3 Record Type			
Name	**NR_InitialCellPower_Type**		
Comment			
MaxReference Power	NR_AbsoluteCellPower_Type		maximum value of cell reference power (RS EPRE in dBm/15kHz as per TS 36.508, clause 4.3.4.1); !!!! NR-FFS: to be checked for NR; reference to 38.508 to be added !!!! a cell is initialised with this reference power; its value is the upper bound of the cell power during the test case
Attenuation	NR_InitialAttenuation_Type		initial attenuation

D.1.3.2 PhysicalLayer

NR_CellConfigPhysicalLayer_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayer_Type**		
Comment	Common configuration of physical channels, signals and BWPs		
Common	NR_CellConfigPhysicalLayerCommon_Type	opt	Configuration common for UL and DL
Downlink	NR_CellConfigPhysicalLayerDownlink_Type	opt	DL configuration
Uplink	NR_CellConfigPhysicalLayerUplink_Type	opt	UL configuration; may be omitted at initial configuration e.g. in case that the cell shall not have an uplink; NOTE: there is no way to explicitly remove the uplink configuration after it has been configured for a cell

D.1.3.2.1 PhysicalLayer_Common

NR_CellConfigPhysicalLayerCommon_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayerCommon_Type**		
Comment	Configuration common for UL and DL		
PhysicalCellId	PhysCellId	opt	Physical-layer cell identity according to 38.211 clause 7.4.2.1; EN-DC: corresponds to ServingCellConfigCommon.physCellId
DuplexMode	NR_DuplexMode_Type	opt	FDD or TDD; FDD/TDD specific parameters

NR_DuplexMode_Type

TTCN-3 Union Type		
Name	**NR_DuplexMode_Type**	
Comment	FDD/TDD and maybe other types of duplex mode; in general FDD/TDD mode is determined from the frequency band	
FDD	NR_FDD_Info_Type	
TDD	NR_TDD_Info_Type	

NR_FDD_Info_Type

TTCN-3 Record Type	
Name	**NR_FDD_Info_Type**
Comment	FDD (paired spectrum) specific parameters: no further parameters defined for FDD

NR_TDD_UL_DL_SlotConfigList_Type

TTCN-3 Record of Type	
Name	**NR_TDD_UL_DL_SlotConfigList_Type**
Comment	corresponds to ServingCellConfig.tdd-UL-DL-ConfigurationDedicated
record of NR_ASN1_TDD_UL_DL_SlotConfig_Type	

NR_TDD_Config_Type

TTCN-3 Record Type			
Name	**NR_TDD_Config_Type**		
Comment	Common and dedicated TDD configuration		
Common	NR_ASN1_TDD_UL_DL_ConfigCommon_Type	opt	Common TDD configuration as used in TS 38.213 clause 11 corresponding to ServingCellConfigCommon.tdd-UL-DL-ConfigurationCommon; shall be present for TDD at initial configuration
Dedicated	NR_TDD_UL_DL_SlotConfigList_Type	opt	Dedicated TDD configuration for single slots over-ruling the flexible slots of the common configuration; corresponds to ServingCellConfig.tdd-UL-DL-ConfigurationDedicated; shall be present for TDD at initial configuration: the list is empty when there is no dedicated slot configuration; (omit means "keep as it is"); NOTE: The dedicated configuration can only exist together with common configuration as a single slot configuration is related to the periodicity given by the common configuration (see TDD-UL-DL-SlotConfig field description for slotIndex in TS 38.331)

NR_TDD_Info_Type

TTCN-3 Union Type		
Name	**NR_TDD_Info_Type**	
Comment	cell specific parameters for TDD (unpaired spectrum)	
Config	NR_TDD_Config_Type	specific TDD configuration with sets of symbols for UL and DL and possibly flexible symbols which are not specified as UL or DL (corresponding to TDD-UL-DL-ConfigurationCommon and TDD-UL-DL-ConfigDedicated according to TS 38.213 clause 11.1)
FullFlexible	Null_Type	No TDD configuration is provided to the UE: all slots and symbols are considered as flexible according to TS 38.213 clause 11.1

D.1.3.2.2 PhysicalLayer_Downlink

PhysicalLayer_Downlink: Basic Type Definitions

TTCN-3 Basic Types		
NR_EPRE_Ratio_Type	integer	Energy per resource element relative to given reference signal or abstract reference cell power (dB)

NR_CellConfigPhysicalLayerDownlink_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayerDownlink_Type**		
Comment	physical layer configuration at the SS for the downlink of a cell !!!! NR-NOTE: there is no AntennaGroup (NR_DownlinkAntennaGroupConfig_Type); specifc antenna group configuration may be described in part 3 if needed !!!!		
FrequencyInfoDL	NR_ASN1_FrequencyInfoDL_Type	opt	carries information about location of SSB and reference resource block (point A) in frequency domain and about associated frequency bands (list of FreqBandIndicatorNR)
SSPbchBlock	NR_SSB_Config_Type	opt	Configuration of SS/PBCH-block transmission
PdschCellLevelConfig	NR_PDSCH_CellLevelConfig_Type	opt	Cell-level configuration of PDSCH being applicable independent from the BWP a PDSCH is associated to
BWPs	NR_DownlinkBWPs_Type	opt	Configuration of DL BWPs and their associated physical channels and signals

D.1.3.2.2.1 SS_PBCH_Block

SS/PBCH block configuration according to TS 38.213 clause 4.1:
SS/PBCH block consists of synchronisation Signals (PSS and SSS) and PBCH (see e.g. TS 38.300 figure 5.2.4-1);
a demodulation reference signal (DM-RS) is frequency multiplexed on the PBCH symbols (TS 38.300 clause 5.2.4, TS 38.211 clause 7.4.1.4) and
the DM-RS sequence corresponds to the three LSBs of the SS/PBCH index (TS 38.213 clause 4.1 and TS 38.211 clause 7.4.1.4.1);
the SS/PBCH index needs to be maintained by the SS (as the system frame number);
the physical layer cell id is carried by PSS and SSS according to TS 38.211 clause 7.4.2

SS_PBCH_Block: Basic Type Definitions

TTCN-3 Basic Types		
NR_SSB_Periodicity_Type	ServingCellConfigCommon.ssb_periodicityServingCell	
NR_SSB_PositionsInBurst_Type	ServingCellConfigCommon.ssb_PositionsInBurst	

NR_SS_BlockPattern_Type

TTCN-3 Enumerated Type	
Name	**NR_SS_BlockPattern_Type**
Comment	TS 38.101-1 Table 5.4.3.3-1 specifies for a given operating band and SS Block subcarrier spacing which case of TS 38.213 clause 4.1 to be applied => first symbol indexes for candidate SS/PBCH blocks and the size of the bitmap are determined accordingly
caseA	15 kHz subcarrier spacing: 4 bits (<= 3GHz) or 8 bits (> 3GHz); first symbol indexes: {2,8} + 14*n
caseB	30 kHz subcarrier spacing: 4 bits (<= 3GHz) or 8 bits (> 3GHz); first symbol indexes: {4,8,16,20} + 28*n
caseC	30 kHz subcarrier spacing: 4 bits (<= 3GHz) or 8 bits (> 3GHz); first symbol indexes: {2,8} + 14*n
caseD	120 kHz subcarrier spacing: 64 bits (> 6GHz); first symbol indexes: {4,8,16,20} + 28*n
caseE	240 kHz subcarrier spacing: 64 bits (> 6GHz); first symbol indexes: {8,12,16,20,32,36,40,44} + 56*n

NR_SSB_Beam_Type

TTCN-3 Record Type			
Name	**NR_SSB_Beam_Type**		
Comment			
SsbIndex	integer	opt	SSB index starting at 0 according to TS 38.213 clause 4.1
Attenuation	integer	opt	Beam power: reference power for SSB transmissions relative to the actual reference cell power (MaxReferencePower - Attenuation of cell power); the beam power is reduced by 'Attenuation' relative to the actual reference cell power; the attenuation may be negative in which case the power level of the SSB transmission is higher than the actual cell power

NR_SSB_BeamArray_Type

TTCN-3 Record of Type	
Name	**NR_SSB_BeamArray_Type**
Comment	
record of NR_SSB_Beam_Type	

NR_SSB_BurstConfig_Type

TTCN-3 Record Type			
Name	**NR_SSB_BurstConfig_Type**		
Comment	To describe the SSB burst		
BlockPattern	NR_SS_BlockPattern_Type		case A..E according to 38.213 clause 4.1
Bitmap	NR_SSB_PositionsInBurst_Type		"SSB-transmitted" parameter as used by the UE to rate-match around SSBs acc. 38.214 cl. 5.1; 4, 8 or 64 bits !!!! to be renamed to PositionsInBurst !!!!
BeamArray	NR_SSB_BeamArray_Type	opt	beam specific configuration: if omit, all SSBs as configured in 'Bitmap' shall be transmitted with no attenuation (i.e. using the actual reference cell power); if present only the SSBs contained in the array shall be transmitted (with beam power as according to their entry in the array); when the array contains beams with an SSB index not included in 'Bitmap', the SS may raise an error

NR_SSB_EPREs_Type

TTCN-3 Record Type			
Name	**NR_SSB_EPREs_Type**		
Comment	EPRE for PBCH and related signals relative to the reference power (EPRE_SSB#N) of an SSB (beam) given by SSB index N		
Pbch	NR_EPRE_Ratio_Type	opt	transmit power for resource elements (REs) being occupied by SS/PBCH block; EPRE ratio of PBCH to PBCH DMRS !!!! to be renamed to PbchToDmrs !!!!
Pss	NR_EPRE_Ratio_Type	opt	Primary synchronization signal; 38.211 clause 7.4.2.2; EPRE ratio of PSS to SSS !!!! to be renamed to PssToSss !!!!
Sss	NR_EPRE_Ratio_Type	opt	Secondary synchronization signal; 38.211 clause 7.4.2.3; EPRE ratio of SSS to EPRE_SSB#N; in general the SSS power is the same as the reference beam power, i.e. Sss = 0dB !!!! to be renamed to SssToSsbBeam !!!!
Dmrs	NR_EPRE_Ratio_Type	opt	DM-RS associated to PBCH (Demodulation reference signals for PBCH; 38.211 clause 7.4.1.4); EPRE ratio of DMRS to SSS !!!! to be renamed to DmrsToSss !!!!

NR_SSB_Config_Type

TTCN-3 Record Type			
Name	**NR_SSB_Config_Type**		
Comment	Synchronization signals and PBCH; TS 38.211 clause 7.4.3, TS 38.300 clause 5.2.4; NOTE: SSB location in frequency domain is specified by NR_CellConfigPhysicalLayerDownlink_Type.FrequencyInfoDL.absoluteFrequencySSB		
SubCarrierSpacing	SubcarrierSpacing	opt	sub-carrier spacing for SS/PBCH block (as specified by ServingCellConfigCommon.subcarrierSpacing in case of non-initial access): According to comments for ServingCellConfigCommon.subcarrierSpacing "Only the values 15 or 30 kHz (<6GHz), 120 or 240 kHz (>6GHz) are applicable"; this corresponds to tables 13-1 .. 13.10 in TS 38.213 where only 15 or 30 kHz and 120 or 240 kHz are considered for SS/PBCH block sub-carrier spacing; and it corresponds to 38.211 clause 7.4.3.1 defining SS/PBCH block type A as numerology=0,1 and type B as numerology=3,4 (i.e. there is no numerology=2 for SS/PBCH block) NOTE 1: in contrast to SS/PBCH block sub-carrier spacing the sub-carrier spacing for SIB1, Msg.2/4 for initial access and broadcast SI-messages is restricted to 15kHz or 30kHz for carrier frequency <= 6 GHz and 60kHz or 120kHz for carrier frequency > 6 GHz (see comments for MIB.subCarrierSpacingCommon and TS 38.213 tables 13-1 .. 13.10) NOTE 2: As long as there is no sub-carrier spacing of 60kHz (numerology=2) for the SS/PBCH block acc. to TS 38.211 Table 4.2-1 there is no extended cyclic prefix either (even though Table 4.2-1 is mainly for BWP there is no indication for any extended cyclic prefix for SS/PBCH block) => there is no need to specify the cyclic prefix for SS/PBCH block configuration (normal cyclic prefix is assumed for all cases)
SubcarrierOffset	integer	opt	k_SSB as defined in TS 38.211 clause 7.4.3.1; needs to be consistent with absoluteFrequencySSB and absoluteFrequencyPointA as provided by FrequencyInfoDL to the UE and the SS
Periodicity	NR_SSB_Periodicity_Type	opt	in multiples of half frames (5ms)
HalfFrameOffset	integer	opt	to specify together the Periodicity the half-frames in which the SSB burst shall be transmitted: - for Periodicity = 5ms SSB burst in every half-frame - for a Periodicity >= 5ms SSB burst in frames with (SFN mod (Periodicity / 10)) = (HalfFrameOffset / 2) and in the - lower half-frame for (HalfFrameOffset mod 2) = 0 - higher half-frame for (HalfFrameOffset mod 2) = 1 Depending on the Periodicity the HalfFrameOffset has a range of 0 .. ((Periodicity / 5) - 1) Unless explicitly required by a test case the HalfFrameOffset is always 0
BurstConfig	NR_SSB_BurstConfig_Type	opt	to specify the burst configuration and a bitmap for the SS/PBCH block candidates which are eventually used for transmission of SS/PBCH blocks in a half frame
RelativeTxPower	NR_SSB_EPREs_Type	opt	transmit power for PBCH and SS/PBCH signals NOTE: Parameter SS-PBCHBlockPower is provided to the UE in SIB1.ss-PBCH-BlockPower, ServingCellConfigCommon.ss-PBCH-BlockPower) as referenceSignalPower; The UE uses referenceSignalPower to determine the transmission power of the PRACH (TS 38.213 clause 7.4) => For signalling tests there seems to be no need to provide this parameter to the SS (nevertheless the value provided to the UE shall not conflict with the power settings for the SSB at the SS)

D.1.3.2.2.2 Cell_Level_Configuration_PDSCH

Cell_Level_Configuration_PDSCH: Basic Type Definitions

TTCN-3 Basic Types		
NR_PDSCH_DMRS_TypeA_Position_Type	MIB.dmrs_TypeA_Position	same as ServingCellConfigCommon.dmrs-TypeA-Position

NR_PDSCH_CellLevelConfig_Type

TTCN-3 Record Type			
Name	**NR_PDSCH_CellLevelConfig_Type**		
Comment	cell-level parameters for PDSCH: in contrast to BWP specific parameters the cell-level parameters apply to any PDSCH independent from the BWP a PDSCH is associated to		
DMRS_TypeA_Position	NR_PDSCH_DMRS_TypeA_Position_Type	opt	Provided to the UE by MIB.dmrs-TypeA-Position or ServingCellConfigCommon.dmrs-TypeA-Position; dmrs-TypeA-Position defines position of the first DM-RS symbol in the sequence of DM-RS symbols according to TS 38.211 clause 7.4.1.1.
RateMatchPattern	NR_CellLevelRateMatchPattern_Type	opt	rate match pattern according to TS 38.214 clause 5.1.4
ServingCellConfig	NR_ASN1_PDSCH_ServingCellConfig_Type	opt	PDSCH related parameters not being BWP-specific; corresponds to ServingCellConfig.pdsch-ServingCellConfig

NR_RateMatchPatternList_Type

TTCN-3 Record of Type	
Name	**NR_RateMatchPatternList_Type**
Comment	
record of NR_ASN1_RateMatchPattern_Type	

NR_RateMatchPatternLteCrsList_Type

TTCN-3 Record of Type	
Name	**NR_RateMatchPatternLteCrsList_Type**
Comment	
record of NR_ASN1_RateMatchPatternLTE_CRS_Type	

NR_CellLevelRateMatchPattern_Type

TTCN-3 Record Type			
Name	**NR_CellLevelRateMatchPattern_Type**		
Comment	configuration of rate match pattern on cell level (see TS 38.214 clause 5.1.4)		
PatternList	NR_RateMatchPatternList_Type	opt	up to 4 cell-level RateMatchPattern according to TS 38.214 clause 5.1.4 (L1 RateMatchPattern); corresponds to ServingCellConfigCommon.rateMatchPatternToAddModList/rateMatchPatternToReleaseList; empty list per default (i.e. at initial configuration)
PatternListLteCrs	NR_RateMatchPatternLteCrsList_Type	opt	0 or 1 LTE CRS pattern to rate match around (see TS 38.214 clause 5.1.4.2) corresponds to ServingCellConfigCommon.lte-CRS-ToMatchAround; empty list per default (i.e. at initial configuration)

D.1.3.2.2.3 Downlink_BWP

NR_DownlinkBWP_Type

TTCN-3 Record Type			
Name	**NR_DownlinkBWP_Type**		
Comment	Configuration of single BWP at the SS		
Id	BWP_Id	opt	Initial BWP: 0 Dedicated BWP: 1..4
BWP	NR_ASN1_BWP_Type	opt	Frequency domain location and bandwidth, subcarrier spacing, cyclic prefix
Pdcch	NR_BWP_PDCCH_Configuration_Type	opt	
Pdsch	NR_BWP_PDSCH_Configuration_Type	opt	
Sps	NR_ASN1_SPS_Config_Type	opt	BWP-DownlinkDedicated.SPS-Config
CSI_RS_Config	NR_CSI_RS_Config_Type	opt	Configuration of CSI Reference Signals

NR_DownlinkBWP_List_Type

TTCN-3 Record of Type	
Name	**NR_DownlinkBWP_List_Type**
Comment	configuration of BWPs: each entry shall have a distinct Id with ID=0 for the initial BWP; NOTE 1: Even though in general the BWP-Id corresponds to the index of the element within the array of BWPs, the SS shall not take this as assumption
record of NR_DownlinkBWP_Type	

NR_DownlinkBWPs_Type

TTCN-3 Record Type			
Name	**NR_DownlinkBWPs_Type**		
Comment	configuration of downlink BWPs		
ActiveBWP	BWP_Id	opt	Id of the currently active BWP (this does not need to be the same as the index) According to TS 38.211 clause 4.4.5: "A UE can be configured with up to four carrier bandwidth parts in the downlink with a single downlink carrier bandwidth part being active at a given time. The UE is not expected to receive PDSCH, PDCCH, CSI-RS, or TRS outside an active bandwidth part."
BwpArray	NR_DownlinkBWP_List_Type	opt	array of band width parts: initial BWP + up to 4 dedicated BWPs

D.1.3.2.2.3.1 PDSCH_Configuration

Configuration of PDSCH and its related reference signals:
- DM-RS (Demodulation reference signal); TS 38.211 clause 7.4.1.1
- PT-RS (Phase-tracking reference signals for PDSCH); TS 38.211 clause 7.4.1.2

NR_BWP_PDSCH_Configuration_Type

TTCN-3 Record Type			
Name	**NR_BWP_PDSCH_Configuration_Type**		
Comment	PDSCH configuration at the SS for specific BWP		
ConfigCommon	NR_ASN1_PDSCH_ConfigCommon_Type	opt	
ConfigDedicated	NR_ASN1_PDSCH_Config_Type	opt	
RelativeTxPower	NR_PDSCH_EPREs_Type	opt	

NR_PDSCH_EPREs_Type

TTCN-3 Record Type			
Name	**NR_PDSCH_EPREs_Type**		
Comment	EPRE for PDSCH and related signals		
PdschToCell	NR_EPRE_Ratio_Type	opt	transmit power relative to given reference cell power for resource elements (REs) being occupied by PDSCH
PdschToDmrs	NR_EPRE_Ratio_Type	opt	DM-RS associated to PDSCH: relative transmit power according to TS 38.214 clause 4.1
PdschToPtrs	NR_EPRE_Ratio_Type	opt	PT-RS associated to PDSCH: relative transmit power according to TS 38.214 clause 4.1 NOTE: PT-RS need only to be considered when being present (TS 38.211 clause 7.4.1.2.2 according to TS 38.214 clause 4.1), i.e. the SS shall ignore the PT-RS's EPRE if no PT-RS is present

D.1.3.2.2.3.2 PDCCH_Configuration

Configuration of PDSCH and its related reference signals:
- DM-RS (Demodulation reference signal); TS 38.211 clause 7.4.1.3

NR_BWP_PDCCH_Configuration_Type

TTCN-3 Record Type			
Name	**NR_BWP_PDCCH_Configuration_Type**		
Comment	PDCCH configuration at the SS for specific BWP; NOTE: There are no fields for PDCCH-Config's "downlinkPreemption", "slotFormatIndicator", "tpc-PUSCH" and "tpc-PUCCH": This information is related to triggering DCI formats 2_X an shall be configured there (NR_DCI_Trigger_Type) according to test case requirements		
SearchSpaceArray	NR_BWP_SearchSpaceList_Type	opt	
CoresetArray	NR_BWP_CoresetList_Type	opt	
RelativeTxPower	NR_PDCCH_EPREs_Type	opt	

NR_BWP_CoresetList_Type

TTCN-3 Record of Type	
Name	**NR_BWP_CoresetList_Type**
Comment	list of CORESETs defined for a single BWP; according to TS 38.213 clause 10.1 "The control resource set configured for Type0-PDCCH common search space has control resource set index 0" NOTE: even though in general (array) index and controlResourceSetId are the same it is not clear what is meant by TS 38.213
record of NR_ASN1_ControlResourceSet_Type	

NR_BWP_SearchSpaceList_Type

TTCN-3 Record of Type	
Name	**NR_BWP_SearchSpaceList_Type**
Comment	list of search spaces defined for a single BWP; according to TS 38.213 clause 10.1 "The Type0-PDCCH common search space has search space index 0" NOTE: even though in general (array) index and searchSpaceId are the same it is not clear what is meant by TS 38.213
record of NR_BWP_SearchSpaceConfig_Type	

NR_PDCCH_EPREs_Type

TTCN-3 Record Type			
Name	**NR_PDCCH_EPREs_Type**		
Comment	EPRE for PDCCH and related signals		
PdcchToCell	NR_EPRE_Ratio_Type	opt	transmit power relative to given reference cell power for resource elements (REs) being occupied by PDCCH
PdcchToDmrs	NR_EPRE_Ratio_Type	opt	DM-RS associated to PDCCH; further DMRS parameters are given by ASN.1 PDCCH-Config as signalled to the UE or by additional parameters of the initial BWP configuration

D.1.3.2.2.3.2.1 Search_Space_Configuration

Search_Space_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_SearchSpaceCandidatePriority_Type	UInt_Type	Priorities to be considered by the SS in order to choose the candidate of a search space not colliding with the candidate of some other search space; a value of 0 represents the highest priority, a value of 1 the second highest priority and so on. (see TS 38.523-3 clause 7.1.2.1.4 for further details)

NR_SearchSpaceType_Type

TTCN-3 Enumerated Type	
Name	**NR_SearchSpaceType_Type**
Comment	types of search spaces according to TS 38.213 clause 10.1; NOTE 1: In principle there could be more than one instance for the same kind of search space; if this is ever needed, this enumerated shall be enhanced by introduction of a second entry for a particular type. NOTE 2: For the USS UL and DL are distinguished as they may need different priority in terms of scheduling of DCIs
cssType0	Type0-PDCCH common search space for scheduling of SIB1 (SI-RNTI); the SS shall scramble the DCI format's CRC with SI-RNTI; aggregation level and number of candidates correspond to TS 38.213 Table 10.1-1; For stand-alone options parameters of search space and associated CORESET are according MIB.pdcch-ConfigSIB1 (TS 38.213 clause 13)
cssType0A	Type0A-PDCCH common search space for scheduling of other system information (SI-RNTI); the SS shall scramble the DCI format's CRC with SI-RNTI
cssType1	Type1-PDCCH common search space for scheduling of Msg2 or Msg4 of RACH procedure; the SS shall scramble the DCI format's CRC with RA-RNTI for Msg2 or with TC-RNTI for Msg4 (temporary C-RNTI) as configured for Msg4 (NR_TempC_RNTI_Type in NR_RAR_Payload_Type)
cssType2	Type2-PDCCH common search space for scheduling of Paging messages or short messages (P-RNTI); the SS shall scramble the DCI format's CRC with P-RNTI
cssType3	Type3-PDCCH common search space for other purpose DCIs (INT-RNTI, SFI-RNTI, TPC-PUSCH-RNTI, TPC-PUCCH-RNTI, TPC-SRS-RNTI, C-RNTI, CS-RNTI(s)); the SS shall scramble the DCI format's CRC with the RNTI-value as according to the ASP triggering the DCI to be sent
ussDL	UE-specific search space (C-RNTI, CS-RNTI(s)); the SS shall scramble the DCI format's CRC with the C-RNTI value as stored for the cell (NR_CellConfigCommon_Type)
ussUL	UE-specific search space: as USS_DL but in general with lower priority to give DL assignments precedence over periodic UL grants

NR_SearchSpaceTypeAndPriority_Type

TTCN-3 Record Type			
Name	**NR_SearchSpaceTypeAndPriority_Type**		
Comment			
Type	NR_SearchSpaceType_Type		
CandidatePriority	NR_SearchSpaceCandidatePriority_Type		priority to be considered when candidates of a different or the same search space overlap the same CCEs

NR_SearchSpaceTypeAndPriorityList_Type

TTCN-3 Record of Type	
Name	**NR_SearchSpaceTypeAndPriorityList_Type**
Comment	
record of NR_SearchSpaceTypeAndPriority_Type	

NR_PDCCH_CCE_AggregationLevel_Type

TTCN-3 Enumerated Type	
Name	**NR_PDCCH_CCE_AggregationLevel_Type**
Comment	Aggregation level for a search space
AggregationLevel1	
AggregationLevel2	
AggregationLevel4	
AggregationLevel8	
AggregationLevel16	

NR_BWP_SearchSpaceConfig_Type

TTCN-3 Record Type			
Name	**NR_BWP_SearchSpaceConfig_Type**		
Comment	configuration of a single search space at the SS: The position of a particular search space candidate in frequency and time domain depends on configuration of the search space and its associated CORESET (see TS 38.213 clause 10.1): - Common or UE-specific search space - aggregation level L - number of candidates per aggregation level - PDCCH monitoring periodicity and offset - frequency domain resources - number of symbols (time domain) in addition in case of UE-specific search space: - C-RNTI (as configured for the active cell) - carrier indicator field value (in case of cross carrier scheduling) all fields are mandatory as modification of a single field may cause inconsistencies		
TypeAndPriorityList	NR_SearchSpaceTypeAndPriorityList_Type		list of search space types (according to TS 38.213 clause 10.1) to be mapped to the given search space configuration. NOTE 1: In general the lists of search space types for different search spaces shall be mutual exclusive; NOTE 2: TS 38.213 clause 10.1 could be read as if the different types of search spaces use distinct instances of search spaces; nevertheless RRC type definitions allow use of different types in one and the same search space
AggregationLevel	NR_PDCCH_CCE_AggregationLevel_Type		aggregation level to be applied for an actual PDCCH of the given search space
SearchSpaceConfigAtUE	NR_ASN1_SearchSpace_Type		search space configuration as sent to the UE; contains searchSpaceId and controlResourceSetId referring to the associated CORESET; furthermore the SS may need e.g. the number of candidates to detect error situations in context of candidate selection

D.1.3.2.2.3.2.2 Search_Space_DCI_Assignment

NR_BWP_Id_List_Type

TTCN-3 Record of Type	
Name	**NR_BWP_Id_List_Type**
Comment	
record of BWP_Id	

NR_AssignedBWPs_Type

TTCN-3 Record Type			
Name	**NR_AssignedBWPs_Type**		
Comment	definition of a set of BWPs being assigned e.g. to system information scheduling or RACH procedures NOTE 1: there is no error when e.g. "ActiveBWP" is set and the currently active BWP is contained in DedicatedBWPs too NOTE 2: it is up to use of this type in TTCN to ensure that a specific BWP assignment makes sense, in most cases multiple BWPs may not be applicable		
ActiveBWP	Null_Type	opt	SS shall assign the currently active BWP
InitialBWP	Null_Type	opt	SS shall assign the initial BWP
DedicatedBWPs	NR_BWP_Id_List_Type		SS shall assign all BWPs as listed (on top of active or initial BWP if set); an empty list indicates that no (additional) BWPs are assigned

NR_SearchSpaceDlDciAssignment_Type

TTCN-3 Record Type			
Name	**NR_SearchSpaceDlDciAssignment_Type**		
Comment	configuration of DCI for a specific search space; in general the configuration belongs to a transport channel configuration (e.g. BCH, PCH, DL-SCH): the DCI is applied for DL transmission on the respective channel and can be explicitly initiated by TTCN (e.g. PCH, DL-SCH) or automatically by the SS (e.g. BCH or Msg2/Msg4 scheduling of RACH procedure); all fields are mandatory for the first configuration of an instance for modifications "omit" means "keep as it is"		
AssignedBWPs	NR_AssignedBWPs_Type	opt	BWP where given DCI shall be scheduled in given search space; NOTE 1: When there is no BWP according to configuration of AssignedBWPs, there is no DL assignment; this can be used e.g. to prevent automatic scheduling of system information; NOTE 2: In principle a DL assignment can happen simultaneously in more than one BWP e.g. if system information shall be scheduled in active and initial BWP; but as long as there is no use case for simultaneous DL assignments, configuration of AssignedBWPs shall be restricted to a maximum of one BWP
SearchSpaceType	NR_SearchSpaceType_Type	opt	search space to be used for sending of given DCI; when at the scheduled point in time of a DL transmission there is no such search space configured at the given BWP, the SS may raise an error
DciInfo	NR_DciDlInfo_Type	opt	DCI to be used

NR_SearchSpaceUlDciAssignment_Type

TTCN-3 Record Type			
Name	**NR_SearchSpaceUlDciAssignment_Type**		
Comment	configuration of DCI for UL grants in the UL USS; in general the configuration belongs to a transport channel configuration (e.g. UL-SCH); all fields are mandatory for the first configuration of an instance for modifications "omit" means "keep as it is"		
AssignedBWPs	NR_AssignedBWPs_Type	opt	BWP where given DCI shall be scheduled in given search space; AssignedBWPs shall specify exactly one BWP (ActiveBWP in general); the SS may raise an error otherwise
SearchSpaceType	NR_SearchSpaceType_Type	opt	search space to be used for sending of given DCI; when at the scheduled point in time of a UL grant transmission there is no such search space configured at the given BWP, the SS may raise an error
DciInfo	NR_DciUlInfo_Type	opt	DCI to be used

D.1.3.2.2.3.3 CSI_Reference_Signals

NR_CSI_ResourceConfigList_Type

TTCN-3 Record of Type	
Name	**NR_CSI_ResourceConfigList_Type**
Comment	
record of NR_ASN1_CSI_ResourceConfig_Type	

NR_CSI_RS_ConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_CSI_RS_ConfigInfo_Type**		
Comment	Channel-state information reference signal (CSI) according to TS 38.211 clause 7.4.1.5; UE procedure for reporting channel state information as according to TS 38.214 clause 5.2		
ResourceConfigList	NR_CSI_ResourceConfigList_Type	opt	list of CSI resource configurations as signalled to the UE; CSI-ResourceConfig contains configuration of either nzp-CSI-RS-ResourceSets or csi-IM-ResourceSets with L1 parameters for the CSI reference signals according to TS 38.211 clause 7.4.1.5 (e.g. ScramblingID, CDM-Type, etc.)
RelativeTxPower	NR_EPRE_Ratio_Type	opt	transmit power for resource elements (REs) being used for CSI-RS

NR_CSI_RS_Config_Type

TTCN-3 Union Type		
Name	**NR_CSI_RS_Config_Type**	
Comment		
ConfigInfo	NR_CSI_RS_ConfigInfo_Type	configuration of CSI Reference Signals
None	Null_Type	no CSI Reference Signals

D.1.3.2.3 PhysicalLayer_Uplink

Uplink physical layer configuration: UL channels and BWPs

NR_CellConfigPhysicalLayerUplink_Type

TTCN-3 Record Type			
Name	**NR_CellConfigPhysicalLayerUplink_Type**		
Comment	physical layer configuration at the SS for the uplink of a cell		
Uplink	NR_Uplink_Type	opt	
Supplementary Uplink	NR_Uplink_Type	opt	
TimingAdvance	NR_SS_TimingAdvanceConfig_Type	opt	
PUSCH_ServingCellConfig	NR_ASN1_PUSCH_ServingCellConfig_Type	opt	

NR_Uplink_Type

TTCN-3 Union Type		
Name	**NR_Uplink_Type**	
Comment		
Config	NR_UplinkConfig_Type	
None	Null_Type	in case the uplink or supplementary uplink is not used/needed

NR_SS_TimingAdvanceConfig_Type

TTCN-3 Union Type		
Name	**NR_SS_TimingAdvanceConfig_Type**	
Comment		
InitialValue	NR_RACH_TimingAdvance_Type	initial 12 bit value corresponding to Timing Advance Command field of the Random Access Response (TS 38.321 clause 6.2.3): value of 0..3846 according to TS 38.213 clause 4.2; 0 in normal cases)
Relative	NR_TimingAdvanceIndex_Type	timing advance command to adjust changes of timing advance acc. to TS 38.213 clause 4.2; (range acc. 6 bit value: -31..32)

D.1.3.2.3.1 Uplink_BWP

NR_UplinkBWP_Type

TTCN-3 Record Type			
Name	**NR_UplinkBWP_Type**		
Comment	Configuration of single BWP at the SS; NOTE: for rel-15 this is the same as the ASN.1 type "BWP-Uplink" but nevertheless the TTCN type may be useful for future extensions		
Id	BWP_Id	opt	Initial BWP: 0 Dedicated BWP: 1..4
Common	NR_ASN1_BWP_UplinkCommon_Type	opt	contains common configuration for RACH, PUSCH, PUCCH configuration at the UE: - Initial BWP: -> ServingCellConfigCommon.uplinkConfigCommon.initialUplinkBWP ServingCellConfigCommon.supplementaryUplinkConfig.initialUplinkBWP -> SIB1.uplinkConfigCommon.initialUplinkBWP SIB1.supplementaryUplink.uplinkConfigCommon.initialUplinkBWP - Dedicated BWP: -> ServingCellConfig.uplinkConfig.uplinkBWP-ToAddModList[-].bwp-Common ServingCellConfig.supplementaryUplink.uplinkBWP-ToAddModList[-].bwp-Common
Dedicated	NR_ASN1_BWP_UplinkDedicated_Type	opt	contains dedicated configuration for PUCCH, PUCCH, ConfiguredGrant, SRS, BeamFailureRecovery configuration at the UE: - Initial BWP: -> ServingCellConfig.uplinkConfig.initialUplinkBWP ServingCellConfig.supplementaryUplink.initialUplinkBWP - Dedicated BWP: -> ServingCellConfig.uplinkConfig.uplinkBWP-ToAddModList[-].bwp-Dedicated ServingCellConfig.supplementaryUplink.uplinkBWP-ToAddModList[-].bwp-Dedicated

NR_UplinkBWP_List_Type

TTCN-3 Record of Type	
Name	**NR_UplinkBWP_List_Type**
Comment	configuration of BWPs: each entry shall have a distinct Id with ID=0 for the initial BWP NOTE: Even though in general the BWP-Id corresponds to the index of the element within the array of BWPs, the SS shall not take this as assumption
record of NR_UplinkBWP_Type	

NR_ActiveUplinkBWP_Id_Type

TTCN-3 Union Type		
Name	**NR_ActiveUplinkBWP_Id_Type**	
Comment		
Explicit	BWP_Id	in case that BWP-Id of active UL-BWP (and/or active UL-BWP of supplementary UL) is different than BWP-Id of active DL-BWP
SameIdAsDL	Null_Type	same BWP-Id as of the active DL-BWP

NR_UplinkBWPs_Type

TTCN-3 Record Type			
Name	**NR_UplinkBWPs_Type**		
Comment	configuration of uplink BWPs		
ActiveBWP	NR_ActiveUplinkBWP_Id_Type	opt	Id of the currently active BWP (this does not need to be the same as the index)
BwpArray	NR_UplinkBWP_List_Type	opt	array of band width parts: initial BWP + up to 4 dedicated BWPs

NR_UplinkConfig_Type

TTCN-3 Record Type			
Name	**NR_UplinkConfig_Type**		
Comment	configuration of a single uplink (uplink or supplementary uplink)		
FrequencyInfoUL	NR_ASN1_FrequencyInfoUL_Type	opt	carries information about location of reference resource block (point A) in frequency domain and about associated frequency bands (list of FreqBandIndicatorNR) !!!! NR-NOTE: there is no configuration parameters anymore as for EUTRA's UplinkStaticCellInfo_Type.Earfcn and UplinkStaticCellInfo_Type.Bandwidth !!!!
BWPs	NR_UplinkBWPs_Type	opt	
RACH_ConfigDedicated	NR_ASN1_RACH_ConfigDedicated_Type	opt	configuration at the UE: -> SpCellConfig.reconfigurationWithSync.rach-ConfigDedicated.uplink/supplementaryUplink
SI_RequestConfig	NR_ASN1_SI_RequestConfig_Type	opt	configuration of PRACH preamble(s) and PRACH resource(s) for si-RequestConfig configuration at the UE: -> in SIB1.si-SchedulingInfo.si-RequestConfig

D.1.3.2.4 DCI_Configuration

Definitions for resource assignment and DCI according to TS 38.212 clause 7.3 and TS 38.214 clause 5.1.2 and 6.1.2

D.1.3.2.4.1 Common_Fields

Common type definitions for DCI fields being used for UL and DL assignments (format 0_X and 1_X);
NOTE: in general fields of DCIs are defined as union in the first place to allow backward compatible enhancements, e.g. when a dynamic SS behaviour needs to replace the static value assignment

NR_DciCommon_CarrierIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_CarrierIndicator_Type**	
Comment	Carrier indicator field (CIF) of DCI formats 0_1 and 1_1 according to TS 38.212 and TS 38.213 clause 10.1	
None	Null_Type	no cell index to be indicated in Carrier indicator field
CellIndex	B3_Type	3 bits cell index to be indicated in Carrier indicator field; applicable when the UE is configured with higher layer parameter CrossCarrierSchedulingConfig

NR_DciCommon_BWPIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_BWPIndicator_Type**	
Comment	Bandwidth part indicator according to TS 38.212 Table 7.3.1.1.2-1; used to address RRC-configured BandwidthPart-Config; NOTE: in general the BWP configuration at the SS is static i.e. dedicated BWPs may be preconfigured in a test case preamble => a) BWP configuration at the SS is not always the same as at the UE and SS cannot determine the number of BWPs being configured at the UE from its BWP configuration. b) The number and order of BWPs may differ at SS and UE. c) The index used in the DCI's BWP indicator is not identical with the BWP-Id as the BWP indicator is the index in the UE's BWP array => in general the SS cannot determine the size and value of the DCI's BWP indicator but this need to be done in TTCN	
Index	bitstring	0, 1 or 2 bits

NR_DciCommon_TpcCommand_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_TpcCommand_Type**	
Comment	TPC Command Field according to TS 38.213 Table 7.1.1-1 and Table 7.2.1-1	
Value	B2_Type	2 bits; default value: '01'B (0 dB; accumulated TPC)

NR_DciCommon_UL_SUL_Indicator_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_UL_SUL_Indicator_Type**	
Comment	TS 38.212 clause 7.3.1.1.1/2: UL/SUL indicator	
None	Null_Type	to be used when no SUL is configured
Value	B1_Type	UL/SUL indicator according to TS 38.212 Table 7.3.1.1.1-1

NR_DciCommon_VrbPrbMapping_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_VrbPrbMapping_Type**	
Comment	to specify how VRB-to-PRB mapping shall be controlled by DCI if applicable (see TS 38.212 Table 7.3.1.1.2-33 and where it is referred	
None	Null_Type	0 bit, applicable for format 1_0 when only resource allocation type 0 is configured
Index	B1_Type	1 bit, index in TS 38.212 Table 7.3.1.1.2-33 indicating non-interleaved or interleaved VRB-to-PRB mapping according to TS 38.211 clause 6.3.1.7

NR_DciCommon_TimeDomainResourceAssignment_Type

TTCN-3 Union Type		
Name	**NR_DciCommon_TimeDomainResourceAssignment_Type**	
Comment	Common type definition for UL/DL Resource allocation in time domain according to TS 38.214 clause 5.1.2.1 and 6.1.2.1	
Index	bitstring	index of entry in SEQUENCE OF PUSCH/PDSCH-TimeDomainResourceAllocation provided e.g. by PUSCH/PDSCH-Config; number of bits in a particular DCI depends on the size of the SEQUENCE OF PUSCH/PDSCH-TimeDomainResourceAllocation (e.g. Time domain resource assignment is an empty bitstring ("B) when only one time-domain configuration is provided to the UE) NOTE: PDSCH/PUSCH-Config overrules list in PDSCH/PUSCH-ConfigCommon

NR_DciFormat_X_1_SrsRequest_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_X_1_SrsRequest_Type**	
Comment	TS 38.212 clause 7.3.1.2: SRS request	
SingleUL	B2_Type	2 bits: Index of the SRS resource set to be used according to TS 38.212 Table 7.3.1.1.2-24
UL_SUL	B3_Type	3 bits: Index of the SRS resource set to be used according to TS 38.212 Table 7.3.1.1.2-24 plus first bit to distiguish UL/SUL

NR_DciFormat_X_1_DmrsSequenceInit_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_X_1_DmrsSequenceInit_Type**	
Comment	TS 38.212 clause 7.3.1.2 (format 0_1) and clause 7.3.2.2 (format 1_1): DMRS sequence initialization	
None	Null_Type	0 bit for format 0_1 and if transform precoder is enabled
Value	B1_Type	1 bit else

D.1.3.2.4.2 Resource_Allocation

Type definitions for resource allocation which do not correpond directly to DCI fields but are used to configure how the SS maintains resource allocation for a given DCI

Resource_Allocation: Basic Type Definitions

TTCN-3 Basic Types		
NR_ImcsValue_Type	integer (0..31)	Modulation and coding scheme index coding
NR_RedundancyVersion_Type	integer (0..3)	Redundancy Version (RV): 2 bits

NR_ResourceAllocationType_Type

TTCN-3 Enumerated Type	
Name	**NR_ResourceAllocationType_Type**
Comment	to specify the format of the resource allocation type being used for frequency domain resource assignment in DCI; NOTE 1: For DCI Format 0_0 and 1_0 only resourceAllocationType1 is applicable (TS 38.214 clause 5.1.2.2 and 6.1.2.2) NOTE 2: The SS needs to determined based on RRC configuration whether MSB of the frequency domain resource assignment needs to used as discriminator for type 0/1 (see TS 38.212 clause 7.3.1.1.2 and clause 7.3.1.2.2 and PUSCH/PDSCH-Config.resourceAllocation) NOTE 3: THe SS shall raise an error if the DCI configuration conflicts with the configuration given by PUSCH/PDSCH-Config.resourceAllocation
resourceAllocationType0	resource allocation type 0 according to TS 38.214 clause 5.1.2.2.1 and 6.1.2.2.1: bitmap indicating the Resource Block Groups (RBGs) that are allocated; not applicable for DCI Format 0_0 and 1_0
resourceAllocationType1	resource allocation type 1 according to TS 38.214 clause 5.1.2.2.2 and 6.1.2.2.2: resource indication value (RIV) corresponding to a starting virtual resource block and a length in terms of contiguously allocated resource blocks

NR_ModulationSchemePDSCH_Type

TTCN-3 Enumerated Type	
Name	**NR_ModulationSchemePDSCH_Type**
Comment	Supported modulation schemes for PDSCH according to 38.211 Table 7.3.1.2-1
qpsk	
qam16	
qam64	
qam256	

NR_FreqDomainSchedulExplicit_Type

TTCN-3 Record Type			
Name	**NR_FreqDomainSchedulExplicit_Type**		
Comment	type used for explicit DL scheduling; Nprb is the exact number of RBs whereas in NR_FreqDomainSchedulCommon_Type MaxRbCnt is the upper bound		
FirstRbIndex	integer		index of the first resource block in frequency domain
Nprb	integer		number of resource blocks to be assigned

NR_FreqDomainSchedulCommonDL_Type

TTCN-3 Record Type			
Name	**NR_FreqDomainSchedulCommonDL_Type**		
Comment	common type to specify restrictions for frequency domain scheduling by a start index and a maximum range of RBs (similar to EUTRA, but for NR in general the frequency domain scheduling is not related to the whole frequency band but to a given band width part (BWP)		
FirstRbIndex	integer		index of the first (virtual) resource block in frequency domain
MaxRbCnt	integer		maximum number of resource-blocks to be used for a transport block; SS shall not assigned more than the given resource blocks; FirstRbIndex + MaxRbCnt shall not exceed the total number of available resoource blocks in frequency domain; the SS shall raise an error otherwise

NR_FreqDomainResourceAssignmentDL_Type

TTCN-3 Union Type		
Name	**NR_FreqDomainResourceAssignmentDL_Type**	
Comment		
Automatic	NR_FreqDomainSchedulCommonDL_Type	The SS shall automatically do the resource assignment needed for a DL transmission based on TBS evaluation guideline given in Annex B.1 of 38.523-3
Explicit	NR_FreqDomainSchedulExplicit_Type	Frequency domain resource assignment is given explicitly by TTCN; the SS needs to calculate the RIV (resource allocation type 1) or generate the bitmap (resource allocation type 0). In case of resource allocation type 0 the allocation shall also be in consecutive RBGs. NOTE: So far there is no requirement for signalling tests to use non-consecutive RBGs ((neither for LTE nor for NR)

NR_RedundancyVersionList_Type

TTCN-3 Record of Type	
Name	**NR_RedundancyVersionList_Type**
Comment	There shall be as many entries in the list as re-transmissions are allowed; if there are not enough elements specified SS shall raise an error; In 4G at least in UL the array length corresponds to maxHARQ-Tx (i.e. up to 28 re-transmissions according to RRC ASN.1)
record of NR_RedundancyVersion_Type	

NR_TransportBlockSchedulingDL_Automatic_Type

TTCN-3 Record Type			
Name	**NR_TransportBlockSchedulingDL_Automatic_Type**		
Comment	transport block information for a DL transmission and potential retransmission in automatic mode		
TransportBlock 1	NR_ModulationSchemePDSCH_Type		
TransportBlock 2	NR_ModulationSchemePDSCH_Type	opt	MCS for 2nd transport block (if any); 'omit' means that there is no 2nd transport block; presence corresponds to PDSCH-Config.maxNrofCodeWordsScheduledByDCI
RedundancyVersionList	NR_RedundancyVersionList_Type	opt	list of Redundancy versions to be used for DL transmission and possible retransmissions; not present, if the DL transmission does not make use of harq processing (e.g. paging); in automatic mode the same list of redundancy versions is used for both transport blocks; if there are not enough elements to achieve successful DL transmission, SS shall raise an error

RetransmissionTiming_Type

TTCN-3 Union Type		
Name	**RetransmissionTiming_Type**	
Comment	to specify the timing of potential retransmissions related to the initial transmission. Rules in case of necessary UL or DL retransmissions: - When a transmission is scheduled with TimingInfo=Now, then any retransmission of a previous transmission takes precedence over the new transmission - Re-transmissions take precedence over periodic UL grants - The SS shall raise an error indication when - a retransmission collides with another UL or DL transmisssion which is scheduled by TTCN with specific TimingInfo for the same slot as the retransmssion - a new DL transmission would take over an ongoing DL transmission - the retransmission is not possible at the given time for any other reason (e.g. due to slot format)	
SlotOffset	integer	the kth retransmission shall be k * SlotOffset slots after the initial transmission: e.g. slots per subframe = N and initial transmission at subframeX and slotX => 1. retransmission at subframeX + (slotX + SlotOffset) / N and (slotX + SlotOffset) mod N 2. retransmission at subframeX + (slotX + 2*SlotOffset) / N and (slotX + 2*SlotOffset) mod N and so on
SubframeOffset	integer	the kth retransmission shall be k * SubframeOffset subframes after the initial transmission in the same slot of subframe as for the initial transmission: e.g. initial transmission at subframeX and slotX 1. retransmission at subframeX + SubframeOffset and slotX 2. retransmission at subframeX + 2*SubframeOffset and slotX and so on
AnyTime	Null_Type	the SS shall autonomuously determine the next possible Ocassion for the retransmission

TransmissionTimingOffset_Type

TTCN-3 Union Type		
Name	**TransmissionTimingOffset_Type**	
Comment	Timing information for retransmissions	
None	Null_Type	initial transmission: no timing offset but timing info as according to common part of the ASP
Retransmission	RetransmissionTiming_Type	retransmission with timing offset relative to initial transmission

NR_TransportBlockSingleTransmission_Type

TTCN-3 Record Type			
Name	**NR_TransportBlockSingleTransmission_Type**		
Comment	TS 38.212 clause 7.3.1.2.1 and 7.3.1.2.2: parameters for transmission (or re-transmission) of a single transport block; used for explicit mode of DL transmission and for UL grants		
TimingOffset	TransmissionTimingOffset_Type		in general "None" in case of a new transmissin (i.e. no timing offset) and "Retransmission" for any retransmission
ImcsValue	NR_ImcsValue_Type		Imcs value to be mapped to the Modulation and coding scheme field of DCI format 1_0 or 1_1
RedundancyVersion	NR_RedundancyVersion_Type		Redundancy version for a single transmission or re-transmission
ToggleNDI	boolean		"true" for transmission of a new transport block, "false" for a re-transmission; the NDI (New data indicator) itself is maintained by the SS and therefore not provided as configuration parameter

NR_TransportBlockRetransmissionList_Type

TTCN-3 Record of Type	
Name	**NR_TransportBlockRetransmissionList_Type**
Comment	list of (initial) transmission and potential retransmissions; used for explicit mode of DL transmission and for UL grants; in general the Imcs is the same for all (re-)transmissions and the NDI is not toggled for the retransmissions
record of NR_TransportBlockSingleTransmission_Type	

NR_TransportBlockSchedulingDL_Explicit_Type

TTCN-3 Record Type			
Name	**NR_TransportBlockSchedulingDL_Explicit_Type**		
Comment			
TransportBlock 1	NR_TransportBlockRetransmissionList_Type		list of transmission and retransmissions for transport block 1
TransportBlock 2	NR_TransportBlockRetransmissionList_Type	opt	'omit' means that there is no 2nd transport block; Presence corresponds to PDSCH-Config.maxNrofCodeWordsScheduledByDCI

NR_TransportBlockSchedulingDL_Type

TTCN-3 Union Type		
Name	**NR_TransportBlockSchedulingDL_Type**	
Comment		
Automatic	NR_TransportBlockSchedulingDL_Automatic_Type	
Explicit	NR_TransportBlockSchedulingDL_Explicit_Type	

NR_HarqProcessConfig_Type

TTCN-3 Union Type		
Name	**NR_HarqProcessConfig_Type**	
Comment	HARQ processes to be used automatically for UL grants or DL assignments	
None	Null_Type	when there is no HARQ for the given DCI (paging)
Broadcast	Null_Type	when the broadcast process shall be used
AnyProcess	Null_Type	The SS may choose any process for scheduling of the UL/DL data transfer
SpecificSubset	NR_HarqProcessList_Type	only the HARQ processes of this list shall be used automatically, other processes are excluded from automatic assignments; nevertheless for DL any HARQ processes may be addressed explicitly by NR_DRB_DataPerSlot_DL_Type.HarqProcess

D.1.3.2.4.3 PDSCH_Scheduling

NR_DciDlInfo_Type

TTCN-3 Record Type			
Name	**NR_DciDlInfo_Type**		
Comment	scheduling for CCCH/DCCH/DTCH mapped to DL-SCH mapped to PDSCH; for all parameters: mandatory for initial configuration of an instance, omit means "keep as it is" afterwards; definition is applicable for DCI format 1_0 (C-RNTI, RA-RNTI, TC-RNTI) and DCI format 1_1		
ResoureAssignment	NR_DciFormat_1_X_ResourceAssignment_Type	opt	resource assignment; to control setting of the following fields in DCI formats 1_0 and 1_1 (TS 38.212 clause 7.3.1.2.1 and 7.3.1.2.2): Frequency domain resource assignment Time domain resource assignment Modulation and coding scheme New data indicator Redundancy version HARQ process number
VrbPrbMapping	NR_DciCommon_VrbPrbMapping_Type	opt	VRB-to-PRB mapping
Format	NR_DciFormat_1_X_SpecificInfo_Type	opt	DCI format and DCI format specific parameters

NR_DciFormat_1_X_ResourceAssignment_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_X_ResourceAssignment_Type**		
Comment	Common definition to be used for resource scheduling in DL		
ResourceAllocationType	NR_ResourceAllocationType_Type	opt	resource allocation type to be used for the frequency domain resource asignment
FreqDomain	NR_FreqDomainResourceAssignmentDL_Type	opt	
TimeDomain	NR_DciCommon_TimeDomainResourceAssignment_Type	opt	
TransportBlockScheduling	NR_TransportBlockSchedulingDL_Type	opt	information about MCS and RV for one or two transport blocks
HarqProcessConfig	NR_HarqProcessConfig_Type	opt	configures which HARQ processes the SS may use; corresponds to "HARQ process number" in TS 38.212 clause 7.3.1.2.1 and 7.3.1.2.2

NR_DciFormat_1_X_SpecificInfo_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_X_SpecificInfo_Type**	
Comment		
Format_1_0	NR_DciFormat_1_0_SpecificInfo_Type	
Format_1_0_P_RNTI	NR_DciFormat_1_0_P_RNTI_SpecificInfo_Type	
Format_1_0_SI_RNTI	NR_DciFormat_1_0_SI_RNTI_SpecificInfo_Type	
Format_1_0_RA_RNTI	NR_DciFormat_1_0_RA_RNTI_SpecificInfo_Type	
Format_1_1	NR_DciFormat_1_1_SpecificInfo_Type	

NR_DciFormat_1_0_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_0_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.1: scheduling of PDSCH in one DL cell; default parameters according to TS 38.508-1 clause 4.3.6.1.2.1		
DAI	NR_DciFormat_1_0_DAI_Type	opt	downlink assignment index
TpcCommandPucch	NR_DciCommon_TpcCommand_Type	opt	TPC command for scheduled PUCCH; to be set to 1 per default (0 dB; accumulated TPC)
PucchResourceIndicator	NR_DciFormat_1_X_PucchResourceIndicator_Type	opt	PUCCH resource indicator
PdschHarqTimingIndicator	NR_DciFormat_1_X_PdschHarqTimingIndicator_Type	opt	PDSCH-to-HARQ_feedback timing indicator

NR_DciFormat_1_0_P_RNTI_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_0_P_RNTI_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.1: scheduling of PDSCH with DCI scrambled by P-RNTI; default parameters according to TS 38.508-1 clause 4.3.6.1.2.2		
ShortMessageIndicator	B2_Type	opt	Short Message Indicator according to TS 38.212 Table 7.3.1.2.1-1
ShortMessages	B8_Type	opt	Short Messages according to TS 38.331 Table 6.5-1
TbScaling	B2_Type	opt	Scaling factor according to TS 38.214 Table 5.1.3.2-2

NR_DciFormat_1_0_SI_RNTI_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_0_SI_RNTI_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.1: scheduling of PDSCH with DCI scrambled by SI-RNTI; default parameters according to TS 38.508-1 clause 4.3.6.1.2.3		
SystemInfoIndicator	B1_Type	opt	System information indicator according to TS 38.212 Table 7.3.1.2.1-2

NR_DciFormat_1_0_RA_RNTI_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_0_RA_RNTI_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.1: scheduling of PDSCH with DCI scrambled by RA-RNTI; default parameters according to TS 38.508-1 clause 4.3.6.1.2.4		
TbScaling	B2_Type	opt	Scaling factor according to TS 38.214 Table 5.1.3.2-2

NR_DciFormat_1_1_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_1_1_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.2.2: scheduling of PDSCH in one cell; default parameters according to TS 38.508-1 clause 4.3.6.1.2.2 For all fields: 'omit' means that the information shall not be contained in the DCI on PDCCH		
CarrierIndicator	NR_DciCommon_CarrierIndicator_Type	opt	Carrier indicator - CIF value for Cross Carrier Scheduling; 'None' otherwise
BWPIndicator	NR_DciCommon_BWPIndicator_Type	opt	Bandwidth part indicator
PrbBundlingSizeIndicator	NR_DciFormat_1_1_PrbBundlingSizeIndicator_Type	opt	PRB bundling size indicator
RateMatchingIndicator	NR_DciFormat_1_1_RateMatchingIndicator_Type	opt	Rate matching indicator
ZP_CSI_RS_Trigger	NR_DciFormat_1_1_ZP_CSI_RS_Trigger_Type	opt	ZP CSI-RS trigger
DAI	NR_DciFormat_1_1_DAI_Type	opt	downlink assignment index
TpcCommandPucch	NR_DciCommon_TpcCommand_Type	opt	TPC command for scheduled PUCCH; to be set to 1 per default (0 dB; accumulated TPC)
PucchResourceIndicator	NR_DciFormat_1_X_PucchResourceIndicator_Type	opt	PUCCH resource indicator
PdschHarqTimingIndicator	NR_DciFormat_1_X_PdschHarqTimingIndicator_Type	opt	PDSCH-to-HARQ_feedback timing indicator
AntennaPorts	NR_DciFormat_1_1_AntennaPorts_Type	opt	Antenna port(s)
TCI	NR_DciFormat_1_1_TCI_Type	opt	Transmission configuration indication
SrsRequest	NR_DciFormat_X_1_SrsRequest_Type	opt	SRS request
CBGTI	NR_DciFormat_1_1_CBGTI_Type	opt	CBG transmission information (CBGTI)
CBGFI	NR_DciFormat_1_1_CBGFI_Type	opt	CBG flushing out information (CBGFI)
DmrsSequenceInit	NR_DciFormat_X_1_DmrsSequenceInit_Type	opt	DMRS sequence initialization

NR_DciFormat_1_X_PucchResourceIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_X_PucchResourceIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.1/2: PUCCH resource indicator	
Value	B3_Type	3 bits as defined in TS 38.213 clause 9.2.3 or reserved bits; index to "PUCCH-ResourceSet" according to 38.213 clause 9.2.3 as provided by PUCCH-Config

NR_DciFormat_1_X_PdschHarqTimingIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_X_PdschHarqTimingIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.1/2: PDSCH-to-HARQ_feedback timing indicator (TS 38.213 clause 9.2.3)	
Value	bitstring	Format 1_0: 3 bits, addresses one of {1, 2, 3, 4, 5, 6, 7, 8} according to TS 38.213 clause 9.2.3; Format 1_1: 0..3 bits, addresses entry in table provided by PUCCH-Config.dl-DataToUL-ACK

NR_DciFormat_1_0_DAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_0_DAI_Type**	
Comment	TS 38.212 clause 7.3.2.1: DAI (downlink assignment indicator)	
Index	B2_Type	2 bits according to TS 38.213 clause 9.1.3 or reserved bits

NR_DciFormat_1_1_PrbBundlingSizeIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_PrbBundlingSizeIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.2: PRB bundling size indicator	
None	Null_Type	no PRB bundling
Dynamic	B1_Type	when PDSCH-Config.prb-BundlingType is set to 'dynamic'; indicates which set of PRG values to be used (see 38.214 clause 5.1.2.3)

NR_DciFormat_1_1_RateMatchingIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_RateMatchingIndicator_Type**	
Comment	TS 38.212 clause 7.3.2.2: Rate matching indicator; rateMatchPatternGroup1 and rateMatchPatternGroup2 configured by PDSCH-Config	
Bitmap	bitstring	0, 1, or 2 bits: bitmap indicating rateMatchPatternGroup1 and/or rateMatchPatternGroup2 to be applied; size depending on whether rateMatchPatternGroup1, rateMatchPatternGroup2 or both are configured by PDSCH-Config at the UE

NR_DciFormat_1_1_ZP_CSI_RS_Trigger_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_ZP_CSI_RS_Trigger_Type**	
Comment	TS 38.212 clause 7.3.2.2: ZP CSI-RS trigger	
Index	bitstring	0, 1, or 2 bits: Index in list of ZP-CSI-RS-Resource as configured by PDSCH-Config at the UE

NR_DciFormat_1_1_DAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_DAI_Type**	
Comment	TS 38.212 clause 7.3.2.2: DAI (downlink assignment indicator) depending on PhysicalCellGroupConfig.pdsch-HARQ-ACK-codebook and the number of serving cells	
None	Null_Type	no DAI
SingleServingCell	B2_Type	pdsch-HARQ-ACK-codebook=dynamic and only one serving cell
MultipleServingCells	B4_Type	pdsch-HARQ-ACK-codebook=dynamic and more than one serving cell

NR_DciFormat_1_1_AntennaPorts_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_AntennaPorts_Type**	
Comment	TS 38.212 clause 7.3.1.2: Antenna ports as defined by Tables TS 38.212 7.3.1.2.2-1..4	
Index	bitstring	bitstring presentation of index to Tables 7.3.1.2.2-1..4

NR_DciFormat_1_1_TCI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_TCI_Type**	
Comment	TS 38.212 clause 7.3.1.2: Transmission configuration indication (TCI)	
None	Null_Type	if ControlResourceSet.tci-PresentInDCI does not indicate 'enabled'
Value	B3_Type	if ControlResourceSet.tci-PresentInDCI=='enabled': TCI according to TS 38.213 clause 5.1.5/6

NR_DciFormat_1_1_CBGTI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_CBGTI_Type**	
Comment	TS 38.212 clause 7.3.1.2: CBG transmission information (CBGTI)	
Bitmap	bitstring	0, 2, 4, 6, or 8 bits according to PDSCH-CodeBlockGroupTransmission.maxCodeBlockGroupsPerTransportBlock and TS 38.214 clause 5.1.7.2

NR_DciFormat_1_1_CBGFI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_1_1_CBGFI_Type**	
Comment	TS 38.212 clause 7.3.1.2: CBG flushing out information (CBGFI)	
None	Null_Type	no CBGFI
Flag	B1_Type	CBGFI flag, if codeBlockGroupTransmission is configured in PDSCH-ServingCellConfig with codeBlockGroupFlushIndicator set to true

D.1.3.2.4.4 PUSCH_Scheduling

NR_DciUlInfo_Type

TTCN-3 Record Type			
Name	**NR_DciUlInfo_Type**		
Comment	scheduling for CCCH/DCCH/DTCH mapped to UL-SCH mapped to PUSCH; for all parameters: mandatory for initial configuration of an instance, omit means "keep as it is" afterwards		
ResoureAssignment	NR_DciFormat_0_X_ResourceAssignment_Type	opt	resource assignment; to control setting of the following fields in DCI formats 0_0 and 0_1 (TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2): Frequency domain resource assignment Time domain resource assignment Modulation and coding scheme New data indicator Redundancy version HARQ process number
PuschHoppingCtrl	NR_DciFormat_0_X_PuschHoppingCtrl_Type	opt	control of frequency hopping in DCI formats 0_0 and 0_1 (TS 38.212 Table 7.3.1.1.1-3)
TpcCommandPusch	NR_DciCommon_TpcCommand_Type	opt	TPC command for scheduled PUSCH; to be set to 1 per default (0 dB; accumulated TPC)
UL_SUL_Indicator	NR_DciCommon_UL_SUL_Indicator_Type	opt	to control use of supplementary UL by DCI
Format	NR_DciFormat_0_X_SpecificInfo_Type	opt	DCI format and DCI format specific parameters

NR_DciFormat_0_X_ResourceAssignment_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_0_X_ResourceAssignment_Type**		
Comment	Common definition to be used for resource scheduling in UL		
ResourceAllocationType	NR_ResourceAllocationType_Type	opt	resource allocation type to be used for the frequency domain resource assignment
FreqDomain	NR_FreqDomainSchedulExplicit_Type	opt	explicit resource assignment: first RB, number of RBs; corresponds to "Frequency domain resource assignment" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2
TimeDomain	NR_DciCommon_TimeDomainResourceAssignment_Type	opt	corresponds to "Time domain resource assignment" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2
TransportBlockScheduling	NR_TransportBlockRetransmissionList_Type	opt	information about MCS and RV for transport block transmission and possible re-transmissions; corresponds to "Modulation and coding scheme", "New data indicator" and "Redundancy version" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2
HarqProcessConfig	NR_HarqProcessConfig_Type	opt	HARQ process to be used for the scheduled UL data transfer corresponds to "HARQ process number" in TS 38.212 clause 7.3.1.1.1 and 7.3.1.1.2; NOTE: for 5G there is no synchronous HARQ anymore but HARQ is asynchroneous even for UL (TS 38.300 clause 5.3.5.4; TS 38.212 clause 7.3.1: 4-bit HARQ process number included in all DCI Formats for UL)

NR_DciFormat_0_X_SpecificInfo_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_X_SpecificInfo_Type**	
Comment		
Format_0_0	NR_DciFormat_0_0_SpecificInfo_Type	
Format_0_1	NR_DciFormat_0_1_SpecificInfo_Type	

NR_DciFormat_0_0_SpecificInfo_Type

TTCN-3 Record Type	
Name	**NR_DciFormat_0_0_SpecificInfo_Type**
Comment	TS 38.212 clause 7.3.1.1: scheduling of PUSCH in one cell; default parameters according to TS 38.508-1 clause 4.3.6.1.1.1

NR_DciFormat_0_1_SpecificInfo_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_0_1_SpecificInfo_Type**		
Comment	TS 38.212 clause 7.3.1.2: scheduling of PUSCH in one cell; default parameters according to TS 38.508-1 clause 4.3.6.1.1.2; for all parameters: mandatory for initial configuration of an instance, omit means "keep as it is" afterwards		
CarrierIndicator	NR_DciCommon_CarrierIndicator_Type	opt	Carrier indicator - CIF value for Cross Carrier Scheduling; 'None' otherwise
BWPIndicator	NR_DciCommon_BWPIndicator_Type	opt	Bandwidth part indicator
FirstDAI	NR_DciFormat_0_1_FirstDAI_Type	opt	1st downlink assignment index
SecondDAI	NR_DciFormat_0_1_SecondDAI_Type	opt	2nd downlink assignment index
SrsResourceIndicator	NR_DciFormat_0_1_SrsResourceIndicator_Type	opt	SRS resource indicator
PrecodingInfo	NR_DciFormat_0_1_PrecodingInfo_Type	opt	Precoding information and number of layers
AntennaPorts	NR_DciFormat_0_1_AntennaPorts_Type	opt	Antenna ports
SrsRequest	NR_DciFormat_X_1_SrsRequest_Type	opt	SRS request
CsiRequest	NR_DciFormat_0_1_CsiRequest_Type	opt	CSI request
CBGTI	NR_DciFormat_0_1_CBGTI_Type	opt	CBG transmission information (CBGTI)
PtrsDmrsAssociation	NR_DciFormat_0_1_PtrsDmrsAssociation_Type	opt	PTRS-DMRS association
BetaOffsetIndicator	NR_DciFormat_0_1_BetaOffsetIndicator_Type	opt	beta_offset indicator
DmrsSequenceInit	NR_DciFormat_X_1_DmrsSequenceInit_Type	opt	DMRS sequence initialization
UlschIndicator	NR_DciFormat_0_1_UlschIndicator_Type	opt	UL-SCH indicator

NR_DciFormat_0_X_PuschHoppingCtrl_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_X_PuschHoppingCtrl_Type**	
Comment	TS 38.212 7.3.1.1.1 (format 0_0) and 7.3.1.1.2 (format 0_1)	
None	Null_Type	DCI format 0_1 only: 0 bit if only resource allocation type 0 is configured or PUSCH-Config.frequencyHopping is not configured
Flag	B1_Type	1 bit if resource allocation type 1 is configured (or type 0 and type 1) '1'B to indicate frequency hopping according to TS 38.214 clause 6.3

NR_DciFormat_0_1_FirstDAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_FirstDAI_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: First DAI (downlink assignment indicator) depending on PhysicalCellGroupConfig.pdsch-HARQ-ACK-Codebook	
SemiStaticCodebook	B1_Type	1 bit according to TS 38.213 clause 9.1.2.2 for Type-1 HARQ-ACK (pdsch-HARQ-ACK-codebook=semi-static)
DynamicCodebook	B2_Type	2 bits according to TS 38.213 Table 9.1.3-2 for Type-2 HARQ-ACK (pdsch-HARQ-ACK-codebook=dynamic)

NR_DciFormat_0_1_SecondDAI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_SecondDAI_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: Second DAI (downlink assignment indicator) depending on PhysicalCellGroupConfig.pdsch-HARQ-ACK-Codebook	
None	Null_Type	no 2nd DAI
DynamicCodebook	B2_Type	2 bits according to TS 38.213 Table 9.1.3-2 for Type-2 HARQ-ACK (pdsch-HARQ-ACK-codebook=dynamic)

NR_DciFormat_0_1_SrsResourceIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_SrsResourceIndicator_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: SRS resource indicator depending on PUSCH-Config.txConfig	
NonCodeBook	bitstring	txConfig==NonCodeBook: bitstring of 0..3 bits according to TS 38.212 Tables 7.3.1.1.2-28/29/30/31 (according to TS 38.331 clause 6.3.2 "SRS-Config" there are at most 4 entries with usage==nonCodebook)
CodeBook	bitstring	txConfig==CodeBook: bitstring of 0 or 1 bits according to TS 38.212 Table 7.3.1.1.2-32 (according to TS 38.331 clause 6.3.2 "SRS-Config" there are at most 2 entries with usage==codebook)

NR_DciFormat_0_1_PrecodingInfo_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_PrecodingInfo_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: Precoding information and number of layers depending on PUSCH-Config.txConfig	
NonCodeBook	Null_Type	txConfig==NonCodeBook: 0 bits
CodeBook	bitstring	txConfig==CodeBook: bitstring according to TS 38.212 Tables 7.3.1.1.2-2..5; empty string for one antenna port only

NR_DciFormat_0_1_AntennaPorts_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_AntennaPorts_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: Antenna ports depending (mainly) on - PUSCH-Config.transformPrecoder, - DMRS-UplinkConfig.dmrs-Type, - DMRS-UplinkConfig.maxLength	
Index	bitstring	bitstring presentation of index to Tables 7.3.1.1.2-6..23

NR_DciFormat_0_1_CsiRequest_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_CsiRequest_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: CSI request	
Index	bitstring	0, 1, 2, 3, 4, 5, or 6 bits determined by CSI-MeasConfig.reportTriggerSize; TS 38.214 clause 5.2.1.5.1)

NR_DciFormat_0_1_CBGTI_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_CBGTI_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: CBG transmission information (CBGTI)	
Index	bitstring	0, 2, 4, 6, or 8 bits determined by PDSCH-CodeBlockGroupTransmission.maxCodeBlockGroupsPerTransportBlock configured by PDSCH-ServingCellConfig

NR_DciFormat_0_1_PtrsDmrsAssociation_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_PtrsDmrsAssociation_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: PTRS-DMRS association	
None	Null_Type	0 bit if UL-PTRS-present=OFF and PUSCH-tp=Disabled, or if PUSCH-tp=Enabled
Value	B2_Type	2 bits according to TS 38.212 Table 7.3.1.1.2-25 and 7.3.1.1.2-26

NR_DciFormat_0_1_BetaOffsetIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_BetaOffsetIndicator_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: beta_offset indicator	
None	Null_Type	0 bit if uci-on-PUSCH != dynamic (ConfiguredGrantConfig.uci-OnPUSCH
Value	B2_Type	2 bits according to TS 38.213 Table 9.3-3

NR_DciFormat_0_1_UlschIndicator_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_0_1_UlschIndicator_Type**	
Comment	TS 38.212 clause 7.3.1.1.2: UL-SCH indicator	
Value	B1_Type	1 bit: "1" indicates UL-SCH shall be transmitted on the PUSCH, "0" indicates UL-SCH shall not be transmitted on the PUSCH

D.1.3.3 MAC_Layer

Configuration for MAC procedures according to TS 38.321 clause 5 and related physical layer configuration

D.1.3.3.1 MAC_Layer_Common

MAC_Layer_Common: Basic Type Definitions

TTCN-3 Basic Types		
NR_TimingAdvanceIndex_Type	integer (0..63)	acc. to TS 38.321, clause 6.1.3.4 "Timing Advance Command MAC CE" and TS 38.213 clause 4.2 "Transmission timing adjustments"
NR_TimingAdvance_Period_Type	integer (400, 600, 1020, 1530, 2040, 4090, 8190)	the values correspond to 80 % of TimeAlignmentTimer (acc. to TS 38.523-3, clause 6.3.2): ms500, ms750, ms1280, ms1920, ms2560, ms5120, ms10240 rounded to nearest multiple of 10

NR_UplinkTimeAlignment_AutoSynch_Type

TTCN-3 Record Type			
Name	**NR_UplinkTimeAlignment_AutoSynch_Type**		
Comment	Parameters for automatic synchronisation of UL time alignment; The SS shall periodically transmit TA MAC control elements according to 38.321 clause 6.1.3.4 with - TAG-Id=0 for the SpCell - TAG-Id as configured for an SCell the transmission shall be continuously until being stopped		
TimingAdvance	NR_TimingAdvanceIndex_Type		amount of timing adjustment that MAC entity has to apply
TA_Period	NR_TimingAdvance_Period_Type		time period after which TA MAC control elements need to be automatically transmitted

NR_UplinkTimeAlignment_Synch_Type

TTCN-3 Union Type		
Name	**NR_UplinkTimeAlignment_Synch_Type**	
Comment	Configuration of Time Alignment of the UL	
None	Null_Type	no PUCCH Synchronisation applied
Auto	NR_UplinkTimeAlignment_AutoSynch_Type	SS automatically maintains PUCCH synchronization at UE

D.1.3.3.2 Random_Access_Procedure

NR_RachProcedureConfig_Type

TTCN-3 Record Type			
Name	**NR_RachProcedureConfig_Type**		
Comment	parameters to control the random access procedure; TS 38.321, clause 5.1; NOTE: RACH-ConfigCommon and RACH-ConfigDedicated are contained in NR_UplinkBWP_Type already (RACH-ConfigCommon as part of BWP-UplinkCommon		
RachProcedureList	NR_RachProcedureList_Type	opt	in normal cases there is one element which is used for any RA procedure

NR_RachProcedureList_Type

TTCN-3 Record of Type	
Name	**NR_RachProcedureList_Type**
Comment	to simulate RACH procedure with one or more than one attempt by the UE: There is one element in the list per PRACH Preamble attempt
record of NR_RachProcedure_Type	

NR_RachProcedure_Type

TTCN-3 Record Type			
Name	**NR_RachProcedure_Type**		
Comment			
RandomAccess Response	NR_RandomAccessResponseConfig_Type	opt	configures how the SS shall react on a PRACH Preamble attempt, in general: - RAR with RAPID matching the RAPID of the UE's PRACH Preamble - RAR with RAPID not matching the RAPID of the UE's PRACH Preamble - BackoffIndicator - no response at all
ContentionResolution	NR_ContentionResolutionCtrl_Type	opt	Random Access Procedure may be 1. Contention free (Non-contention based) => no contention resolution 2. Contention based (see TS 38.321 clause 5.1.5): 2a) C-RNTI based: Msg3 contains MAC C-RNTI control element and in general contention resolution is done by assignment of an UL grant for this C-RNTI 2b) UE Contention Resolution Identity based: Msg3 contains RRC message to setup or restore RRC connection => contention resolution is done by sending of Msg4 with UE Contention Resolution Identity MAC CE

D.1.3.3.2.1 Random_Access_Response

Random_Access_Response: Basic Type Definitions

TTCN-3 Basic Types		
NR_RACH_TimingAdvance_Type	integer (0..3846)	12 bit value corresponding to Timing Advance Command field of the Random Access Response (TS 38.321 clause 6.2.3): 0..3846 according to TS 38.213 clause 4.2)
NR_RAR_BackoffIndicator_Type	integer (0..15)	MAC subPDU for Backoff Indicator only according to TS 38.321 clause 6.1.5

NR_RAR_UplinkGrant_Type

TTCN-3 Record Type			
Name	**NR_RAR_UplinkGrant_Type**		
Comment	27 bits according to TS 38.213 Table 8.2-1 and TS 38.321 Figure 6.2.3-1		
HoppingFlag	B1_Type		Hopping flag
Msg3FrequencyResourceAllocation	B14_Type		Msg3 PUSCH frequency resource allocation: RIV value as defined in TS 38.213 clause 8.2 and TS 38.214 clause 6.1.2.2.2
Msg3TimeResourceAllocation	B4_Type		Msg3 PUSCH time resource allocation similar to the Time-domain resource assignment field of DCI format 0_0: index addressing an entry of the applicable PUSCH time domain resource allocation table as specified in TS 38.214 clause 6.1.2.1.1; the timing between the RAR and Msg3 is given by K2 (as in the time domain resource allocation table) and a delta value as according to Table 6.1.2.1.1-5 in TS 38.214. It is the responsibility of SS implementation to send the RAR in an appropriate DL slot so that the corresponding Msg3 transmission is scheduled for a valid UL slot; it is responsibility of test specification to provide a correct K2 value for the given numerology.
MCS	B4_Type		Modulation and Coding Scheme: first sixteen indices of the applicable MCS index table for PUSCH (TS 38.214 Table 6.1.4.1-1)
TPC_Command	B3_Type		TPC command for Msg3 PUSCH
CQI_Req	B1_Type		CQI request

NR_TempC_RNTI_Type

TTCN-3 Union Type		
Name	**NR_TempC_RNTI_Type**	
Comment		
SameAsC_RNTI	Null_Type	in the RA response SS shall use the same C-RNTI as configured in NR_CellConfigCommon_Type; this is useful for initial random access
Explicit	RNTI_Value_Type	in the RA response SS shall use different value as configured in NR_CellConfigCommon_Type; this can be used when the UE already is in RRC_CONNECTED to have a temporary C-RNTI different from the one used by the UE; NOTE: when the UE is not in RRC_CONNECTED there shall be no explicit temp. C-RNTI since then the UE would assume this value as C-RNTI

NR_RAR_Payload_Type

TTCN-3 Record Type			
Name	**NR_RAR_Payload_Type**		
Comment	MAC payload for Random Access Response according to TS 38.321 clause 6.2.3		
TimingAdvance	NR_RACH_TimingAdvance_Type		timing advance: TS 38.321 clause 6.2.3 and TS 38.213 clause 4.2 NOTE: timing advance has impact not only on the RA procedure; SS in general needs to adjust its timing accordingly
UplinkGrant	NR_RAR_UplinkGrant_Type		initial UL grant
TempC_RNTI	NR_TempC_RNTI_Type		NOTE: In general for initial Random Access Procedure TempC_RNTI shall be 'SameAsC_RNTI' For Random Access Procedure in RRC_CONNECTED state the NW assigns a temporary C-RNTI which is replaced by the one stored at the UE; => TempC_RNTI may be 'SameAsC_RNTI' (in this case temp. C-RNTI and C-RNTI are equal what is not likely in a real network), or there is an explicit temp. C-RNTI what is used during RA procedure only (as in a real network)

NR_RAR_RapIdOnly_Type

TTCN-3 Record Type			
Name	**NR_RAR_RapIdOnly_Type**		
Comment	MAC subPDU for RAPID only (acknowledgment for SI request) according to TS 38.321 clause 6.1.5		
RapId	RAR_RapIdCtrl_Type		

NR_RAR_RapIdAndPayload_Type

TTCN-3 Record Type			
Name	**NR_RAR_RapIdAndPayload_Type**		
Comment	MAC subPDU for RAPID and RAR payload according to TS 38.321 clause 6.1.5		
RapId	RAR_RapIdCtrl_Type		
Payload	NR_RAR_Payload_Type		

NR_RAR_SubPdu_Type

TTCN-3 Union Type		
Name	**NR_RAR_SubPdu_Type**	
Comment	Random Access Response sub-PDU according to TS 38.321 clause 6.1.5	
BackoffIndicator	NR_RAR_BackoffIndicator_Type	
RapIdOnly	NR_RAR_RapIdOnly_Type	
RapIdAndPayload	NR_RAR_RapIdAndPayload_Type	

NR_RAR_SubPduList_Type

TTCN-3 Record of Type	
Name	**NR_RAR_SubPduList_Type**
Comment	list of MAC subPDUs; if a Backoff Indicator is included it has to be the first element (TS 38.321 clause 6.1.5)
record of NR_RAR_SubPdu_Type	

NR_RAR_MacPdu_Type

TTCN-3 Record Type			
Name	**NR_RAR_MacPdu_Type**		
Comment			
SubPduList	NR_RAR_SubPduList_Type	opt	list of Backoff Indicator (optional) and random access responses; empty list if no RAR shall be sent at all (omit means "keep as it is" as usual)
CrcError	boolean	opt	if set, MAC PDU shall transmitted with CRC bits (0-3) being toggled

NR_RandomAccessResponseConfig_Type

TTCN-3 Record Type			
Name	**NR_RandomAccessResponseConfig_Type**		
Comment	configuration for Random Access Response mapped to DL-SCH mapped to PDSCH		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general a RACH procedure is expected at the BWP currently being configured as active BWP at the SS; Type1-PDCCH common search space is used for scheduling of the Random Access Response (Msg2)
MacPdu	NR_RAR_MacPdu_Type	opt	MAC PDU to be sent automatically by the SS when there has been a RACH preamble

D.1.3.3.2.2 Contention_Resolution

NR_ContentionResolutionCtrl_Type

TTCN-3 Union Type		
Name	**NR_ContentionResolutionCtrl_Type**	
Comment		
None	Null_Type	no contention resolution: e.g. in case of contention free random access procedure or for special cases of contention based random access procedure
CRNTI_Based	NR_SearchSpaceUlDciAssignment_Type	contention resolution based on C-RNTI on PDCCH: The SS assigns UL grant on PDCCH; the UL grant is scrambled by C-RNTI and associated with the UE-specific search space
Msg4_Based	NR_RachProcedureMsg4_Type	contention resolution based on UE Contention Resolution Identity on DL-SCH

NR_RachProcedureMsg4_Type

TTCN-3 Record Type			
Name	**NR_RachProcedureMsg4_Type**		
Comment	Msg4 of the RACH procedure in case of contention resolution based on UE Contention Resolution Identity		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	DCI to be used for Msg4; the DCI is scrambled by the temporary C-RNTI and associated with the Type1-PDCCH common search space
ContentionResolutionId	NR_ContentionResolutionId_Type	opt	Contention Resolution Id contained in MAC PDU of Msg4
RrcPdu	NR_RachProcedureMsg4RrcMsg_Type	opt	RRC message to be contained in Msg4 of the RACH procedure
CrcError	boolean	opt	if set, MAC PDU shall transmitted with CRC bits (0-3) being toggled

NR_ContentionResolutionId_Type

TTCN-3 Union Type		
Name	**NR_ContentionResolutionId_Type**	
Comment		
XorMask	B48_Type	When SS receives Contention Resolution ID from the UE, SS shall XOR it with the given mask and use this as Contention Resolution ID; this allows to get an unmatching Contention Resolution ID; in normal cases mask shall be set to tsc_ContentionResolutionId_Unchanged (i.e. the Contention Resolution ID remains unchanged) NOTE: In case of UL_CCCH1_Message the contention resolution id shall be cut down to the first 48 bits according to TS 38.321 clause 6.1.3.3
None	Null_Type	MAC Contention Resolution Control Element is not contained in the MAC PDU sent out as response for Msg3

NR_RachProcedureMsg4RrcMsg_Type

TTCN-3 Union Type		
Name	**NR_RachProcedureMsg4RrcMsg_Type**	
Comment		
RrcCcchMsg	octetstring	encoded RRC message for CCCH; LCID=000000 for CCCH
RrcDcchMsg	octetstring	encoded RRC message for DCCH; the SS shall - apply integrity protection, - add a PDCP header accordingly, - add an AM RLC header, - use LCID=000001 corresponding to SRB1 as logical channel id
None	Null_Type	Msg4 does not contain any RRC message, e.g. when RRC message is sent stand-alone in separate DL transmission

D.1.3.4 System_Information_Control

Primitive to configuration scheduling of system information on BCCH/BCH

System_Information_Control: Basic Type Definitions

TTCN-3 Basic Types		
NR_BcchToPbchConfig_Type	Null_Type	place holder for BCCH mapped to BCH mapped to PBCH: MIB using fixed periodicity (80ms) and repetitions (80ms) according to TS 38.331 clause 5.2.1; the position of SS/PBCH blocks in frequency and time domain is specified in TS 38.211 clause 7.4.3 and TS 38.213 clause 4.1 the SS configuration for SS/PBCH blocks is defined by NR_SSB_Config_Type as part of physical layer configuration of a cell

NR_Sib1Schedul_Type

TTCN-3 Record Type			
Name	**NR_Sib1Schedul_Type**		
Comment	Scheduling of SIB1 (RMSI - Remaining Minimum SI, according to TS 38.300 clause 7.3): fixed scheduling in time domain according to TS 38.331 clause 5.2.1 (periodicity: 160ms according to TS 38.331 clause 5.2.1)		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general SIB scheduling is assigned to the initial BWP's Type0-PDCCH common search space (searchSpaceZero); in principle SIB scheduling can be configured to happen simultaneously in more than one BWP (e.g. initial BWP and active BWP); SIB1 scheduling may be stopped by not assigning any BWP (AssignedBWPs being empty)
Periodicity	integer	opt	SIB1 repetition transmission period in milliseconds. According to TS 38.331 clause 5.2.1 the SIB1 repetition transmission period is 20 ms in case of SSB and CORESET multiplexing pattern 1; for SSB and CORESET multiplexing pattern 2/3 it is the same as the SSB period
SlotOffsetList	IntegerList_Type	opt	List of slot offsets for SIB1: For single beam configuration there is exactly one offset corresponding to the SSB index of the beam. For multiple beam configuration with N beams, SIB1 may be scheduled per beam so that there can be up-to N SIB1-transmission per repetition period. The offsets correspond to the SSB index of the respective beam as according to TS 38.213 clause 13: For a repetition period of 20ms the offset is relative to start of frames with even SFN (i.e. SFN mod 2 = 0) => in terms of TS 38.213 clause 13 for a given SSB index the slot offset is n0 when nO refers to a frame with even SFN n0 + (number of slots per frame) when nO refers to a frame with odd SFN A repetition period other than 20ms is not considered as long as there is no test requirement. NOTE: the SIB1 scheduling for a given offset shall match the Type0-PDCCH common search space configuration as configured in the SearchSpaceArray of the BWP

NR_SingleSiSchedul_Type

TTCN-3 Record Type			
Name	**NR_SingleSiSchedul_Type**		
Comment	Scheduling for a single SI in its SI-window within a BWP (or even within several BWPs)		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general SIB scheduling is assigned to the initial BWP's Type0A-PDCCH common search space; nevertheless in principle scheduling can be configured to happen simultaneously in more than one BWP (e.g. initial BWP and active BWP)
SlotOffset	integer	opt	slot-offset within the SI-window

NR_OtherSiSchedul_Type

TTCN-3 Record Type			
Name	**NR_OtherSiSchedul_Type**		
Comment	Scheduling of other SI ("other SI" according to TS 38.300 clause 7.3): specifies for a specific SI the scheduling and repetitions within its SI window		
Periodicity	NR_SiPeriodicity_Type	opt	
Window	record of NR_SingleSiSchedul_Type	opt	one or more repetitions within the si-window

NR_OtherSiSchedulList_Type

TTCN-3 Record of Type	
Name	**NR_OtherSiSchedulList_Type**
Comment	
record of NR_OtherSiSchedul_Type	

NR_AllOtherSiSchedul_Type

TTCN-3 Record Type			
Name	**NR_AllOtherSiSchedul_Type**		
Comment	Scheduling of (all) other SI (i.e. SIB2 and above according to TS 38.300 clause 7.3)		
WindowLength	NR_SiWindowLength_Type	opt	to calculate start of each SI window according to TS 38.331 clause 5.2.2.3.2
SiList	NR_OtherSiSchedulList_Type	opt	list of scheduling info for the SIs containing one or more SIBs
SegmentedSiList	NR_OtherSiSchedulList_Type	opt	list of scheduling info for segmented SIs (e.g. SI containing SIB7 or SIB8); corresponds to SegmentedSIs in NR_BcchInfo_Type: SS shall subsequently schedule the elements of the corresponding SegmentedSIs (NR_BcchInfo_Type); SegmentedSiList[i] provides scheduling info for BcchInfo_Type's SegmentedSIs[i] The kth element of SegmentedSIs[i] is sent at the following slot number from T0: SlotOffset + ((N+i)* WindowLength) + k*Periodicity with k : kth element in SegmentedSIs[i], i.e. SegmentedSIs[i][k] N : number of SI provided in SIs in NR_BcchInfo_Type T0: start of the modification period SlotOffset, Periodicity: scheduling info as given by SegmentedSiList[i] - in slots WindowLength: provided in NR_AllOtherSiSchedul_Type - in slots

NR_BcchToPdschConfig_Type

TTCN-3 Record Type			
Name	**NR_BcchToPdschConfig_Type**		
Comment	configuration for BCCH mapped to DL-SCH mapped to PDSCH		
Sib1Schedul	NR_Sib1Schedul_Type	opt	SIB1 scheduling
SiSchedul	NR_AllOtherSiSchedul_Type	opt	scheduling of other SI

NR_SI_List_Type

TTCN-3 Record of Type	
Name	**NR_SI_List_Type**
Comment	list of system information messages
record of BCCH_DL_SCH_Message	

NR_SegmentedSI_List_Type

TTCN-3 Record of Type	
Name	**NR_SegmentedSI_List_Type**
Comment	Each element is a list of segments; used for segmented SIBs Used for SIB7/SIB8 segmentation
record of NR_SI_List_Type	

NR_BcchInfo_Type

TTCN-3 Record Type			
Name	**NR_BcchInfo_Type**		
Comment	Configuration of system information message contents to be scheduled at the SS		
MIB	BCCH_BCH_Message	opt	TS 38.331, clause 6.2.1 BCCH-BCH-Message and clause 6.2.2 MIB; NOTE: the system frame number included in MIB needs to be handled and maintained by the system simulator; that means that the system frame number being setup by TTCN shall be ignored and overwritten by the SS
SIB1	BCCH_DL_SCH_Message	opt	TS 38.331, clause 6.2.1 BCCH-DL-SCH-Message and clause 6.2.2 SIB1
SIs	NR_SI_List_Type	opt	list of SIs corresponding to SiList of NR_AllOtherSiSchedul_Type (i.e. element i of NR_AllOtherSiSchedul_Type's SiList specifies the scheduling for SIs[i])
SegmentedSIs	NR_SegmentedSI_List_Type	opt	list of SIs containing segmented SIBs; corresponds to SegmentedSiList in NR_AllOtherSiSchedul_Type

NR_BcchConfig_Type

TTCN-3 Record Type			
Name	**NR_BcchConfig_Type**		
Comment	Configuration of system information scheduling and content at the SS		
Pbch	NR_BcchToPbchConfig_Type	opt	
Pdsch	NR_BcchToPdschConfig_Type	opt	
BcchInfo	NR_BcchInfo_Type	opt	

D.1.3.5 Paging_Control

Primitive to configuration PCCH/PCH

NR_PcchConfig_Type

TTCN-3 Record Type			
Name	**NR_PcchConfig_Type**		
Comment	configuration for PCCH mapped to PCH mapped to PDSCH		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general Paging happens at the BWP currently being configured as active BWP at the SS and Type2-PDCCH common search space is used for scheduling; NOTE 1: there is no use case to schedule Paging simultaneously in multiple BWPs NOTE 2: the DCI may or may not carry a short message but it in any case it shall indicate presence of the paging (to send only a short message the "DciTrigger" primitive shall be used)

D.1.3.6 CCCH_DCCH_DTCH_Configuration

NR_DcchDtchConfigDL_Type

TTCN-3 Record Type			
Name	**NR_DcchDtchConfigDL_Type**		
Comment	configuration for DCCH/DTCH mapped to DL-SCH mapped to DL-SCH mapped to PDSCH; NOTE: in contrast to EUTRA the configuration of HARQ processes to be used is done as part of DCI configuration		
SearchSpaceAndDci	NR_SearchSpaceDlDciAssignment_Type	opt	in general DCCH/DTCH transmissions happen at the BWP currently being the active BWP at the SS and the UE specific search space is used for scheduling; DCI configuration for Msg2 of the RACH procedure is done as part of the RACH procedure configuration (NR_RandomAccessResponseConfig_Type)

NR_DcchDtchConfigUL_Type

TTCN-3 Record Type			
Name	**NR_DcchDtchConfigUL_Type**		
Comment	scheduling for DCCH/DTCH mapped to UL-SCH mapped to PUSCH		
SearchSpaceAndDci	NR_SearchSpaceUlDciAssignment_Type	opt	in general DCCH/DTCH transmissions happen at the BWP currently being the active BWP at the SS and the UE specific search space is used for scheduling
PUCCH_Synch	NR_UplinkTimeAlignment_Synch_Type	opt	parameters for automatic control of timing advance
GrantConfig	UL_GrantConfig_Type	opt	configuration how UL grant allocation is done (as response to scheduling request, periodically, etc.

NR_DrxCtrl_Type

TTCN-3 Union Type		
Name	**NR_DrxCtrl_Type**	
Comment	DRX configuration for connected mode (TS 38.321, clause 5.7)	
None	Null_Type	DRX not configured
Config	NR_ASN1_DRX_Config_Type	DRX is configured as signalled to the UE

NR_MeasGapCtrl_Type

TTCN-3 Union Type		
Name	**NR_MeasGapCtrl_Type**	
Comment	support of measurement gap configuration	
None	Null_Type	no measurement gap configuration
Config	NR_ASN1_MeasGapConfig_Type	measurement gap configuration acc. to TS 38.331, clause 5.5.2.9; NOTE: the release branch of MeasGapConfig in general is not used for configuration of the SS

NR_CcchDcchDtchConfig_Type

TTCN-3 Record Type			
Name	**NR_CcchDcchDtchConfig_Type**		
Comment	!!!! NR-TBD: to be renamed to NR_DcchDtchConfig_Type !!!!		
DL	NR_DcchDtchConfigDL_Type	opt	Scheduling, parameters related to DCCH and DTCH in DL
UL	NR_DcchDtchConfigUL_Type	opt	Scheduling, parameters related to DCCH and DTCH in UL
DrxCtrl	NR_DrxCtrl_Type	opt	DRX configuration as sent to the UE (or 'None' when the UE does not support connected mode DRX)
MeasGapCtrl	NR_MeasGapCtrl_Type	opt	to tell the SS when no assignments/grants shall be assigned to the UE

D.1.3.7 Cell_Group_Configuration

Configuration of cell group(s) in terms of dual connecivity and carrier aggregation

Cell_Group_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_ServingCellIndex_Type	integer	corresponds to ASN.1 (v15.1.0) definitions SCellIndex (1..31) and ServCellIndex (0..maxNrofServingCells-1): According to ASN.1 "The value range is shared across the Cell Groups" and "the PCell of the Master Cell Group uses ID = 0"

NR_ServingCellConfig_Type

TTCN-3 Union Type		
Name	**NR_ServingCellConfig_Type**	
Comment	serving cell capabilities of a cell	
SpCell	NR_SpCellConfig_Type	parameters specific for an SpCell and cell group configuration
SCell	NR_SCellConfig_Type	parameters specific for an SCell
None	Null_Type	the is no serving cell at all (e.g. neighbouring cell only)

NR_SCellConfig_Type

TTCN-3 Record Type			
Name	**NR_SCellConfig_Type**		
Comment	cell parameters specific for an SCell; NOTE: the corresponding SpCell can be derived from the SpCell's SCellList; further parameters may be added according to test requirements for CA test cases		
ServingCellIndex	NR_ServingCellIndex_Type	opt	
TAG_Id	TAG_Id	opt	Id of the Timing Advance Group the SCell belongs to (according to TS 38.321 clause 6.1.3.4 the SpCell has the TAG Identity 0); the SS shall use the given TAG_Id e.g. for automatic time alignment in UL (see NR_UplinkTimeAlignment_AutoSynch_Type)

NR_SpCellConfig_Type

TTCN-3 Record Type			
Name	**NR_SpCellConfig_Type**		
Comment	cell parameters specific for an SpCell (PCell of the MCG or the PSCell of the SCG) and additionall parameters of the cell group; further parameters may be added according to test requirements for CA test cases		
ServingCellIndex	NR_ServingCellIndex_Type	opt	
CellGroupConfig	NR_SpCell_CellGroupConfig_Type	opt	parameters of the cell group of which the cell is SpCell (PCell or PSCell): assigned to SpCell as in many test cases the cell group consists of the SpCell only and on the other hand every cell group has to have at least an SpCell

NR_SpCell_CellGroupConfig_Type

TTCN-3 Record Type			
Name	**NR_SpCell_CellGroupConfig_Type**		
Comment	Configuration of an NR cell group; NOTE 1: The type of cell group (MCG, SCG) may be derived from the CellGroupId (CellGroupId==0 => MCG, CellGroupId>0 => SCG) NOTE 2: Further cell group specific MAC and PHY parameters may be added corresponding to ASN.1 MAC-CellGroupConfig or may need to be added (but e.g. the DRX configuration is assigned to NR_CcchDcchDtchConfig_Type already i.e. there is no need to configure it here)		
CellGroupId	CellGroupId	opt	0 for MCG (i.e. EUTRA in EN-DC), 1 for SCG (NR in EN-DC); see comments to ASN.1 definition of CellGroupId (v15.1.0)
SCellList	NR_CellIdList_Type	opt	list of SCells belonging to the SpCell's cell group; shall be initialised as empty list
MAC_CellGroupConfig	NR_ASN1_MAC_CellGroupConfig_Type	opt	Cell group specific MAC parameters as sent to the UE in CellGroupConfig.MAC-CellGroupConfig
PhysicalCellGroupConfig	NR_ASN1_PhysicalCellGroupConfig_Type	opt	Cell group specific physical layer parameters as sent to the UE in CellGroupConfig.PhysicalCellGroupConfig

D.1.4 Cell_Power_Attenuation

NR_CellAttenuationConfig_Type

TTCN-3 Record Type			
Name	**NR_CellAttenuationConfig_Type**		
Comment			
CellId	NR_CellId_Type		
Attenuation	NR_Attenuation_Type		
TimingInfo	TimingInfo_Type	opt	

NR_CellAttenuationList_Type

TTCN-3 Record of Type	
Name	**NR_CellAttenuationList_Type**
Comment	
record of NR_CellAttenuationConfig_Type	

D.1.5 Radio_Bearer_Configuration

Radio Bearer Configuration: SRBs/DRBs
NOTE: Type definitions for PDCP configuration are in NR_PDCP_TypeDefs

NR_RlcBearerConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_RlcBearerConfigInfo_Type**		
Comment	RLC bearer as defined in TS 37.340: RLC and MAC logical channel configuration of a radio bearer in one cell group		
Rlc	NR_RLC_Configuration_Type	opt	mandatory for initial configuration; omit means "keep as it is"
LogicalChannelId	NR_LogicalChannelId_Type	opt	DRBs: DTCH-LogicalChannelIdentity as for rb-MappingInfo in DRB-ToAddModifyList; SRBs: for SRBs specified configurations acc. to 38.331 clause 9.2.1 shall be applied: SRB1: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 1 SRB2: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 2 SRB3: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 3 for SRB0 being mapped to CCCH the SS shall apply - LCID=0 for DL according to TS 38.321 Table 6.2.1-1 - LCID=0 or LCID=52 for UL according to TS 38.321 Table 6.2.1-2 depending on whether it is a CCCH1 or a CCCH message; For DRBs and SRBs - except SRB0: mandatory for initial configuration; omit means "keep as it is" For SRB0 LogicalChannelId is always omit and the SS shall apply the LCIDs according to TS 38.321
Mac	NR_MAC_Configuration_Type	opt	

DiscardULData	boolean	opt	if omitted:
			initial configuration: data is handed over to TTCN as usual
			re-configuration: "keep as it is"
			if set:
			true - SS shall discard any data in UL for this radio bearer
			false - (re)configuration back to normal mode
			NOTE: typically applicable for UM DRBs only

NR_RlcBearerConfig_Type

TTCN-3 Union Type		
Name	**NR_RlcBearerConfig_Type**	
Comment	configuration of RLC bearer below NR-PDCP	
Config	NR_RlcBearerConfigInfo_Type	"normal" configuration: there is an RLC bearer configured for the cell which is linked to the PDCP being configured at the cell (the PDCP can be either 'RBTerminating' or 'Proxy')
None	Null_Type	No RLC bearer is configured at NR below the NR-PDCP: NR_PDCP_Configuration_Type shall be 'RBTerminating' with LinkToOtherCellGroup indicating cell with RLC bearer to be used

NR_RadioBearerConfigInfo_Type

TTCN-3 Record Type			
Name	**NR_RadioBearerConfigInfo_Type**		
Comment			
Sdap	SDAP_Configuration_Type	opt	omitted for EN-DC, otherwise mandatory for initial configuration; omit means "keep as it is" for SRBs: Sdap.None:=true
Pdcp	NR_PDCP_Configuration_Type	opt	for SRB0: "Pdcp.None:=true" mandatory for initial configuration; omit means "keep as it is"
RlcBearer	NR_RlcBearerConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"

NR_RadioBearerConfig_Type

TTCN-3 Union Type		
Name	**NR_RadioBearerConfig_Type**	
Comment		
AddOrReconfigure	NR_RadioBearerConfigInfo_Type	add / re-configure RB - CellId : identifier of the cell being configured RoutingInfo : 'None' TimingInfo : 'Now' in common ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)
Release	Null_Type	release RB - CellId : identifier of the cell being configured RoutingInfo : 'None' TimingInfo : 'Now' in common ControlInfo : CnfFlag:=true; FollowOnFlag:=false (in general)

NR_RadioBearer_Type

TTCN-3 Record Type			
Name	**NR_RadioBearer_Type**		
Comment			
Id	NR_RadioBearerId_Type		either for SRB or DRB
Config	NR_RadioBearerConfig_Type		

NR_RadioBearerList_Type

TTCN-3 Record of Type	
Name	**NR_RadioBearerList_Type**
Comment	array of SRBs and/or DRBs
record of NR_RadioBearer_Type	

D.1.5.1 RLC_Configuration

RLC configuration: radio bearer specific

RLC_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_SS_RLC_TM_Type	Null_Type	TM to configure SRB0; no parameters to be defined

NR_RLC_NotACK_NextRLC_PDU_Type

TTCN-3 Enumerated Type	
Name	**NR_RLC_NotACK_NextRLC_PDU_Type**
Comment	
Start	cause SS RLC layer not to ACK the next received RLC PDU; this is done regardless of whether the poll bit is set or not; Example [from UMTS]: when the UE gets new security information in a SECURITY MODE COMMAND the response (SECURITY MODE COMPLETE) sent by the UE is not acknowledged at the RLC level; this causes the UE to continue using the "old" security information

NR_RLC_TransparentMode

TTCN-3 Union Type		
Name	**NR_RLC_TransparentMode**	
Comment		
Umd	SN_FieldLengthUM	SN-FieldLengthUM ::= ENUMERATED {size6, size12} TS 38.331
Amd	SN_FieldLengthAM	SN-FieldLengthAM ::= ENUMERATED {size12, size18} TS 38.331

NR_RLC_TestModeInfo_Type

TTCN-3 Union Type		
Name	**NR_RLC_TestModeInfo_Type**	
Comment		
NotACK_NextRLC_PDU	NR_RLC_NotACK_NextRLC_PDU_Type	valid only when the RLC is configured in AM
TransparentMode	NR_RLC_TransparentMode	

NR_RLC_TestModeConfig_Type

TTCN-3 Union Type		
Name	**NR_RLC_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	NR_RLC_TestModeInfo_Type	

NR_SS_RLC_AM_Type

TTCN-3 Record Type			
Name	**NR_SS_RLC_AM_Type**		
Comment			
Tx	NR_ASN1_UL_AM_RLC_Type	opt	the UE's UL setting to be used in SS's tx direction
Rx	NR_ASN1_DL_AM_RLC_Type	opt	the UE's DL setting to be used in SS's rx direction

NR_SS_RLC_UM_Type

TTCN-3 Record Type			
Name	**NR_SS_RLC_UM_Type**		
Comment			
Tx	NR_ASN1_UL_UM_RLC_Type	opt	the UE's UL setting to be used in SS's tx direction
Rx	NR_ASN1_DL_UM_RLC_Type	opt	the UE's DL setting to be used in SS's rx direction

NR_RLC_RbConfig_Type

TTCN-3 Union Type		
Name	**NR_RLC_RbConfig_Type**	
Comment	!!!! NR-NOTE: in EUTRA UM_OnlyUL is not used at all and UM_OnlyDL is used for MBMS only => not defined for NR (yet) !!!!	
AM	NR_SS_RLC_AM_Type	
UM	NR_SS_RLC_UM_Type	
TM	NR_SS_RLC_TM_Type	normally SRB0 only; may be used for test purposes also

NR_RLC_Configuration_Type

TTCN-3 Record Type			
Name	**NR_RLC_Configuration_Type**		
Comment			
Rb	NR_RLC_RbConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	NR_RLC_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"

D.1.5.2 MAC_Configuration

MAC configuration: radio bearer specific configuration

MAC_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
NR_LogicalChannelId_Type	UInt_Type	

NR_MAC_Test_DLLogChID_Type

TTCN-3 Union Type		
Name	**NR_MAC_Test_DLLogChID_Type**	
Comment		
LogChId	NR_LogicalChannelId_Type	Specifies to over write the logical channel ID in MAC header in all the DL messages sent on the configured logical channel
ConfigLchId	Null_Type	Specifies that the normal mode of correct logical channel ID to be used in DL MAc header. This will be the default mode, when SS is initially configured.

NR_MAC_Test_SCH_NoHeaderManipulation_Type

TTCN-3 Enumerated Type	
Name	**NR_MAC_Test_SCH_NoHeaderManipulation_Type**
Comment	
NormalMode	MAC header is fully controlled by the SS
DL_SCH_Only	TTCN can submit a final MAC PDU including header and payloads; SS does not do anything with this MAC PDU i.e. no header is added for the DL SCH transport channel. It is possible that data belonging to multiple DRBs is sent in one MAC PDU and from one special RB configured. NOTE: SRBs shall work as in normal mode and data can be sent/received on SRBs but sending on SRBs shall be in different TTIs than sending data PDUs.
DL_UL_SCH	In UL and DL the SS' MAC layer is transparent i.e. SS does not add or remove any MAC header

NR_MAC_TestModeInfo_Type

TTCN-3 Record Type			
Name	**NR_MAC_TestModeInfo_Type**		
Comment	Parameters/Configuration for MAC tests		
DiffLogChId	NR_MAC_Test_DLLogChID_Type		to be used in test cases 7.1.1.1 and 7.1.1.2 for using a different logical channel ID in MAC-header on DL-SCH channel
No_HeaderManipulation	NR_MAC_Test_SCH_NoHeaderManipulation_Type		to configure mode for no header manipulation in SS MAC layer for DL/UL SCH

NR_MAC_TestModeConfig_Type

TTCN-3 Union Type		
Name	**NR_MAC_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	NR_MAC_TestModeInfo_Type	

NR_MAC_LogicalChannelConfig_Type

TTCN-3 Record Type			
Name	**NR_MAC_LogicalChannelConfig_Type**		
Comment			
Priority	integer		logical channel priority for the DL as described in TS 38.321, clause 5.4.3.1 for the UL
PrioritizedBitRate	NR_PrioritizedBitRate_Type		PBR as described for the UL; probably not needed at SS

NR_MAC_Configuration_Type

TTCN-3 Record Type			
Name	**NR_MAC_Configuration_Type**		
Comment			
LogicalChannel	NR_MAC_LogicalChannelConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	NR_MAC_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"; for none MAC tests "TestMode.None:=true"

D.1.6 AS_Security

Primitive for control of AS security

NR_PdcpSQN_Type

TTCN-3 Record Type			
Name	**NR_PdcpSQN_Type**		
Comment			
Format	NR_PdcpCountFormat_Type		12 bit or 18 bit SQN
Value	integer		SQN value (12 bit or 18 bit SQN) NOTE: in TTCN the test case writer is responsible to deal with potential overflows (e.g. there shall be a "mod 32", "mod 128" or "mod 4096" according to the format)

NR_PDCP_ActTime_Type

TTCN-3 Union Type		
Name	**NR_PDCP_ActTime_Type**	
Comment	The sequence number in UL and DL for SRB1 should be one more than the present SQN, as Ciphering starts in UL and DL soon after SMC and SMComp; For other SRB/DRB it should be the present SQN.	
None	Null_Type	No Activation time; to be used if Ciphering is not applied
SQN	NR_PdcpSQN_Type	PDCP sequence number

NR_SecurityActTime_Type

TTCN-3 Record Type			
Name	**NR_SecurityActTime_Type**		
Comment			
RadioBearerId	NR_RadioBearerId_Type		
UL	NR_PDCP_ActTime_Type		
DL	NR_PDCP_ActTime_Type		

NR_SecurityActTimeList_Type

TTCN-3 Record of Type	
Name	**NR_SecurityActTimeList_Type**
Comment	
record of NR_SecurityActTime_Type	

NR_AS_IntegrityInfo_Type

TTCN-3 Record Type			
Name	**NR_AS_IntegrityInfo_Type**		
Comment	for initial configuration activation time is not needed for integrity protection as all messages in DL after security activation are integrity protected; this means this ASP is invoked before transmission of Security mode command; if there is a integrity violation in UL SS shall set the IndicationStatus in the common ASP part to flag the integrity error (IndicationStatus.Error.Integrity.Pdcp := true); integrity to be provided for each SRB as per core spec		
Algorithm	IntegrityProtAlgorithm		IntegrityProtAlgorithm being defined in RRC ASN.1
KRRCint	B128_Key_Type		
KUPint	B128_Key_Type	opt	Not used when UE connected to EPS (i.e. set to omit for EPS)
ActTimeList	NR_SecurityActTimeList_Type	opt	omit for initial configuration (i.e. all SRBs to be integrity protected immediately); in HO scenarios activation time may be needed e.g. for SRB1

NR_AS_CipheringInfo_Type

TTCN-3 Record Type			
Name	**NR_AS_CipheringInfo_Type**		
Comment			
Algorithm	CipheringAlgorithm		CipheringAlgorithm_Type being defined in RRC ASN.1
KRRCenc	B128_Key_Type		
KUPenc	B128_Key_Type		KUPenc is mandatory; and SS uses it when DRB are configured
ActTimeList	NR_SecurityActTimeList_Type		

NR_AS_SecStartRestart_Type

TTCN-3 Record Type			
Name	**NR_AS_SecStartRestart_Type**		
Comment			
Integrity	NR_AS_IntegrityInfo_Type	opt	optional to allow separated activation of integrity and ciphering; omit: keep as it is
Ciphering	NR_AS_CipheringInfo_Type	opt	optional to allow separated activation of integrity and ciphering; omit: keep as it is

NR_AS_Security_Type

TTCN-3 Union Type		
Name	**NR_AS_Security_Type**	
Comment	Security mode command procedure (TS 38.331, clause 5.3.4): !!!! NR-FFS: both SMC and SMComp are integrity protected !!!! !!!! NR-FFS: (nevertheless SS shall be able to cope with unprotected SM reject); !!!! !!!! NR-FFS: ciphering is started just after SMComp (acc. to TS 38.331, clause 5.3.4.3 and 5.3.1.1) !!!!	
StartRestart	NR_AS_SecStartRestart_Type	information to start/restart AS security protection in the PDCP
Release	Null_Type	to release AS security protection in the PDCP

D.1.7 Paging_Trigger

NR_SlotOffsetList_Type

TTCN-3 Record of Type	
Name	**NR_SlotOffsetList_Type**
Comment	
record length (1..infinity) of integer	

NR_PagingTrigger_Type

TTCN-3 Record Type			
Name	**NR_PagingTrigger_Type**		
Comment	to trigger transmission of a paging message on the PCCH at a calculated paging occasion (TS 38.304, clause 7); the paging occasion is calculated by TTCN and activation time is applied CellId : identifier of the cell where the UE is active RoutingInfo : None TimingInfo : Calculated paging occasion ControlInfo : CnfFlag:=false; FollowOnFlag:=false		
Paging	PCCH_Message		paging to be send out at paging occasion and being announced on PDCCH using P-RNTI SS shall add the necessary padding bits as specified in TS 38.331, clause 8.5
SlotOffsetList	NR_SlotOffsetList_Type	opt	list of slot offsets relative to the absolute timing information given in the common part of the ASP; if present, multiple pagings are sent out at all occasions given by the list; if omitted only a single paging is sent at the occasion given by the timing information in the common part of the ASP

D.1.8 System_Indication_Control

Primitive for control of system indications for special purposes

NR_System_IndicationControl_Type

TTCN-3 Record Type			
Name	**NR_System_IndicationControl_Type**		
Comment	Initially all indications apart from "Error" are disabled in SS (i.e. it shall not be necessary in 'normal' test cases to use this primitive but only if a specific indication is needed); omit means indication mode is not changed		
RLC_Discard	IndicationAndControlMode_Type	opt	To enable/disable reporting of discarded RLC PDUs
MAC_BSR	IndicationAndControlMode_Type	opt	To enable/disable reporting of short/long BSR
MAC_PHR	IndicationAndControlMode_Type	opt	To enable/disable reporting of short/long PHR
RachPreamble	IndicationAndControlMode_Type	opt	To enable/disable reporting of PRACH preamble
SchedReq	IndicationAndControlMode_Type	opt	To enable/disable reporting of Scheduling Request
UL_HARQ	IndicationAndControlMode_Type	opt	To enable/disable reporting of reception of HARQ ACK/NACK
HarqError	IndicationAndControlMode_Type	opt	To enable/disable reporting of HARQ errors

D.1.9 PDCP_Count

Primitives to enquire PDCP COUNT

NR_PdcpCountFormat_Type

TTCN-3 Enumerated Type	
Name	**NR_PdcpCountFormat_Type**
Comment	
PdcpCount_Srb	20 bit HFN; 12 bit SQF
PdcpCount_DrbSQN12	20 bit HFN; 12 bit SQF
PdcpCount_DrbSQN18	14 bit HFN; 18 bit SQF

NR_PdcpCount_Type

TTCN-3 Record Type			
Name	**NR_PdcpCount_Type**		
Comment			
Format	NR_PdcpCountFormat_Type		
Value	PdcpCountValue_Type		

NR_PdcpCountInfo_Type

TTCN-3 Record Type			
Name	**NR_PdcpCountInfo_Type**		
Comment			
RadioBearerId	NR_RadioBearerId_Type		
UL	NR_PdcpCount_Type	opt	omit: keep as it is
DL	NR_PdcpCount_Type	opt	omit: keep as it is

NR_PdcpCountInfoList_Type

TTCN-3 Record of Type	
Name	**NR_PdcpCountInfoList_Type**
Comment	
record of NR_PdcpCountInfo_Type	

NR_PdcpCountGetReq_Type

TTCN-3 Union Type		
Name	**NR_PdcpCountGetReq_Type**	
Comment		
AllRBs	Null_Type	return COUNT values for all RBs being configured
SingleRB	NR_RadioBearerId_Type	

NR_PDCP_CountReq_Type

TTCN-3 Union Type		
Name	**NR_PDCP_CountReq_Type**	
Comment		
Get	NR_PdcpCountGetReq_Type	Request PDCP count for one or all RBs being configured at the PDCP
Set	NR_PdcpCountInfoList_Type	Set PDCP count for one or all RBs being configured at the PDCP; list for RBs which's COUNT shall be manipulated

NR_PDCP_CountCnf_Type

TTCN-3 Union Type		
Name	**NR_PDCP_CountCnf_Type**	
Comment		
Get	NR_PdcpCountInfoList_Type	RBs in ascending order; SRBs first
Set	Null_Type	

D.1.10 PDCP_Handover

Primitives to control PDCP regarding handover

NR_PDCP_HandoverInit_Type

TTCN-3 Record Type			
Name	**NR_PDCP_HandoverInit_Type**		
Comment			
SourceCellId	NR_CellId_Type		

NR_PDCP_HandoverControlReq_Type

TTCN-3 Union Type		
Name	**NR_PDCP_HandoverControlReq_Type**	
Comment		
HandoverInit	NR_PDCP_HandoverInit_Type	to inform SS that a handover (or PSCell change) will follow, for SS handling of PDCP context from the source cell to the target cell. In the common ASP part the CellId shall be set to the id of the target cell
HandoverComplete	Null_Type	to inform SS that the handover (or PSCell change) has successfully been performed by the UE; this shall trigger the SS to send a PDCP Status Report on AM DRB(s) to the UE; in the common ASP part the CellId shall be set to the id of the target cell

D.1.11 L1_Test_Mode

Primitive for control of L1 Test Modes

NR_L1_TestMode_Type

TTCN-3 Record Type			
Name	**NR_L1_TestMode_Type**		
Comment			
DL_SCH_CRC	NR_DL_SCH_CRC_Type		Manipulation of CRC bit generation for DL-SCH

NR_MAC_Test_DL_SCH_CRC_Mode_Type

TTCN-3 Enumerated Type	
Name	**NR_MAC_Test_DL_SCH_CRC_Mode_Type**
Comment	
Normal	default mode, the CRC generation is correct
Erroneous	SS shall generate CRC error by toggling CRC bits; the CRC error shall be applied for all PDUs of the given RNTI and their retransmission until SS is configured back to 'normal' operation
Error1AndNormal	the SS generates wrong CRC for first transmission and correct CRC on first retransmission. Later SS operates in normal mode. The retransmission is automatically triggered by reception of HARQ NACK

NR_DL_SCH_CRC_Type

TTCN-3 Union Type		
Name	**NR_DL_SCH_CRC_Type**	
Comment	NOTE: CRC error mode for RA_RNTI is not addressed as it will be configured in RACHProcedureConfig	
C_RNTI	NR_MAC_Test_DL_SCH_CRC_Mode_Type	to configure mode for CRC bit for all MAC PDUs for which C-RNTI is used in PDCCH transmission
SI_RNTI	NR_MAC_Test_DL_SCH_CRC_Mode_Type	to configure mode for CRC bit for all MAC PDUs for which SI-RNTI is used in PDCCH transmission
SPS_RNTI	NR_MAC_Test_DL_SCH_CRC_Mode_Type	to configure mode for CRC bit for all MAC PDUs for which SPS-RNTI is used in PDCCH transmission

D.1.12 DCI_Trigger

Primitive to trigger SS to send specific DCI (e.g. PDCCH order) which is not associated with any PDSCH or PUSCH transmission

NR_DCI_Trigger_Type

TTCN-3 Record Type			
Name	**NR_DCI_Trigger_Type**		
Comment			
AssignedBWPs	NR_AssignedBWPs_Type		BWP which shall be used to schedule the DCI
SearchSpaceType	NR_SearchSpaceType_Type		search space to be used for sending of given DCI; the SS may raise an error when there is no such search space at the scheduled point in time
DciFormat	NR_DCI_TriggerFormat_Type		

NR_DCI_TriggerFormat_Type

TTCN-3 Union Type	
Name	**NR_DCI_TriggerFormat_Type**
Comment	
PdcchOrder	NR_PDCCH_Order_Type
ShortMessage	NR_DciWithShortMessageOnly_Type
DciFormat_2_0	NR_DciFormat_2_0_Type
DciFormat_2_1	NR_DciFormat_2_1_Type
DciFormat_2_2	NR_DciFormat_2_2_Type
DciFormat_2_3	NR_DciFormat_2_3_Type

NR_DciWithShortMessageOnly_Type

TTCN-3 Record Type			
Name	**NR_DciWithShortMessageOnly_Type**		
Comment	"stand-alone" DCI with CRC scrambled by P-RNTI with no PCCH-Message being associated; => all fields apart from the ones listed in this record are reserved (see TS 38.212 clause 7.3.1.2.1)		
ShortMessageIndicator	B2_Type		Short Message Indicator according to TS 38.212 Table 7.3.1.2.1-1; to be set to '10'B indicating that only short message is present in the DCI
ShortMessages	B8_Type		Short Messages according to TS 38.331 Table 6.5-1
SlotOffsetList	NR_SlotOffsetList_Type	opt	list of slot offsets relative to the absolute timing information given in the common part of the ASP; if present, multiple short messages are sent out at all occasions given by the list; if omitted only a single short message is sent at the occasion given by the timing information in the common part of the ASP

NR_PDCCH_Order_Type

TTCN-3 Record Type			
Name	**NR_PDCCH_Order_Type**		
Comment	PDCCH order accordingt to TS 38.212 clause 7.3.1.2.1 to initiate RA procedure (TS 38.321, clause 5.1.1): DCI format 1_0 with CRC scrambled by C-RNTI and the "Frequency domain resource assignment" field are of all ones		
RA_PreambleIndex	B6_Type		ra-PreambleIndex according to TS 38.321 clause 5.1.2
UL_SUL_Indicator	NR_DciCommon_UL_SUL_Indicator_Type		indicates which UL carrier in the cell to transmit the PRACH if the UE is configured with SUL in the cell and RA_PreambleIndex != '000000'B; "None" otherwise
SSB_Index	B6_Type		indicates the SS/PBCH that shall be used to determine the RACH occasion for the PRACH transmission if RA_PreambleIndex != '000000'B; '000000'B (reserved) otherwise
PrachMaskIndex	B4_Type		indicates the RACH occasion associated with the SS/PBCH indicated by "SS/PBCH index" for the PRACH transmission, according to TS 38.321 clause 5.1.1; '0000'B (reserved) otherwise

NR_DciFormat_2_0_SfiList_Type

TTCN-3 Record of Type	
Name	**NR_DciFormat_2_0_SfiList_Type**
Comment	list of SFI-indexes as used as slotFormatCombinationId in SlotFormatCombination (see TS 38.331): Each index addresses the SlotFormatCombination for a serving cell in SlotFormatCombinationsPerCell (the position is given by 'positionInDCI'); the size of each SFI-index depends on the maximum value of slotFormatCombinationIds (maxSFIindex) in the sequence of SlotFormatCombinations: SFI-index-length = MAX(CEIL(log2(maxSFIindex+1)), 1); see TS 38.213 clause 11.1.1; !!!! NR OPEN ISSUE: it is not fully clear whether the maximum slotFormatCombinationId is determined per Cell or over all cells !!!! !!!! ASSUMPTION: it is per cell and therefore different SFI-indexes may use bitstrings of different length !!!!
record of bitstring	

NR_DciFormat_2_0_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_0_Type**		
Comment	TS 38.212 clause 7.3.1.3.1: for notifying the slot format; default parameters according to TS 38.508-1 clause 4.3.6.1.3.1		
SfiList	NR_DciFormat_2_0_SfiList_Type		

NR_DciFormat_2_1_IntValueList_Type

TTCN-3 Record of Type	
Name	**NR_DciFormat_2_1_IntValueList_Type**
Comment	list of 14 bit INT values per serving cell (see DownlinkPreemption, INT-ConfigurationPerServingCell in TS 38.331 and TS 38.213 clause 11.2)
record length (1..9) of B14_Type	

NR_DciFormat_2_1_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_1_Type**		
Comment	TS 38.212 clause 7.3.1.3.2: notifying the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE; default parameters according to TS 38.508-1 clause 4.3.6.1.3.2		
IntValueList	NR_DciFormat_2_1_IntValueList_Type		

NR_DciFormat_2_2_ClosedLoopIndicator_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_2_ClosedLoopIndicator_Type**		
Comment	TS 38.212 clause 7.3.1.3.3: Closed loop indicator		
None	Null_Type		0 bit if the UE is not configured with higher layer parameter twoPUSCH-PC-AdjustmentStates
Index	B1_Type		1 bit otherwise

NR_DciFormat_2_2_TpcBlock_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_2_2_TpcBlock_Type**	
Comment	TS 38.212 clause 7.3.1.3.3: single TPC block	
ClosedLoopIndicator	NR_DciFormat_2_2_ClosedLoopIndicator_Type	
TpcCommand	NR_DciCommon_TpcCommand_Type	

NR_DciFormat_2_2_TpcBlockList_Type

TTCN-3 Record of Type	
Name	**NR_DciFormat_2_2_TpcBlockList_Type**
Comment	list of TPC blocks according to TS 38.212 clause 7.3.1.3.3; beginning of each block is configured at the UE by tpc-IndexPCell or tpc-IndexPUCCH-SCell for PUCCH and by tpc-Index or tpc-IndexSUL for PUCCH (see PUCCH-TPC-CommandConfig and PUSCH-TPC-CommandConfig in TS 38.331 and TS 38.213 clause 11.3)
record of NR_DciFormat_2_2_TpcBlock_Type	

NR_DciFormat_2_2_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_2_Type**		
Comment	TS 38.212 clause 7.3.1.3.3: for the transmission of TPC commands for PUCCH and PUSCH; default parameters according to TS 38.508-1 clause 4.3.6.1.3.3		
TpcBlockList	NR_DciFormat_2_2_TpcBlockList_Type		

NR_DciFormat_2_3_SrsRequest_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_3_SrsRequest_Type**		
Comment	TS 38.212 clause 7.3.1.3.4: according to TS 38.213 clause 11.4 the presence of SRS request(s) depends on fieldTypeFormat2-3 (see SRS-TPC-CommandConfig in TS 38.331)		
None	Null_Type		0 bit: no SRS request
SrsRequestValue	B2_Type		2 bits: Index of the SRS resource set to be used according to TS 38.212 Table 7.3.1.1.2-24

NR_DciCommon_TpcCommandList_Type

TTCN-3 Record of Type	
Name	**NR_DciCommon_TpcCommandList_Type**
Comment	
record of NR_DciCommon_TpcCommand_Type	

NR_DciFormat_2_3_TypeA_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_3_TypeA_Type**		
Comment	TS 38.212 clause 7.3.1.3.4: srs-TPC-PDCCH-Group = typeA (see SRS-CarrierSwitching in TS 38.331)		
SrsRequest	NR_DciFormat_2_3_SrsRequest_Type		
TpcCommandList	NR_DciCommon_TpcCommandList_Type		

NR_DciFormat_2_3_SingleBlockTypeB_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_3_SingleBlockTypeB_Type**		
Comment	TS 38.212 clause 7.3.1.3.4: srs-TPC-PDCCH-Group = typeB (see SRS-CarrierSwitching in TS 38.331)		
SrsRequest	NR_DciFormat_2_3_SrsRequest_Type		
TpcCommand	NR_DciCommon_TpcCommand_Type		

NR_DciFormat_2_3_TypeB_Type

TTCN-3 Record of Type	
Name	**NR_DciFormat_2_3_TypeB_Type**
Comment	
record of NR_DciFormat_2_3_SingleBlockTypeB_Type	

NR_DciFormat_2_3_TypeA_B_Type

TTCN-3 Union Type		
Name	**NR_DciFormat_2_3_TypeA_B_Type**	
Comment		
TypeA	NR_DciFormat_2_3_TypeA_Type	Type-A as indicated in srs-TPC-PDCCH-Group (see SRS-CarrierSwitching in TS 38.331)
TypeB	NR_DciFormat_2_3_TypeB_Type	Type-B as indicated in srs-TPC-PDCCH-Group (see SRS-CarrierSwitching in TS 38.331)

NR_DciFormat_2_3_Type

TTCN-3 Record Type			
Name	**NR_DciFormat_2_3_Type**		
Comment	TS 38.212 clause 7.3.1.3.4: for the transmission of a group of TPC commands for SRS transmissions by one or more UEs; default parameters according to TS 38.508-1 clause 4.3.6.1.3.4		
TypeA_B	NR_DciFormat_2_3_TypeA_B_Type		

D.1.13 System_Indications

Primitives for System indications

NR_HarqProcessInfo_Type

TTCN-3 Record Type			
Name	**NR_HarqProcessInfo_Type**		
Comment			
Id	NR_HarqProcessId_Type		

NR_HarqError_Type

TTCN-3 Union Type		
Name	**NR_HarqError_Type**	
Comment		
UL	NR_HarqProcessInfo_Type	indicates HARQ error detected at the SS side (error at UL transmission)
DL	NR_HarqProcessInfo_Type	indicates HARQ NACK sent by the UE (error at DL transmission)

NR_RachPreamble_Type

TTCN-3 Record Type			
Name	**NR_RachPreamble_Type**		
Comment			
RAPID	integer		indicates the RAPID of the preamble (integer (0..63))

NR_RlcDiscardInd_Type

TTCN-3 Record Type			
Name	**NR_RlcDiscardInd_Type**		
Comment	SS shall send this indication if it discards a received RLC AMD PDU as specified in TS 38.322 cl. 5.2.3.2.2		
SequenceNumber	integer		sequence number of the PDU being discarded

D.1.14 System_Interface

NR_SYSTEM_CTRL_REQ

TTCN-3 Record Type			
Name	**NR_SYSTEM_CTRL_REQ**		
Comment			
Common	NR_ReqAspCommonPart_Type		CellId : identifier of the cell RoutingInfo : 'none' RlcBearerRouting : 'none' TimingInfo : depends on respective primitive (see below) ControlInfo : CnfFlag depends on use case; in general 'false' when for scheduled configuration, 'true' for 'now' FollowOnFlag 'false'
Request	NR_SystemRequest_Type		- Cell TimingInfo: 'now' (in general) - CellAttenuationList TimingInfo: 'now' (in general, but activation time may be used also) - RadioBearerList TimingInfo: 'now' in general; activation time may be used in special case for release and/or reconfiguration of one or several RBs; the following rules shall be considered: - release/Reconfiguration of an RB shall not be scheduled ealier than 5ms after a previous data transmission on this RB - subsequent release and reconfiguration(s) shall be scheduled with an interval of at least 5ms - a subsequent data transmission on an RB shall not be scheduled ealier than 5ms after the last reconfiguration of the RB the configuration shall be performed exactly at the given time - EnquireTiming TimingInfo: 'now' - AS_Security TimingInfo: 'now'; NOTE: "activation time" may be specified in the primitive based on PDCP SQN - Sps TimingInfo: activation time for SPS assignment transmission - Paging TimingInfo: Calculated paging occasion - L1MacIndCtrl TimingInfo: 'now' (in general) - PdcpCount TimingInfo: 'now' (in general) activation time may be used in case of CA inter cell handover to set the PdcpCount - L1_TestMode TimingInfo: depends on the test mode; activation time is used e.g. for manipulation of the CRC - PdcchOrder TimingInfo: 'now' (in general)

NR_SYSTEM_CTRL_CNF

TTCN-3 Record Type			
Name	**NR_SYSTEM_CTRL_CNF**		
Comment			
Common	NR_CnfAspCommonPart_Type		TimingInfo is ignored by TTCN (apart from EnquireTiming) => SS may set TimingInfo to "None"
Confirm	NR_SystemConfirm_Type		

NR_SYSTEM_IND

TTCN-3 Record Type			
Name	**NR_SYSTEM_IND**		
Comment			
Common	NR_IndAspCommonPart_Type		CellId : identifier of the cell RoutingInfo : 'none' RlcBearerRouting : 'none' TimingInfo : The SS shall provide TimingInfo depending on the respective indication (see below)
Indication	NR_SystemIndication_Type		- Error TimingInfo: related to the error (if available) - RlcDiscardInd TimingInfo: slot in which the RLC PDU has been received - MAC TimingInfo: slot in which the MAC PDU has been received containing the MAC CE being indicated - RachPreamble TimingInfo: start of the RACH preamble - SchedReq TimingInfo: slot containing the SR - UL_HARQ TimingInfo: slot containing the UL HARQ - HarqError TimingInfo: slot containing the UL HARQ

NR_SYSTEM_PORT

TTCN-3 Port Type		
Name	**NR_SYSTEM_PORT**	
Comment	NR PTC: Port for system configuration	
out	NR_SYSTEM_CTRL_REQ	
in	NR_SYSTEM_CTRL_CNF	

NR_SYSIND_PORT

TTCN-3 Port Type		
Name	**NR_SYSIND_PORT**	
Comment	NR PTC: Port for system indications	
in	NR_SYSTEM_IND	

D.2 NR_ASP_DrbDefs

ASP interface for DRBs

D.2.1 PDU_TypeDefs

D.2.1.1 MAC_PDU

NR_MAC_PDU_DL_Type

TTCN-3 Record Type			
Name	**NR_MAC_PDU_DL_Type**		
Comment			
CE_SubPDUList	NR_MAC_CE_SubPDU_DL_List_Type	opt	list of subPDUs with MAC CE
SDU_SubPDUList	NR_MAC_SDU_SubPDU_List_Type	opt	list of subPDUs with MAC SDU
Padding_SubPDU	NR_MAC_Padding_SubPDU_Type	opt	subPDU with padding

NR_MAC_PDU_UL_Type

TTCN-3 Record Type			
Name	**NR_MAC_PDU_UL_Type**		
Comment			
SDU_SubPDUList	NR_MAC_SDU_SubPDU_List_Type	opt	list of subPDUs with MAC SDU
CE_SubPDUList	NR_MAC_CE_SubPDU_UL_List_Type	opt	list of subPDUs with MAC CE
Padding_SubPDU	NR_MAC_Padding_SubPDU_Type	opt	subPDU with padding

NR_MAC_PDU_Type

TTCN-3 Union Type		
Name	**NR_MAC_PDU_Type**	
Comment		
DL	NR_MAC_PDU_DL_Type	
UL	NR_MAC_PDU_UL_Type	

NR_MAC_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_PDUList_Type**
Comment	
record of NR_MAC_PDU_Type	

D.2.1.1.1 MAC_PDU_SubPDU

MAC subPDU (TS 38.321 clause 6.1.2)

MAC_PDU_SubPDU: Basic Type Definitions

TTCN-3 Basic Types		
B8_16_Type	bitstring length(8..16)	NOTE: length restriction can only be a range but not two distinct lengths
NR_MAC_SDU_Type	octetstring	

NR_MAC_PDU_SubHeader_Type

TTCN-3 Record Type			
Name	**NR_MAC_PDU_SubHeader_Type**		
Comment	MAC PDU SubHeader (TS 38.321 clause 6.1.2)		
Reserved	B1_Type		Reserved bit
Format	B1_Type		F: The Format field indicates the size of the Length field according to TS 38.321 clause 6.2.1: value 0 => 8 bits, value 1 => 16 bits. In case of MAC subheader for fixed sized MAC CE or padding (R/LCID MAC subheader) this field is reserved (i.e. treated as another R field)
LCID	B6_Type		LCID: Logical Channel ID field according to TS 38.321 Tables 6.2.1-1 and 6.2.1-2
Length	B8_16_Type	opt	Either omit (fixed-sized MAC CE) or 8 bits (F=0) or 16 bits (F=1)

NR_MAC_CE_SubPDU_DL_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SubPDU_DL_Type**		
Comment	MAC DL subPPU with MAC subheader only (in case of MAC CE with fixed size of zero bits) or MAC subheader + MAC CE		
SubHeader	NR_MAC_PDU_SubHeader_Type		
ControlElement	NR_MAC_ControlElementDL_Type	opt	omit if MAC CE has fixed size of zero bits

NR_MAC_CE_SubPDU_DL_List_Type

TTCN-3 Set of Type	
Name	**NR_MAC_CE_SubPDU_DL_List_Type**
Comment	
set of NR_MAC_CE_SubPDU_DL_Type	

NR_MAC_CE_SubPDU_UL_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SubPDU_UL_Type**		
Comment	MAC UL subPPU with MAC subheader only (in case of MAC CE with fixed size of zero bits) or MAC subheader + MAC CE		
SubHeader	NR_MAC_PDU_SubHeader_Type		
ControlElement	NR_MAC_ControlElementUL_Type	opt	omit if MAC CE has fixed size of zero bits

NR_MAC_CE_SubPDU_UL_List_Type

TTCN-3 Set of Type	
Name	**NR_MAC_CE_SubPDU_UL_List_Type**
Comment	
set of NR_MAC_CE_SubPDU_UL_Type	

NR_MAC_SDU_SubPDU_Type

TTCN-3 Record Type			
Name	**NR_MAC_SDU_SubPDU_Type**		
Comment	MAC subPPU with MAC subheader + MAC SDU		
SubHeader	NR_MAC_PDU_SubHeader_Type		
SDU	NR_MAC_SDU_Type		

NR_MAC_SDU_SubPDU_List_Type

TTCN-3 Set of Type	
Name	**NR_MAC_SDU_SubPDU_List_Type**
Comment	
set of NR_MAC_SDU_SubPDU_Type	

NR_MAC_Padding_SubPDU_Type

TTCN-3 Record Type			
Name	**NR_MAC_Padding_SubPDU_Type**		
Comment	MAC subPPU with MAC subheader + Padding		
SubHeader	NR_MAC_PDU_SubHeader_Type		
Padding	octetstring		0 or more octets padding

D.2.1.1.2 MAC_ControlElements

MAC Control Elements (CEs) (TS 38.321 clause 6.1.3)

NR_MAC_ControlElementDL_Type

TTCN-3 Union Type		
Name	**NR_MAC_ControlElementDL_Type**	
Comment		
ContentionResolutionID	NR_MAC_CE_ContentionResolutionId_Type	TS 38.321 clause 6.1.3.3
TimingAdvance	NR_MAC_CE_TimingAdvance_Type	TS 38.321 clause 6.1.3.4
SCellActDeact	NR_MAC_CE_SCellActDeact_Type	TS 38.321 clause 6.1.3.10
DuplicationActDeact	NR_MAC_CE_DuplicationActDeact_Type	TS 38.321 clause 6.1.3.11
SP_ResourceSetActDeact	NR_MAC_CE_SP_ResourceSetActDeact_Type	TS 38.321 clause 6.1.3.12
CSI_TriggerStateSubselection	NR_MAC_CE_CSI_TriggerStateSubselection_Type	TS 38.321 clause 6.1.3.13
TCI_StatesActDeact	NR_MAC_CE_TCI_StatesActDeact_Type	TS 38.321 clause 6.1.3.14
TCI_StateIndication	NR_MAC_CE_TCI_StateIndication_Type	TS 38.321 clause 6.1.3.15
SP_CSI_ReportingActDeact	NR_MAC_CE_SP_CSI_ReportingActDeact_Type	TS 38.321 clause 6.1.3.16
SP_SRS_ActDeact	NR_MAC_CE_SP_SRS_ActDeact_Type	TS 38.321 clause 6.1.3.17
PUCCH_SpatialRelationActDeact	NR_MAC_CE_PUCCH_SpatialRelationActDeact_Type	TS 38.321 clause 6.1.3.18
SP_ZP_ResourceSetActDeact	NR_MAC_CE_SP_ZP_ResourceSetActDeact_Type	TS 38.321 clause 6.1.3.19
RecommendatdBitrate	NR_MAC_CE_RecommendedBitrate_Type	TS 38.321 clause 6.1.3.20

NR_MAC_ControlElementUL_Type

TTCN-3 Union Type		
Name	**NR_MAC_ControlElementUL_Type**	
Comment		
ShortBSR	NR_MAC_CE_ShortBSR_Type	TS 38.321 clause 6.1.3.1
LongBSR	NR_MAC_CE_LongBSR_Type	TS 38.321 clause 6.1.3.1
C_RNTI	RNTI_B16_Type	TS 38.321 clause 6.1.3.2
SingleEntryPHR	NR_MAC_CE_SingleEntryPHR_Type	TS 38.321 clause 6.1.3.8
MultiEntryPHR	NR_MAC_CE_MultiEntryPHR_Type	TS 38.321 clause 6.1.3.9
Recommended Bitrate	NR_MAC_CE_RecommendedBitrate_Type	TS 38.321 clause 6.1.3.20

D.2.1.1.2.1 MAC_ControlElement_Common

NR_MAC_CE_SCellFlags_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SCellFlags_Type**		
Comment	bitmap to indicate presence of SCell with SCellIndex according to TS 38.331 either SCellIndex7_1 is present only or all octets are present		
SCellIndex7_1	B8_Type		leftmost bit corresponds to SCellIndex7, 2nd bit from the right corresponds to SCellIndex1, rightmost bit is reserved
SCellIndex15_8	B8_Type	opt	leftmost bit corresponds to SCellIndex15, rightmost bit corresponds to SCellIndex8
SCellIndex23_16	B8_Type	opt	leftmost bit corresponds to SCellIndex23, rightmost bit corresponds to SCellIndex16
SCellIndex31_24	B8_Type	opt	leftmost bit corresponds to SCellIndex31, rightmost bit corresponds to SCellIndex24

NR_MAC_CE_AD_ServCellId_BwpId_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_AD_ServCellId_BwpId_Type**		
Comment	Common definition for first octet of CEs defined in TS 38.321 clause 6.1.3.12 .. TS 38.321 clause 6.1.3.19		
AD	B1_Type		A/D field for NR_MAC_CE_SP_ResourceSetActDeact_Type and NR_MAC_CE_SP_SRS_ActDeact_Type reserved (set to 0) otherwise
ServCellId	B5_Type		identity of the Serving Cell for which the MAC CE applies
BwpId	B2_Type		BWP-Id (as specified in TS 38.331) of the uplink/downlink bandwidth part for which the MAC CE applies

D.2.1.1.2.2 MAC_ControlElement_BSR

TS 38.321 clause 6.1.3.1 (Buffer Status Report MAC CEs)

MAC_ControlElement_BSR: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_LongBSR_BufferSize_Type	O1_Type	

NR_MAC_CE_ShortBSR_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_ShortBSR_Type**		
Comment	Short BSR and Short Truncated BSR MAC CE according to TS 38.321 Figure 6.1.3.1-1		
LCG	B3_Type		
BufferSize	B5_Type		

NR_MAC_LongBSR_BufferSizeList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_LongBSR_BufferSizeList_Type**
Comment	
record length (1..8) of NR_MAC_LongBSR_BufferSize_Type	

NR_MAC_CE_LongBSR_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_LongBSR_Type**		
Comment	Long BSR and Long Truncated BSR MAC CE according to TS 38.321 Figure 6.1.3.1-2		
LCG_Presence	B8_Type		'1' indicates that the Buffer Size field for a logical channel group i is reported, with i = 7 for the leftmost bit and i = 0 for the rightmost
BufferSizeList	NR_MAC_LongBSR_BufferSizeList_Type		According to TS 38.321 clause 6.1.3.1 the Buffer Size fields are included in ascending order based on the LCGi

D.2.1.1.2.3 MAC_ControlElement_ContentionResolutionId

TS 38.321 clause 6.1.3.3 (UE Contention Resolution Identity MAC CE)

MAC_ControlElement_ContentionResolutionId: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_ContentionResolutionId_Type	B48_Type	TS 38.321 Figure 6.1.3.3-1; fix size of 48 bits

D.2.1.1.2.4 MAC_ControlElement_TimingAdvance

TS 38.321 clause 6.1.3.4 (Timing Advance Command MAC CE)

NR_MAC_CE_TimingAdvance_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TimingAdvance_Type**		
Comment	TS 38.321 Figure 6.1.3.4-1		
TAG_ID	B2_Type		TAG Identity of the addressed TAG
TimingAdvanceCommand	B6_Type		index value TA (0..63) used to control the amount of timing adjustment that MAC entity has to apply (as specified in TS 38.213)

D.2.1.1.2.5 MAC_ControlElement_PHR

TS 38.321 clause 6.1.3.8 (Single Entry PHR) and 6.1.3.9 (Multiple Entry PHR)

MAC_ControlElement_PHR: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_SingleEntry PHR_Type	NR_MAC_CE_PH_Record_Type	TS 38.321 Figure 6.1.3.8-1

NR_MAC_CE_PH_Record_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_PH_Record_Type**		
Comment			
P_Bit	B1_Type		P bit: 1 indicates the UE applies power backoff due to power management; reserved (R = '0'B) for Single Entry PHR MAC CE
V_Bit	B1_Type		V bit: Indicates when the PH value is based on a real transmission or a reference format; reserved (R = '0'B) for Single Entry PHR MAC CE
Value	B6_Type		The power headroom level. Ph Type 2 (if configured) for Pcell and Type 1 for Pcell and Scell
Reserved	B2_Type	opt	2 reserved bits; present if V=1
PCMaxc	B6_Type	opt	present if V=1

NR_MAC_CE_MultiEntryPHR_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_MultiEntryPHR_Type**		
Comment	TS 38.321 Figure 6.1.3.9-1 and Figure 6.1.3.9-2		
PHFieldPresent ForSCell	NR_MAC_CE_SCellFlags_ Type		to indicate presence of PH field for particular SCell
PH_Record	record of NR_MAC_CE_PH_Record_ Type		list of PH_Records for PCell and SCells as described in TS 38.321 clause 6.1.3.9

D.2.1.1.2.6 MAC_ControlElement_SCellActivationDeactivation

TS 38.321 clause 6.1.3.10 (SCell Activation/Deactivation MAC CEs)

MAC_ControlElement_SCellActivationDeactivation: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_SCellActDe act_Type	NR_MAC_CE_SCellFlags_Type	TS 38.321 Figure 6.1.3.10-1 and Figure 6.1.3.10-2

D.2.1.1.2.7 MAC_ControlElement_DuplicationActivationDeactivation

TS 38.321 clause 6.1.3.11 (Duplication Activation/Deactivation MAC CE)

MAC_ControlElement_DuplicationActivationDeactivation: Basic Type Definitions

TTCN-3 Basic Types		
NR_MAC_CE_Duplication ActDeact_Type	B8_Type	TS 38.321 Figure 6.1.3.11-1

D.2.1.1.2.8 MAC_ControlElement_SP_ResourceSetActivationDeactivation

TS 38.321 clause 6.1.3.12 (SP CSI-RS / CSI-IM Resource Set Activation/Deactivation MAC CE)

NR_MAC_CE_SP_ResourceSetActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ResourceSetActDeact_Octet2_Type**		
Comment			
Reserved	B1_Type		
IM	B1_Type		indicates whether or not octet 3 is present
CSI_RS_Resourcesetld	B6_Type		

NR_MAC_CE_SP_ResourceSetActDeact_Octet3_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ResourceSetActDeact_Octet3_Type**		
Comment			
Reserved	B2_Type		
CSI_IM_ResourcesetId	B6_Type		

NR_MAC_CE_SP_ResourceSetActDeact_TciStateId_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ResourceSetActDeact_TciStateId_Type**		
Comment			
Reserved	B1_Type		
Id	B7_Type		

NR_MAC_CE_SP_ResourceSetActDeact_TciStateIdList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_CE_SP_ResourceSetActDeact_TciStateIdList_Type**
Comment	
record of NR_MAC_CE_SP_ResourceSetActDeact_TciStateId_TypeeId_Type	

NR_MAC_CE_SP_ResourceSetActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ResourceSetActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.12-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		
Octet2	NR_MAC_CE_SP_ResourceSetActDeact_Octet2_Type		
Octet3	NR_MAC_CE_SP_ResourceSetActDeact_Octet3_Type	opt	present if IM=1 in octet 2
IdList	NR_MAC_CE_SP_ResourceSetActDeact_TciStateIdList_Type		

D.2.1.1.2.9 MAC_ControlElement_CSI_TriggerStateSubselection

TS 38.321 clause 6.1.3.13 (Aperiodic CSI Trigger State Subselection MAC CE)

NR_MAC_CE_CSI_TriggerStateSubselection_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_CSI_TriggerStateSubselection_Type**		
Comment	TS 38.321 Figure 6.1.3.13-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		A/D field: reserved
Selection	B8_List_Type		

D.2.1.1.2.10 MAC_ControlElement_TCI_StatesActivationDeactivation

TS 38.321 clause 6.1.3.14 (TCI States Activation/Deactivation for UE-specific PDSCH MAC CE)

NR_MAC_CE_TCI_StatesActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TCI_StatesActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.14-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		A/D field: reserved
Status	B8_List_Type		

D.2.1.1.2.11 MAC_ControlElement_TCI_StateIndication

TS 38.321 clause 6.1.3.15 (TCI State Indication for UE-specific PDCCH MAC CE)

NR_MAC_CE_TCI_StateIndication_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_TCI_StateIndication_Type**		
Comment	TS 38.321 Figure 6.1.3.15-1		
ServCellId	B5_Type		identity of the Serving Cell for which the MAC CE applies
CoresetId	B4_Type		ControlResourceSetId for which the TCI State is being indicated
TciStateId	B7_Type		TCI-StateId applicable to the Control Resource Set identified by CORESET ID field

D.2.1.1.2.12 MAC_ControlElement_SP_CSI_ReportingActivationDeactivation

TS 38.321 clause 6.1.3.16 (SP CSI reporting on PUCCH Activation/Deactivation MAC CE)

NR_MAC_CE_SP_CSI_ReportingActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_CSI_ReportingActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.16-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		A/D field: reserved
Reserved	B4_Type		
ConfigState	B4_Type		

D.2.1.1.2.13 MAC_ControlElement_SP_SRS_ActivationDeactivation

NR_MAC_CE_SP_SRS_ActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_Octet2_Type**		
Comment	TS 38.321 clause 6.1.3.17 (SP SRS Activation/Deactivation MAC CE)		
Reserved	B2_Type		
C	B1_Type		
SUL	B1_Type		
SRS_Resource setId	B4_Type		

NR_MAC_CE_SP_SRS_ActDeact_ResourceId_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_ResourceId_Type**		
Comment			
F	B1_Type		
Id	B7_Type		

NR_MAC_CE_SP_SRS_ActDeact_ResourceIdList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_CE_SP_SRS_ActDeact_ResourceIdList_Type**
Comment	
record of NR_MAC_CE_SP_SRS_ActDeact_ResourceId_Typee	

NR_MAC_CE_SP_SRS_ActDeact_ResourceInfo_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_ResourceInfo_Type**		
Comment			
Reserved	B1_Type		
ServingCellId	B5_Type		
BwpId	B2_Type		

NR_MAC_CE_SP_SRS_ActDeact_ResourceInfoList_Type

TTCN-3 Record of Type	
Name	**NR_MAC_CE_SP_SRS_ActDeact_ResourceInfoList_Type**
Comment	
record of NR_MAC_CE_SP_SRS_ActDeact_ResourceInfo_Typeype	

NR_MAC_CE_SP_SRS_ActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_SRS_ActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.17-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		
Octet2	NR_MAC_CE_SP_SRS_ActDeact_Octet2_Type		
ResourceIdList	NR_MAC_CE_SP_SRS_ActDeact_ResourceIdList_Type		
ResourceInfoList	NR_MAC_CE_SP_SRS_ActDeact_ResourceInfoList_Type		empty list when C=0

D.2.1.1.2.14 MAC_ControlElement_PUCCH_SpatialRelationActivationDeactivation

TS 38.321 clause 6.1.3.18 (PUCCH spatial relation Activation/Deactivation MAC CE)

NR_MAC_CE_PUCCH_SpatialRelationActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_PUCCH_SpatialRelationActDeact_Octet2_Type**		
Comment			
Reserved	B1_Type		
ResourceId	B7_Type		

NR_MAC_CE_PUCCH_SpatialRelationActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_PUCCH_SpatialRelationActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.18-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		A/D field: reserved
Octet2	NR_MAC_CE_PUCCH_SpatialRelationActDeact_Octet2_Type		
ActivationStatus	B8_Type		

D.2.1.1.2.15 MAC_ControlElement_ZP_ResourceSetActivationDeactivation

TS 38.321 clause 6.1.3.19 (SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE)

NR_MAC_CE_SP_ZP_ResourceSetActDeact_Octet2_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ZP_ResourceSetActDeact_Octet2_Type**		
Comment			
Reserved	B4_Type		
Id	B4_Type		

NR_MAC_CE_SP_ZP_ResourceSetActDeact_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_SP_ZP_ResourceSetActDeact_Type**		
Comment	TS 38.321 Figure 6.1.3.19-1		
Octet1	NR_MAC_CE_AD_ServCellId_BwpId_Type		
Octet2	NR_MAC_CE_SP_ZP_ResourceSetActDeact_Octet2_Type		

D.2.1.1.2.16 MAC_ControlElement_RecommendedBitrate

TS 38.321 clause 6.1.3.20 (Recommended bit rate MAC CE)

NR_MAC_CE_RecommendedBitrate_Type

TTCN-3 Record Type			
Name	**NR_MAC_CE_RecommendedBitrate_Type**		
Comment	TS 38.321 Figure 6.1.3.20-1		
LCID	B6_Type		
UL_DL	B1_Type		
Bitrate	B6_Type		
Reserved	B3_Type		

D.2.1.2 RLC_PDU

RLC_PDU: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_SDU_Type	octetstring	

NR_RLC_PDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_PDU_Type**	
Comment		
TMD	NR_RLC_TMD_PDU_Type	
UMD	NR_RLC_UMD_PDU_Type	
AMD	NR_RLC_AMD_PDU_Type	
Status	NR_RLC_AM_StatusPDU_Type	

NR_RLC_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_RLC_PDUList_Type**
Comment	
record of NR_RLC_PDU_Type	

NR_RLC_SDUList_Type

TTCN-3 Record of Type	
Name	**NR_RLC_SDUList_Type**
Comment	
record of NR_RLC_SDU_Type	

D.2.1.2.1 Common

RLC PDU definition: common AM/UM field definitions

Common: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_SegmentationInfo_Type	B2_Type	Segmentation Info (SI) field (TS 38.322, clause 6.2.3.4) 00 - Data field contains all bytes of an RLC SDU 01 - Data field contains the first segment of an RLC SDU 10 - Data field contains the last segment of an RLC SDU 11 - Data field contains neither the first nor last segment of an RLC SDU
NR_RLC_SegmentOffset_Type	B16_Type	Segment Offset (SO) field (TS 38.322, 6.2.3.5)

D.2.1.2.2 TM_Data

RLC PDU definition: UM (TS 38.322, clause 6.2.2.2)

TM_Data: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_TMD_PDU_Type	octetstring	TS 38.322, clause 6.2.2.2

D.2.1.2.3 UM_Data

RLC PDU definition: UM (TS 38.322, clause 6.2.2.3)

UM_Data: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_UMD_Data_Type	octetstring	TS 38.322, clause 6.2.2.3

NR_RLC_UMD_HeaderNoSN_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_HeaderNoSN_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-1; one octet		
SegmentationInfo	NR_RLC_SegmentationInfo_Type		
Reserved	B6_Type		

NR_RLC_UMD_PduNoSN_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_PduNoSN_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-1); one octet		
Header	NR_RLC_UMD_HeaderNoSN_Type		
Data	NR_RLC_UMD_Data_Type		

NR_RLC_UMD_HeaderSN6Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_HeaderSN6Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (6.2.2.3-2, 6.2.2.3-4); one octet		
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
SequenceNumber	B6_Type		6 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.3)

NR_RLC_UMD_PduSN6Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_PduSN6Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (6.2.2.3-2, 6.2.2.3-4); one octet		
Header	NR_RLC_UMD_HeaderSN6Bit_Type		
Data	NR_RLC_UMD_Data_Type		

NR_RLC_UMD_HeaderSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_HeaderSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-3, 6.2.2.3-5); two octets		
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
Reserved	B2_Type		2 bits reserved
SequenceNumber	B12_Type		12 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.3)

NR_RLC_UMD_PduSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_UMD_PduSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.3 (Figure 6.2.2.3-3, 6.2.2.3-5); two octets		
Header	NR_RLC_UMD_HeaderSN12Bit_Type		
Data	NR_RLC_UMD_Data_Type		

NR_RLC_UMD_PDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_UMD_PDU_Type**	
Comment		
NoSN	NR_RLC_UMD_PduNoSN_Type	
SN6Bit	NR_RLC_UMD_PduSN6Bit_Type	
SN12Bit	NR_RLC_UMD_PduSN12Bit_Type	

D.2.1.2.4 AM_Data

RLC PDU definition: AM (TS 38.322, clause 6.2.2.4)

AM_Data: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_AMD_Data_Type	octetstring	TS 38.322, clause 6.2.2.4

NR_RLC_AMD_HeaderSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_HeaderSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 (Figure 6.2.2.4-1, 6.2.2.4-3)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Poll	B1_Type		1 bit, '0'B - Status report not requested '1'B - Status report is requested
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
SequenceNumber	B12_Type		12 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.4)

NR_RLC_AMD_PduSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_PduSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 (Figure 6.2.2.4-1, 6.2.2.4-3)		
Header	NR_RLC_AMD_HeaderSN12Bit_Type		
Data	NR_RLC_AMD_Data_Type		

NR_RLC_AMD_HeaderSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_HeaderSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 (Figure 6.2.2.4-2, 6.2.2.4-4)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Poll	B1_Type		1 bit, 0 - Status report not requested 1 - Status report is requested
SegmentationInfo	NR_RLC_SegmentationInfo_Type		2 bits SI
Reserved	B2_Type		2 bits reserved
SequenceNumber	B18_Type		18 bits SN
SegmentOffset	NR_RLC_SegmentOffset_Type	opt	16 bits SO; included in case of segmentation but not for the first segment (TS 38.322 clause 6.2.2.4)

NR_RLC_AMD_PduSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_AMD_PduSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.4 Figure 6.2.2.4-2, 6.2.2.4-4)		
Header	NR_RLC_AMD_HeaderSN18Bit_Type		
Data	NR_RLC_AMD_Data_Type		

NR_RLC_AMD_PDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_AMD_PDU_Type**	
Comment	TS 38.322, clause 6.2.2.4	
SN12Bit	NR_RLC_AMD_PduSN12Bit_Type	
SN18Bit	NR_RLC_AMD_PduSN18Bit_Type	

D.2.1.2.5 AM_Status

AM Status PDU (TS 36.322, clause 6.2.1.6)

AM_Status: Basic Type Definitions

TTCN-3 Basic Types		
NR_RLC_Status_ExtensionBit1_Type	B1_Type	TS 38.322, clause 6.2.3.11 Extension bit 1 (E1) field: '0'B A set of NACK_SN, E1, E2 and E3 does not follow. '1'B A set of NACK_SN, E1, E2 and E3 follows.
NR_RLC_Status_ExtensionBit2_Type	B1_Type	TS 38.322, clause 6.2.3.13 Extension bit 2 (E2) field: '0'B A set of SOstart and SOend does not follow for this NACK_SN. '1'B A set of SOstart and SOend follows for this NACK_SN.
NR_RLC_Status_ExtensionBit3_Type	B1_Type	TS 38.322, clause 6.2.3.16 Extension bit 3 (E3) field: '0'B A set of NACK_SN, E1, E2 and E3 follows. '1'B NACK range field follows for this NACK_SN.

NR_RLC_Status_NackSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_Status_NackSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
SequenceNumberNACK	B12_Type		12 bits SN
E1	NR_RLC_Status_ExtensionBit1_Type		1 bit E1 field; set if further NACK set follows
E2	NR_RLC_Status_ExtensionBit2_Type		1 bit E2 field
E3	NR_RLC_Status_ExtensionBit3_Type		1 bit E3 field
Reserved	B1_Type		1 bit reserved
SOstart	NR_RLC_SegmentOffset_Type	opt	segment offset (start), present only if E2 is set to '1'B
SOstop	NR_RLC_SegmentOffset_Type	opt	segment offset (stop), present only if E2 is set to '1'B
NACKrange	B8_Type	opt	NACK range, present only if E3 is set to '1'B

NR_RLC_Status_NackListSN12Bit_Type

TTCN-3 Record of Type	
Name	**NR_RLC_Status_NackListSN12Bit_Type**
Comment	
record of NR_RLC_Status_NackSN12Bit_Type	

NR_RLC_StatusPduSN12Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_StatusPduSN12Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
D_C	B1_Type		1 bit, '0'B for Control PDU
CPT	B3_Type		3 bits, TS 38.322, clause 6.2.3.9 Control PDU Type (CPT) field: '000'B STATUS PDU ELSE reserved
SequenceNumberACK	B12_Type		12 bits SN
E1	NR_RLC_Status_ExtensionBit1_Type		1 bit E1 field
Reserved	B7_Type		7 bits reserved
NackList	NR_RLC_Status_NackListSN12Bit_Type	opt	zero or more sets of a NACK_SN, E1, E2 and E3 and possibly a pair of SOstart/SOend or NACK range field for each NACK_SN

NR_RLC_Status_NackSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_Status_NackSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
SequenceNumberNACK	B18_Type		18 bits SN
E1	NR_RLC_Status_ExtensionBit1_Type		1 bit E1 field; set if further NACK set follows
E2	NR_RLC_Status_ExtensionBit2_Type		1 bit E2 field
E3	NR_RLC_Status_ExtensionBit3_Type		1 bit E3 field
Reserved	B3_Type		3 bits reserved
SOstart	NR_RLC_SegmentOffset_Type	opt	segment offset (start), present only if E2 is set to '1'B
SOstop	NR_RLC_SegmentOffset_Type	opt	segment offset (stop), present only if E2 is set to '1'B
NACKrange	B8_Type	opt	NACK range, present only if E3 is set to '1'B

NR_RLC_Status_NackListSN18Bit_Type

TTCN-3 Record of Type	
Name	**NR_RLC_Status_NackListSN18Bit_Type**
Comment	
record of NR_RLC_Status_NackSN18Bit_Type	

NR_RLC_StatusPduSN18Bit_Type

TTCN-3 Record Type			
Name	**NR_RLC_StatusPduSN18Bit_Type**		
Comment	TS 38.322, clause 6.2.2.5 (Figure 6.2.2.5-1)		
D_C	B1_Type		1 bit, '0'B for Control PDU
CPT	B3_Type		3 bits, TS 38.322, clause 6.2.3.9 Control PDU Type (CPT) field: '000'B STATUS PDU ELSE reserved
SequenceNumberACK	B18_Type		18 bits SN
E1	NR_RLC_Status_ExtensionBit1_Type		1 bit E1 field
Reserved	B1_Type		1 bit reserved
NackList	NR_RLC_Status_NackListSN18Bit_Type	opt	zero or more sets of a NACK_SN, E1, E2 and E3 and possibly a pair of SOstart/SOend or NACK range field for each NACK_SN

NR_RLC_AM_StatusPDU_Type

TTCN-3 Union Type		
Name	**NR_RLC_AM_StatusPDU_Type**	
Comment	TS 38.322, clause 6.2.254	
SN12Bit	NR_RLC_StatusPduSN12Bit_Type	
SN18Bit	NR_RLC_StatusPduSN18Bit_Type	

D.2.2 DRB_Primitive_Definitions

Primitive definitions to send/receive data PDUs over DRB's

D.2.2.1 DRB_Common

NR_L2DataList_Type

TTCN-3 Union Type		
Name	**NR_L2DataList_Type**	
Comment	MAC: acc. to rel-15 protocols there is exactly one MAC PDU per TB but in case of spatial multiplexing there can be one or more TB per HARQ process; any MAC PDU is completely included in one slot (TTI) RLC: one or more RLC PDUs per slot (TTI) (e.g. RLC Data + Status PDU on a logical channel; more than one RLC Data PDU in one MAC PDU is valid too) any RLC PDU is completely included in one slot (TTI) PDCP: one or more PDUs per slot (TTI); one PDCP PDU may be included in more than one slot (TTI)	
MacPdu	NR_MAC_PDUList_Type	SS configuration: RLC TM mode, MAC no header removal (PDCP is not configured)
RlcPdu	NR_RLC_PDUList_Type	SS configuration: RLC TM mode, MAC header removal (PDCP is not configured)
RlcSdu	NR_RLC_SDUList_Type	SS configuration: RLC UM mode with no PDCP
PdcpPdu	NR_PDCP_PDUList_Type	SS configuration: RLC AM/UM mode, no handling of PDCP header
PdcpSdu	NR_PDCP_SDUList_Type	SS configuration: RLC AM/UM mode, PDCP normal mode (automatic handling of PDCP header)
SdapPdu	SDAP_PDUList_Type	SS configuration: RLC AM/UM mode, PDCP normal mode (automatic handling of PDCP header), no handling of SDAP header
SdapSdu	SDAP_SDUList_Type	SS configuration: RLC AM/UM mode, PDCP normal mode (automatic handling of PDCP header), automatic handling of SDAP header

NR_HarqProcessAssignment_Type

TTCN-3 Union Type		
Name	**NR_HarqProcessAssignment_Type**	
Comment	in DL the HARQ process id may be specified by the test case or automatically assigned by SS	
Id	NR_HarqProcessId_Type	HARQ process as specified by the test case NOTE1: the scope of this type is only for data being sent in one slot (TTI); if data needs more than one slot (TTI) the HarqProcessId is undefined for the 2nd TTI onward what shall be handled as an error at the SS; SS may send a SYSTEM_IND indicating an error in this case; NOTE2: The initial value of the NDI shall be the same for all HARQ processes and cells
Automatic	Null_Type	HARQ process id automatically assigned by SS

D.2.2.2 Downlink

NR_DRB_DataPerSlot_DL_Type

TTCN-3 Record Type			
Name	**NR_DRB_DataPerSlot_DL_Type**		
Comment	common definition for one or several PDUs/SDUs; in NR the DL data is sent in the slot given by the slot offset NOTE 1: For MAC and RLC PDUs a single PDU is always sent in one slot; SS shall raise an error indication (using SYSTEM_IND) when that is not possible NOTE 2: For PDCP the data may be spread over more than one slot (segmented by the RLC); the TTCN implementation is responsible to calculate appropriate offsets accordingly; the exact timing depends on (and is exactly specified by) configuration of the DL scheduling; SS shall raise an error when there is any conflict		
SlotOffset	integer		NR: Slot offset relative to the absolute timing information given in the common part of the ASP; NOTE: if a PDCP PDU or SDU takes more than one slot, SlotOffset specifies the first slot (TTI)
HarqProcess	NR_HarqProcessAssignment_Type	opt	HARQ process to be used: specific value or automatically assigned by SS; in automatic mode SS chooses HARQ process out of the set configured by CcchDcchDtchConfigDL_Type.HarqProcessConfig NOTE: for PDCP SDUs or PDUs automatic mode shall be used; otherwise SS shall raise an error
PduSduList	NR_L2DataList_Type		list of PDUs/SDUs to be sent in one slot (TTI)

NR_DRB_DataPerSlotList_DL_Type

TTCN-3 Record of Type	
Name	**NR_DRB_DataPerSlotList_DL_Type**
Comment	list of user plane data to be sent in slots given by the SlotOffset in the single elements of the list; Timing: the start time for the whole sequence is given by the timing info of the ASP (common information); the timing for the respective data pdus is given by the SlotOffset relative to the common timing info; design consideration: repetitions of this sequence are not foreseen (in which case the slot offset could not be related to the timing info of the ASP)
record of NR_DRB_DataPerSlot_DL_Type	

NR_L2Data_Request_Type

TTCN-3 Record Type			
Name	**NR_L2Data_Request_Type**		
Comment	NOTE: formal type definition to allow later enhancements		
SlotDataList	NR_DRB_DataPerSlotList_DL_Type		

D.2.2.3 Uplink

NR_DRB_DataPerSlot_UL_Type

TTCN-3 Record Type			
Name	**NR_DRB_DataPerSlot_UL_Type**		
Comment	common definition for one or several PDUs/SDUs being received in one slot or to receive one PDCP PDU or SDU being spread over more than one slot (TTI); NOTE: There is a fix relation between HARQ process id and slot in UL => it is not necessary to include HARQ process id for UL data		
PduSduList	NR_L2DataList_Type		list of PDUs/SDUs being received in one TTI; elements of the list appear in the same order as the PDUs/SDUs in the MAC PDU; for PDCP when a PDU or SDU takes more than one TTI the list only contains this PDU or SDU
NoOfTTIs	integer		in case of PDCP: number of TTIs the SDU or PDU has taken NOTE 1: for the time being the NoOfTTIs is not checked by TTCN-3 and may be set to 1 by SS; NOTE 2: the timing info in common part of the ASP refers to the last TTI NOTE 3: when NoOfTTIs > 1 => PduSduList shall only contain one PDCP PDU or SDU in case of MAC or RLC PDUs: NoOfTTIs shall always be 1

NR_L2Data_Indication_Type

TTCN-3 Record Type			
Name	**NR_L2Data_Indication_Type**		
Comment	NOTE: formal type definition to allow later enhancements; L2Data_Indication_Type defines data being received in a single slot i.e. PDUs of subsequent TTIs are indicated in separated ASPs		
SlotData	NR_DRB_DataPerSlot_UL_Type		

D.2.3 System_Interface

NR_DRB_COMMON_REQ

TTCN-3 Record Type			
Name	**NR_DRB_COMMON_REQ**		
Comment	common ASP to send PDUs to DRBs		
Common	NR_ReqAspCommonPart_Type		CellId : identifier of the cell RoutingInfo : QosFlow when SDAP is configured in non-transparent mode at the SS, else DRB id RlcBearerRouting : TTCN provides the id of the cell in which the SS shall send the data out to the UE (for non-split bearers in general same as CellId) TimingInfo : starting point when to start sending sequence of data PDUs e.g. SFN = X, subframe number = x; slot number = slot_i depending on numerology U_Plane.SubframeDataList[i].SlotOffset := offset_i; => U_Plane.SubframeDataList[0].PduSduList shall be sent out at (X, x, i) U_Plane.SubframeDataList[i].PduSduList shall be sent out offset_i slots after U_Plane.SubframeDataList[0].PduSduList (depending on the numerology) NOTE: In case of K0>0 (K0 according to 38.214 clause 5.1.2.1) the timing specifies the PDCCH assignment (rather than the PDSCH transmission) ControlInfo : CnfFlag:=false; FollowOnFlag:=false
U_Plane	NR_L2Data_Request_Type		
SuppressPdcchForC_RNTI	Null_Type	opt	By default all DRB_COMMON_REQ scheduled DL PDU's are associated with an appropriate explicit configured or SS selected DL assignment allocation on PDCCH. For SuppressPdcch:=true in the sub frame in which DL PDU's are transmitted, there is no associated DL assignment allocation for configured C-RNTI. This will be used for SPS assignment based transmission or in any error scenarios; NOTE: this flag has no impact on PDCCH messages required for SPS activation

NR_DRB_COMMON_IND

TTCN-3 Record Type			
Name	**NR_DRB_COMMON_IND**		
Comment	common ASP to receive PDUs from DRBs		
Common	NR_IndAspCommonPart_Type		CellId : identifier of the cell RoutingInfo : QosFlow when SDAP is configured in non-transparent mode at the SS, else DRB id RlcBearerRouting : The SS shall provide the id of the cell in which the data has been sent from the UE TimingInfo : time when message has been received NOTE 1: For MAC and RLC PDUs per definition L2Data_Indication_Type corresponds to exactly one slot => TimingInfo refers to this slot NOTE 2: For PDCP a single PDU or SDU may take more than one TTI => TimingInfo refers to the end of the PDU/SDU and the length is given by NoOfTTIs in L2Data_Indication_Type (the end of the PDU/SDU is the last RLC PDU being received; in case of retransmissions this is not necessarily the RLC PDU with the last SN)
U_Plane	NR_L2Data_Indication_Type		

NR_DRB_PORT

TTCN-3 Port Type		
Name	**NR_DRB_PORT**	
Comment		
out	NR_DRB_COMMON_REQ	
in	NR_DRB_COMMON_IND	

D.3 NR_ASP_SrbDefs

D.3.1 SRB_DATA_ASPs

ASP Definitions to send/receive peer-to-peer messages on SRBs

NR_C_Plane_Request_Type

TTCN-3 Record Type			
Name	**NR_C_Plane_Request_Type**		
Comment	RRC and/or NAS PDU to be send to the UE; Note: it may be necessary to allow more than one NAS PDU (-> "record of")		
Rrc	NR_RRC_MSG_Request_Type	opt	omit: NAS message shall be present; NAS message shall be sent in DLInformationTransfer present: if NAS message is present also, (piggybacked) NAS PDU shall be security protected (if necessary) and inserted in RRC PDU's DedicatedInfoNAS
Nas	NG_NAS_MSG_RequestList_Type	opt	omit: RRC message shall be present; RRC message does not contain (piggybacked) NAS PDU present: if RRC message is omitted => NAS message shall be sent embedded in DLInformationTransfer if RRC message is present => NAS message is piggybacked in RRC message in case of RRC message is sent on CCCH, NAS message shall be omitted

NR_C_Plane_Indication_Type

TTCN-3 Record Type			
Name	**NR_C_Plane_Indication_Type**		
Comment	RRC and/or NAS PDU to be received from the UE; Note: it may be necessary to allow more than one NAS PDU (-> "record of")		
Rrc	NR_RRC_MSG_Indication_Type	opt	omit: NAS message shall be present; NAS message is received in ULInformationTransfer present: if NAS message is present also, DedicatedInfoNAS contains unstructured and ciphered NAS message and the NAS message is the deciphered message in structured format
Nas	NG_NAS_MSG_IndicationList_Type	opt	omit: RRC message shall be present; RRC message does not contain (piggybacked) NAS PDU present: if RRC message is omitted => NAS message has been received in ULInformationTransfer if RRC message is present => NAS message has been piggybacked in RRC message NOTE: even though currently (DEC 08 ASN.1) there is no RRC PDU in UL containing more than one DedicatedInfoNAS we provide a list to allow extendability

NR_SRB_COMMON_REQ

TTCN-3 Record Type			
Name	**NR_SRB_COMMON_REQ**		
Comment	common ASP to send PDUs to SRB0, SRB1 or SRB2		
Common	NR_ReqAspCommonPart_Type		CellId : identifier of the cell RoutingInfo : SRB0, SRB1, SRB2, SRB3 RlcBearerRouting : TTCN provides the id of the cell in which the SS shall send the data out to the UE (for non-split bearers in general same as CellId) TimingInfo : Now in normal cases; For latency tests TimingInfo can be set to the SFN/subframe in which the RRC messages shall be sent out (in this case and if the RRC PDU is too long to be sent in one TTI the TimingInfo corresponds to the first TTI) ControlInfo CnfFlag:=false; FollowOnFlag true: Indicates that the message(s) to be sent on the same TTI will follow NOTE 1: When FollowOnFlag is true, TimingInfo shall always be "Now". Otherwise SS shall produce an error NOTE 2: the follow on flag applies only for messages of the same SRB false: Indicates that no more message(s) will follow
Signalling	NR_C_Plane_Request_Type		

NR_SRB_COMMON_IND

TTCN-3 Record Type			
Name	**NR_SRB_COMMON_IND**		
Comment	common ASP to receive PDUs from SRB0, SRB1 or SRB2		
Common	NR_IndAspCommonPart_Type		CellId : identifier of the cell RoutingInfo : SRB0, SRB1, SRB2, SRB3 RlcBearerRouting : The SS shall provide the id of the cell in which the data has been sent from the UE TimingInfo : time when message has been received (as received from the SS by the NAS emulator)
Signalling	NR_C_Plane_Indication_Type		

D.3.2 Port_Definitions

NR_SRB_PORT

TTCN-3 Port Type		
Name	**NR_SRB_PORT**	
Comment	NR PTC: Port for Sending/Receiving data on SRBs	
out	NR_SRB_COMMON_REQ	
in	NR_SRB_COMMON_IND	

NASEMU_NR_SRB_PORT

TTCN-3 Port Type		
Name	**NASEMU_NR_SRB_PORT**	
Comment	NASEMU PTC: Port for Sending/Receiving data on SRBs (interface to NR PTC)	
out	NR_SRB_COMMON_IND	
in	NR_SRB_COMMON_REQ	

D.4 NR_CommonDefs

D.4.1 Common_Types

Common_Types: Basic Type Definitions

TTCN-3 Basic Types		
NR_HarqProcessId_Type	integer	HARQ process id; NOTE: there seems to be no need for any value restriction
NR_AbsoluteCellPower_Type	integer (-150..0)	absolute cell power (dBm)

NR_RRC_MSG_Request_Type

TTCN-3 Union Type		
Name	**NR_RRC_MSG_Request_Type**	
Comment	DL RRC PDU on CCCH or DCCH	
Ccch	DL_CCCH_Message	
Dcch	DL_DCCH_Message	

NR_RRC_MSG_Indication_Type

TTCN-3 Union Type		
Name	**NR_RRC_MSG_Indication_Type**	
Comment	UL RRC PDU on CCCH or DCCH	
Ccch	UL_CCCH_Message	
Ccch1	UL_CCCH1_Message	
Dcch	UL_DCCH_Message	

NR_HarqProcessList_Type

TTCN-3 Record of Type	
Name	**NR_HarqProcessList_Type**
Comment	list of HARQ processes: each element shall be unique; NOTE: there seems to be no need for any length restriction
record of NR_HarqProcessId_Type	

D.4.2 RRC_Nested_Types

RRC_Nested_Types: Basic Type Definitions

TTCN-3 Basic Types		
NR_PrioritizedBitRate_Type	LogicalChannelConfig.ul_SpecificParameters.prioritisedBitRate	
NR_SiPeriodicity_Type	SchedulingInfo.si_Periodicity	
NR_SiWindowLength_Type	SI_SchedulingInfo.si_WindowLength	

D.4.3 ASP_CommonPart

Definition of ASP common parts for REQ-, CNF- and IND-ASPs

D.4.3.1 ASP_CommonPart_Definitions

D.4.3.1.1 Routing_Info

!!!! NR-NOTE: tsc_MaxRB as defined in EUTRA should not be needed as being used only to limit RadioBearerList_Type, SecurityActTimeList_Type and PdcpCountInfoList_Type and there seems to be no reason for any upper limit for these types !!!!

NR_RadioBearerId_Type

TTCN-3 Union Type		
Name	**NR_RadioBearerId_Type**	
Comment		
Srb	SRB_Identity_Type	
Drb	DRB_Identity	

NR_RoutingInfo_Type

TTCN-3 Union Type		
Name	**NR_RoutingInfo_Type**	
Comment		
None	Null_Type	
RadioBearerId	NR_RadioBearerId_Type	routing of signalling and user plane data when SDAP is not configured at the SS for the DRB or it is configured in transparent mode
QosFlow	QosFlow_Identification_Type	routing of user plane data with SDAP being configured in non-transparent mode at the SS

D.4.3.2 REQ_ASP_CommonPart

NR_ReqAspCommonPart_Type

TTCN-3 Record Type			
Name	**NR_ReqAspCommonPart_Type**		
Comment			
CellId	NR_CellId_Type		
RoutingInfo	NR_RoutingInfo_Type		
RlcBearerRouting	RlcBearerRouting_Type		
TimingInfo	TimingInfo_Type		
ControlInfo	ReqAspControlInfo_Type		

D.4.3.3 CNF_ASP_CommonPart

NR_CnfAspCommonPart_Type

TTCN-3 Record Type			
Name	**NR_CnfAspCommonPart_Type**		
Comment			
CellId	NR_CellId_Type		
RoutingInfo	NR_RoutingInfo_Type		
TimingInfo	TimingInfo_Type		
Result	ConfirmationResult_Type		

D.4.3.4 IND_ASP_CommonPart

NR_IndAspCommonPart_Type

TTCN-3 Record Type			
Name	**NR_IndAspCommonPart_Type**		
Comment			
CellId	NR_CellId_Type		
RoutingInfo	NR_RoutingInfo_Type		
RlcBearerRouting	RlcBearerRouting_Type		
TimingInfo	TimingInfo_Type		
Status	IndicationStatus_Type		

D.5 IP_ASP_TypeDefs

General Notes:
NOTE 1:
In general the handling of IP data shall be independent from the RAT being used on lower layers.
NOTE 2:
It shall be possible for SS implementation to reuse existing IP stack implementations in the system adaptor;
therefore the well-known concept of socket programming shall be supported
(regardless of whether those are used in the system adaptor implementation or not)
NOTE 3:
Since in general at the network side there are several different IP addresses the SS needs to simulate more than one IP address;
that can be based on a concept of multiple virtual network adaptors
NOTE 4:
There is no easy way to control the routing of IP data for an IP connection from above the IP stack
i.e. there are no parameters at the socket interface to determine e.g. cell id and DRB id
=> another independent logical entity (DRB-MUX) is needed below the IP stack which is responsible to control the routing of IP packets from/to DRBs in different cells of different RATs

Reference:
An introduction to socket programming can be found in
UNIX Network Programming Volume 1, Third Edition: The Sockets Networking API
by W. Richard Stevens, Bill Fenner, Andrew M. Rudoff

D.5.1 IP_Common

IP_Common: Basic Type Definitions

TTCN-3 Basic Types		
PortNumber_Type	UInt16_Type	

IPv4_AddrInfo_Type

TTCN-3 Record Type			
Name	**IPv4_AddrInfo_Type**		
Comment	IPv4 specific info of the socket addr (AF_INET)		
Addr	charstring		IP Address as string (IP v4 dot notation) to be converted to 32-bit unsigned integer

IPv6_AddrInfo_Type

TTCN-3 Record Type			
Name	**IPv6_AddrInfo_Type**		
Comment	IPv6 specific info of the socket addr (AF_INET6); NOTE: sin6_flowinfo can be ignored and set to 0		
Addr	charstring		to be converted to sin6_addr
ScopeId	UInt32_Type	opt	sin6_scope_id in general an IPv6 address is like "fe80::1%eth0" with eth0 being the network adaptor mapped to a scope id (Unix) assumption: for UE conformance testing it is not necessary to distinguish different scopes and the scope id in general can be determined by the system adaptor => omit

IP_AddrInfo_Type

TTCN-3 Union Type		
Name	**IP_AddrInfo_Type**	
Comment		
V4	IPv4_AddrInfo_Type	
V6	IPv6_AddrInfo_Type	

IP_Socket_Type

TTCN-3 Record Type			
Name	**IP_Socket_Type**		
Comment	Socket		
IpAddr	IP_AddrInfo_Type	opt	IP address
Port	PortNumber_Type	opt	port number

InternetProtocol_Type

TTCN-3 Enumerated Type	
Name	**InternetProtocol_Type**
Comment	
udp	
tcp	
icmp	
icmpv6	

IP_Connection_Type

TTCN-3 Record Type			
Name	**IP_Connection_Type**		
Comment	A connection between peer-to-peer entities is unambiguously defined by the protocol (udp/tcp/icmp/icmpv4), the local socket and the remote socket		
Protocol	InternetProtocol_Type		
Local	IP_Socket_Type	opt	
Remote	IP_Socket_Type	opt	

D.5.2 IP_Config

Configuration of the routing table managed be the system adaptor's DRB-MUX:
foreach IP connection it is specified which
- RAT
- Cell
- DRB

to be used.
The IP connection does not need to be fully specified depending on the role SS plays (e.g. in case of a server role the port number of the remote side is not known in advance).
The configurations of DRBs within the same cell shall be mutual exclusive.

With the configuration of the IP routing the DRB is configured either in IP or in raw mode:
either there are entries for the DRB in the routing table (IP mode) or not (raw mode)
=> It is not necessary to reconfigure this for the respective RAT.

Behaviour of the DRB-MUX in UL:
- SS gets data packet from the lower layers (e.g. PDCP SDU)
- SS checks whether there is any IP connection configured for this DRB (identified by {RAT, CellId, DrbId})
  if YES => packet is routed to the IP stack (IP mode)
  if NO => packet is handed over to the DRB port (raw mode)

NOTE 1:
If there is any entry for a DRB in the routing table this DRB is considered as being in IP mode and all UL IP packets are sent to the IP stack regardless of whether their addresses match the DRB's routing entries or not (in general 'unknown' packets are discarded by the IP stack)
=> a DRB can be either in IP or in raw mode
NOTE 2:
=> The SS does not need to evaluate any IP headers to decide whether data shall be routed to the DRB port or to the IP stack (i.e. there is no conflict with unstructured loopback data)

Behaviour of the DRB-MUX in DL:
- SS gets IP packets from the IP stack for an IP connection
- SS compares the IP connection (protocol, local/remote IP Addr) against the IP routing table and checks whether the corresponding protocol stack is configured at the lower layers =>
  1. no match:
     no entry in the routing table fits to the address in the IP packet
     or the corresponding RB is not configured
     => SS shall raise an error (DRBMUX_COMMON_IND_CNF.Error)
  2. one match:
     There is exactly one possibility to route the IP packet
     => SS shall send the packet to this RB
  3. several matches:
     There are more than one DRBs, cells or RATs to which the packet may be routed
     => SS shall raise an error if there is more than one DRB in one cell matching;
        if the DRBs belong to different cells or RATs SS shall send the data to all of them
        (whether this may occur in test cases is FFS)

General notes:
NOTE 1:
SS may use the information of the routing table to determine which network adaptors it needs to simulate (implementation dependent);
in general there will be more than one IP address at the network side.
NOTE 2:
In general the routing table is a simplified DL TFT implementation
NOTE 3:
When the routing table is empty all DRBs are in raw mode; this shall be the initial condition at the DRB-MUX;
=> for L2 testing in general (and apart from the preamble) there is no need to use/configure the IP_PTC; the configuration of the RAT specific U-plane stacks is not affected

IP_DataMode_Type

TTCN-3 Enumerated Type	
Name	**IP_DataMode_Type**
Comment	
discard	
loopbackRTP	
loopbackRTCP	
IPsecTunnel	

IP_RoutingInfo_Type

TTCN-3 Record Type			
Name	**IP_RoutingInfo_Type**		
Comment			
IpInfo	IP_Connection_Type		IP connection tuple: protocol, local socket, remote socket depending on the role the SS plays the following information may be provided (informative; even less information can be sufficient): 1. TCP/UDP server - local IP addr -- provided - local port -- provided - remote IP addr -- omit - remote port -- omit 2. TCP/UDP client - local IP addr -- provided (to inform SS about the local IP addr for this service) - local port -- omit; for UDP a well-defined port may be defined (protocol dependent, e.g. DHCP) - remote IP addr -- provided - remote port -- provided 3. ICMP (in general ICMP may be mapped only to a single DRB) - local IP addr -- provided (to inform SS about the local IP addr for this service) - local port -- n/a (shall be set to omit) - remote IP addr -- omit - remote port -- n/a (shall be set to omit) NOTE: In case of broadcasts in UL the broadcast address shall match any local IP address; in DL for broadcast services typically no remote IP address is specified in the routing table
DRB	IP_DrbInfo_Type		
DataMode	IP_DataMode_Type	opt	present when IP packets matching this entry shall be discarded or be looped back to the UE as defined for RTP or RTCP

IP_RoutingTable_Type

TTCN-3 Record of Type	
Name	**IP_RoutingTable_Type**
Comment	NOTE: configurations of DRBs within the same cell shall be mutual exclusive
record of IP_RoutingInfo_Type	

D.5.3 IPsec_Config

IP_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_IPsec_SPI_Max	integer	4294967295	

IPsec_Config: Basic Type Definitions

TTCN-3 Basic Types		
IPsec_SPI_Type	integer (0..tsc_IPsec_SPI_Max)	security parameter index for IPsec; According to RFC 2406, SPI values from 0 to 255 are reserved

IPsec_IntegrityAlgorithm_Type

TTCN-3 Enumerated Type	
Name	**IPsec_IntegrityAlgorithm_Type**
Comment	
hmac_md5_96	
hmac_sha_1_96	

IPsec_CipheringAlgorithm_Type

TTCN-3 Enumerated Type	
Name	**IPsec_CipheringAlgorithm_Type**
Comment	
des_ede3_cbc	
aes_cbc	
nociph	no ciphering

IPsec_SecurityKeys_Type

TTCN-3 Record Type			
Name	**IPsec_SecurityKeys_Type**		
Comment	to install the security keys		
MD5_96Key	bitstring length (128)		
SHA_1_96Key	bitstring length (160)		
DES_EDE3_CBCKey	bitstring length (192)		
AES_CBCKey	bitstring length (128)		

IPsec_SecurityAssociation_Type

TTCN-3 Record Type			
Name	**IPsec_SecurityAssociation_Type**		
Comment	single security association (SA); for configuration of an SA at the SS all fields are mandatory; to release an SA the optional information is omitted		
SPI	IPsec_SPI_Type		
SrcAddress	charstring		
DestAddress	charstring		
SrcPort	UInt16_Type		
DestPort	UInt16_Type		
IntegrityAlgorithm	IPsec_IntegrityAlgorithm_Type	opt	mandatory to set-up an SA
CipheringAlgorithm	IPsec_CipheringAlgorithm_Type	opt	mandatory to set-up an SA

IPsec_SecurityAssociationList_Type

TTCN-3 Record of Type	
Name	**IPsec_SecurityAssociationList_Type**
Comment	
record of IPsec_SecurityAssociation_Type	

IPsec_Configure_Type

TTCN-3 Record Type			
Name	**IPsec_Configure_Type**		
Comment	add new security associations; existing SAs are not affected		
SA_List	IPsec_SecurityAssociationList_Type		
SecurityKeys	IPsec_SecurityKeys_Type		

IPsec_Release_Type

TTCN-3 Record Type			
Name	**IPsec_Release_Type**		
Comment	release security associations; NOTE: in context with multiple PDNs it cannot be ensured that all SPIs are unique; e.g. the UE may use the same SPI values in different PDNs in which case uniqueness cannot be achieved furthermore it depends on the system implementation how entries in the IPsec SAD and SPD are administrated => to release SAs the SS gets the same information as for configuration but without the security algorithms		
SA_List	IPsec_SecurityAssociationList_Type		

D.5.4 IP_SocketHandling

Handling of IP data and IP connections
NOTE 1:
In general IP connections are distinguished by the tuple {protocol, local socket, remote socket};
this information is used at the interface between TTCN and the system adaptor.
It is up the system adaptor implementation to associate the IP connection with the internal socket (file descriptor; implementation dependent)
NOTE 2:
In general the association of the IP connections to (internal) sockets and the routing table for the DRB mapping (as configured with IP_RoutingTable_Type) are independent from each other

D.5.4.1 Socket_Common

IP_SockOpt_Type

TTCN-3 Union Type		
Name	**IP_SockOpt_Type**	
Comment	socket options acc. to the setsockopt system call (i.e. for level=SOL_SOCKET in case of Berkeley socket API); NOTE: only options being relevant for a specific applications (upon a socket) are configured by TTCN other options (e.g. SO_REUSEADDR) are out of TTCN and therefore a matter of system adaptor implementation	
SO_BROADCAST	boolean	set to true when IP broadcast messages shall be allowed for a port; this is required e.g. in case of DHCP
IP_MTU_SIZE	integer	MTU size to be used for IP data; NOTEs: - Even though the MTU size is defined as socket option it shall be the same for all sockets of a given interface (i.e. at least within one PDN the MTU size shall be the same) - in general a PIXIT is used as constant value for all sockets

IP_SockOptList_Type

TTCN-3 Record of Type	
Name	**IP_SockOptList_Type**
Comment	
record of IP_SockOpt_Type	

IP_SocketError_Type

TTCN-3 Union Type		
Name	**IP_SocketError_Type**	
Comment	used to indicate errors related to sockets; the IP_Connection shall contain as much address information as available at the system adaptor	
InvalidAddress	Null_Type	TTCN error: e.g. invalid or incomplete address information
System	integer	system error caused by system call; the integer value may be used for validation but shall not be evaluated by TTCN

D.5.4.2 Socket_Datagram

Socket_Datagram: Basic Type Definitions

TTCN-3 Basic Types		
Datagram_Content_Type	octetstring	data as sent/received with sendto()/recvfrom() on UDP or ICMP socket; NOTE: For ICMP the data may depend on the socket options; in general it does not include the IP header and the checksum of the ICMP packet needs to be calculated/checked in TTCN

Datagram_DL_Type

TTCN-3 Record Type			
Name	**Datagram_DL_Type**		
Comment	datagram to be sent at a UDP or ICMP socket		
Buffer	Datagram_Content_Type		content of the IP packet

Datagram_UL_Type

TTCN-3 Record Type			
Name	**Datagram_UL_Type**		
Comment	datagram as received on a UDP or ICMP socket		
Buffer	Datagram_Content_Type		content of the IP packet
DrbInfo	IP_DrbInfo_Type	opt	"interface id" where the data comes from in case of broadcast or multicast packets: for the LTE test model this is the DRB on which the IP packet has been received; the information is necessary when the SS cannot resolve an IP address being assigned to that DRB. => when the SS provides a broadcast or multicast address as local address in the ConnectionId of the ASP, the SS shall provide the DRB information in this field When the ConnectionId of the ASP is fully specified and unique (unicast address at least for local address) the DrbId is ignored by TTCN

D.5.4.3 TCP_Socket

TCP primitives used on the IP port

TCP_Socket: Basic Type Definitions

TTCN-3 Basic Types		
TCP_Data_Type	octetstring	data as sent/received with send()/recv() on a TCP socket

InternetApplication_Type

TTCN-3 Enumerated Type	
Name	**InternetApplication_Type**
Comment	as TCP is stream oriented SS may need information about which criteria to be applied to get start/end of an application message
ims	
http	

TLS_CIPHER_Type

TTCN-3 Enumerated Type	
Name	**TLS_CIPHER_Type**
Comment	Cipher suite to be used for TLS
TLS_PSK_WITH_RC4_128_SHA	RFC 4279
TLS_PSK_WITH_3DES_EDE_CBC_SHA	RFC 4279
TLS_PSK_WITH_AES_128_CBC_SHA	RFC 4279
TLS_PSK_WITH_AES_256_CBC_SHA	RFC 4279
TLS_PSK_WITH_AES_128_CBC_SHA256	RFC 5487

PSK_BootstrappingInfo_Type

TTCN-3 Record Type			
Name	**PSK_BootstrappingInfo_Type**		
Comment	bootstrapping information as defined in 24.109		
BTid	charstring		
Ks_NAF	bitstring		

TLS_PSK_Info_Type

TTCN-3 Record Type			
Name	**TLS_PSK_Info_Type**		
Comment	configuration information for PSK TLS		
IdentityHint	charstring		
BootstrappingInfo	PSK_BootstrappingInfo_Type		

TLS_CipherSuiteInfo_Type

TTCN-3 Union Type			
Name	**TLS_CipherSuiteInfo_Type**		
Comment			
psk	TLS_PSK_Info_Type		

TLSPSKInfo_Type

TTCN-3 Record Type			
Name	**TLSPSKInfo_Type**		
Comment			
cipherSuite	TLS_CIPHER_Type		Cipher suite to be used
cipherSuiteInfo	TLS_CipherSuiteInfo_Type		parameters for the respective cipher suite

TLSCertificateInfo_Type

TTCN-3 Record Type			
Name	**TLSCertificateInfo_Type**		
Comment			
serverName	charstring		Use certificate stored in the SS matching given server name
cipherSuite	TLS_CIPHER_Type		

TLSConfig_Type

TTCN-3 Union Type		
Name	**TLSConfig_Type**	
Comment		
pskInfo	TLSPSKInfo_Type	Used in the case of PSK
certificateInfo	TLSCertificateInfo_Type	Used in the case of certificate based TLS

TCP_ConnectRequest_Type

TTCN-3 Record Type			
Name	**TCP_ConnectRequest_Type**		
Comment	TCP client: -> 'connect' system call		
SockOptList	IP_SockOptList_Type		when there are no options to configure the list is empty
Application	InternetApplication_Type		to specify start/end criteria for application messages

TCP_Listen_Type

TTCN-3 Record Type			
Name	**TCP_Listen_Type**		
Comment	TCP server: -> 'listen' system call		
SockOptList	IP_SockOptList_Type		when there are no options to configure the list is empty
Application	InternetApplication_Type		to specify start/end criteria for application messages
TLSConfig	TLSConfig_Type	opt	to support TLS for HTTP server implementation

TCP_CtrlRequest_Type

TTCN-3 Union Type		
Name	**TCP_CtrlRequest_Type**	
Comment		
ConnectReq	TCP_ConnectRequest_Type	request a 'connect' to a remote server system calls (informative) socket -- get file descriptor (setsockopt) -- normally not needed bind -- assign local IP addr (to cope with multiple IP addresses) and dedicated port number (if local port is given) connect -- connect to the client IP_Connection: protocol -- tcp local IP addr -- mandatory to distinguish different network adaptors local port -- omit (ephemeral port will be assigned by the system) or specific port to be used for this connection (e.g. to bind a given port number to the IMS client) remote IP addr -- mandatory remote port -- mandatory
Listen	TCP_Listen_Type	establish a server at the local (SS) side system calls (informative) socket -- get file descriptor (setsockopt) -- if needed bind -- assign local IP addr and port listen -- await incoming connection IP_Connection: protocol -- tcp local IP addr -- mandatory to distinguish different network adaptors local port -- mandatory remote IP add -- omit remote port -- omit
Close	Null_Type	close a connection system calls (informative): close IP_Connection: protocol -- tcp local IP addr -- mandatory local port -- mandatory remote IP addr -- mandatory for TCP connections, omit for TCP server remote port -- mandatory for TCP connections, omit for TCP server

TCP_DataRequest_Type

TTCN-3 Union Type		
Name	**TCP_DataRequest_Type**	
Comment		
Send	TCP_Data_Type	send data system calls (informative): send or write IP_Connection: protocol -- tcp local IP addr -- mandatory local port -- mandatory remote IP addr -- mandatory remote port -- mandatory

TCP_CtrlIndication_Type

TTCN-3 Union Type		
Name	**TCP_CtrlIndication_Type**	
Comment		
ConnectCnf	Null_Type	confirm a 'connect' to a remote server system calls (informative): getsockname -- get local port (ephemeral port assigned by the system) IP_Connection: protocol -- tcp local IP addr -- mandatory (as in corresponding TCP_ConnectRequest) local port -- mandatory (if there is more than one connection to the same server the local port is necessary to distinguish the connections) remote IP addr -- mandatory (as in corresponding TCP_ConnectRequest) remote port -- mandatory (as in corresponding TCP_ConnectRequest)
Accept	Null_Type	sent by the SS when it 'accepts' an incoming connection system calls (informative): accept IP_Connection: protocol -- tcp local IP addr -- mandatory (as in corresponding TCP_ListenRequest) local port -- mandatory (as in corresponding TCP_ListenRequest) remote IP addr -- mandatory (as gotten from 'accept') remote port -- mandatory (as gotten from 'accept')
Close	Null_Type	indicate 'close' by the remote side system calls (informative): indicated by recv or read IP_Connection: protocol -- tcp local IP addr -- mandatory local port -- mandatory remote IP addr -- mandatory remote port -- mandatory
CloseCnf	Null_Type	Confirmation for 'close' request; necessary since for TCP there are IP packets to release the connection system calls (informative): close IP_Connection: protocol -- tcp local IP addr -- mandatory local port -- mandatory remote IP addr -- mandatory for TCP connections, omit for TCP server remote port -- mandatory for TCP connections, omit for TCP server

TCP_DataIndication_Type

TTCN-3 Union Type		
Name	**TCP_DataIndication_Type**	
Comment		
Recv	TCP_Data_Type	receive data system calls (informative): recv or read IP_Connection: protocol -- tcp local IP addr -- mandatory local port -- mandatory remote IP addr -- mandatory remote port -- mandatory

D.5.4.4 UDP_Socket

UDP primitives used on the IP port
NOTE:
In principle a UDP socket may communicate with different remote entities;
therefore the system adaptor may associate the socket handle with the local socket only
(local IP address and local port)

UDP_SocketReq_Type

TTCN-3 Record Type			
Name	**UDP_SocketReq_Type**		
Comment	to establish a UDP server or to bind local port number		
SockOptList	IP_SockOptList_Type		e.g. to allow broadcast messages; when there are no options to configure the list is empty

UDP_CtrlRequest_Type

TTCN-3 Union Type		
Name	**UDP_CtrlRequest_Type**	
Comment		
SocketReq	UDP_SocketReq_Type	request the system adaptor to bind a socket to a local address; this is needed in general when the system adaptor acts as 1. UDP server 2. UDP client when it uses a well-known port rather than an ephemeral port (this is e.g. for DHCP) 3. UDP client when a local address needs to be bond (e.g. when there are several local addresses) system calls (informative): socket -- get file descriptor (setsockopt) -- needed e.g. to allow broad cast message bind -- assign local IP address (to cope with multiple IP addresses) and local port (in case of well-known local port) IP_Connection: protocol -- udp local IP addr -- mandatory (to distinguish multiple IP addresses) local port -- optional (mandatory in case of a UDP server) remote IP addr -- omit remote port -- omit
Close	Null_Type	release local socket system calls (informative): close IP_Connection: protocol -- udp local IP addr -- mandatory (to identify local socket) local port -- mandatory (to identify local socket) remote IP addr -- omit remote port -- omit

UDP_DataRequest_Type

TTCN-3 Union Type		
Name	**UDP_DataRequest_Type**	
Comment		
SendTo	Datagram_DL_Type	send data to (any) remote socket; NOTE: To simplify implementation of the system adaptor the local socket shall be bond in any case (using 'SocketReq') to specify the local IP address before sending data; (in general the sendto system call can be used without explicitly binding the socket before; in this case the port gets implicitly bond to an ephemeral port and the default IP address is used) system calls (informative): sendto IP_Connection: protocol -- udp local IP addr -- mandatory (to identify local socket) local port -- mandatory (to identify local socket) remote IP addr -- mandatory (to address remote socket) remote port -- mandatory (to address remote socket)

UDP_CtrlIndication_Type

TTCN-3 Union Type		
Name	**UDP_CtrlIndication_Type**	
Comment		
SocketCnf	Null_Type	confirm 'SocketReq' and tell TTCN about assignment of ephemeral port; system calls (informative): getsockname -- get local port (ephemeral port assigned by the system; not needed if local port is well-known) IP_Connection: protocol -- udp local IP addr -- mandatory local port -- mandatory (well-known or ephemeral port assigned by the system) remote IP addr -- omit remote port -- omit

UDP_DataIndication_Type

TTCN-3 Union Type		
Name	**UDP_DataIndication_Type**	
Comment		
RecvFrom	Datagram_UL_Type	receive data; system calls (informative): recvfrom -- get data and src addr IP_Connection: protocol -- udp local IP addr -- mandatory (see note) local port -- mandatory remote IP addr -- mandatory (as gotten from recvfrom) remote port -- mandatory (as gotten from recvfrom) NOTE: The UE may send a UDP packet as broadcast (IP Addr 255.255.255.255 - e.g. in case of DHCP) or multicast (e.g. ICMPv6) SS shall consider a broadcast address as matching every IP for UL and DL; the SS shall not replace the broadcast/multicast address by the local unicast address, but shall provide DRB information in RecvFrom; example: - SS gets DHCPDISCOVER with DEST_Addr=255.255.255.255 DEST_Port=67, SRC_Addr=0.0.0.0 SRC_Port=68 - TTCN gets DHCPDISCOVER with local Addr=(255.255.255.255 Port=67), remote Addr=(0.0.0.0 Port=68), DrbId=(LTE, cell1, DRB1) - TTCN sends DHCPOFFER with local Addr=(local IP Addr Port=67), remote Addr=(255.255.255.255 Port=68)

D.5.4.5 ICMP_Socket

ICMP primitives used on the IP port
NOTE:
the local side is identified by the protocol and in general by the local IP address

ICMP_SocketReq_Type

TTCN-3 Record Type			
Name	**ICMP_SocketReq_Type**		
Comment	to establish a raw socket to send/receive ICMP packets		
SockOptList	IP_SockOptList_Type		e.g. to set the IP_HDRINCL socket option (to include the IP header in the data buffer) when there are no options to configure the list is empty

ICMP_CtrlRequest_Type

TTCN-3 Union Type		
Name	**ICMP_CtrlRequest_Type**	
Comment		
SocketReq	ICMP_SocketReq_Type	request the system adaptor to open a raw socket (IPv4 or IPv6) system calls (informative): socket -- get file descriptor (IPPROTO_ICMP or IPPROTO_IPV6); (setsockopt) -- optional; to set socket options bind -- assign local IP address (to cope with multiple IP addresses) IP_Connection: protocol -- icmp or icmpv6 local IP addr -- mandatory (to distinguish multiple IP addresses) local port -- omit (not applicable for ICMP) remote IP addr -- omit remote port -- omit (not applicable for ICMP)
Close	Null_Type	release local socket system calls (informative): close IP_Connection: protocol -- icmp or icmpv6 local IP addr -- mandatory (to identify local socket) local port -- omit remote IP addr -- omit remote port -- omit

ICMP_DataRequest_Type

TTCN-3 Union Type		
Name	**ICMP_DataRequest_Type**	
Comment		
SendTo	Datagram_DL_Type	send datagram system calls (informative): sendto IP_Connection: protocol -- icmp or icmpv6 local IP addr -- mandatory (to identify local socket) local port -- omit remote IP addr -- mandatory remote port -- omit

ICMP_CtrlIndication_Type

TTCN-3 Union Type		
Name	**ICMP_CtrlIndication_Type**	
Comment		
SocketCnf	Null_Type	confirm 'SocketReq' system calls (informative): (SocketCnf is sent when all system calls for SocketReq have been successful) IP_Connection: protocol -- icmp or icmpv6 local IP addr -- mandatory local port -- omit remote IP addr -- omit remote port -- omit

ICMP_DataIndication_Type

TTCN-3 Union Type		
Name	**ICMP_DataIndication_Type**	
Comment		
RecvFrom	Datagram_UL_Type	receive datagram system calls (informative): recvfrom -- get data and src addr IP_Connection: protocol -- icmp or icmpv6 local IP addr -- mandatory (see note) local port -- omit remote IP addr -- mandatory (as gotten from recvfrom) remote port -- omit NOTE: As for UDP there may be multicast/broadcast packets. In this case - as for UDP - the SS shall provide the DRB information in RecvFrom.

D.5.4.6 Socket_Primitives

IP_CtrlRequest_Type

TTCN-3 Union Type		
Name	**IP_CtrlRequest_Type**	
Comment		
TCP	TCP_CtrlRequest_Type	
UDP	UDP_CtrlRequest_Type	
ICMP	ICMP_CtrlRequest_Type	

IP_DataRequest_Type

TTCN-3 Union Type		
Name	**IP_DataRequest_Type**	
Comment		
TCP	TCP_DataRequest_Type	
UDP	UDP_DataRequest_Type	
ICMP	ICMP_DataRequest_Type	

IP_CtrlIndication_Type

TTCN-3 Union Type		
Name	**IP_CtrlIndication_Type**	
Comment		
TCP	TCP_CtrlIndication_Type	
UDP	UDP_CtrlIndication_Type	
ICMP	ICMP_CtrlIndication_Type	
Error	IP_SocketError_Type	

IP_DataIndication_Type

TTCN-3 Union Type		
Name	**IP_DataIndication_Type**	
Comment		
TCP	TCP_DataIndication_Type	
UDP	UDP_DataIndication_Type	
ICMP	ICMP_DataIndication_Type	

D.5.5 System_Interface

DRBMUX_CONFIG_REQ

TTCN-3 Union Type		
Name	**DRBMUX_CONFIG_REQ**	
Comment	NOTE 1: There is just one primitive to configure the whole routing table. It is not foreseen to add, remove or manipulate single entries but the table is managed in TTCN and completely configured on any change; (otherwise it might get complicated to identify single entries) NOTE 2: the SS's routing table shall be empty at the beginning and can be cleared by an empty record (DRBMUX_CONFIG_REQ.RoutingInfo = {}) NOTE 3: In general a reconfiguration of the routing table during a test case would be necessary only if an ephemeral port is needed to distinguish different routing (e.g. when there are several TCP connections of the same service routed to different DRBs)	
RoutingInfo	IP_RoutingTable_Type	

DRBMUX_COMMON_IND_CNF

TTCN-3 Union Type		
Name	**DRBMUX_COMMON_IND_CNF**	
Comment		
Confirm	Null_Type	confirm DRBMUX_CONFIG_REQ
Error	Null_Type	indication of errors at the DRB-MUX: An Error shall be raised by the DRB-MUX e.g. in the following cases: - in DL when there are IP packets which cannot be routed to any DRB i.e. the IP packet does not match to any entry in the routing table or the corresponding RB is not configured - in DL when there are several DRBs possible for routing in the same cell

IPSEC_CONFIG_REQ

TTCN-3 Union Type		
Name	**IPSEC_CONFIG_REQ**	
Comment		
Configure	IPsec_Configure_Type	
Release	IPsec_Release_Type	

IPSEC_CONFIG_CNF

TTCN-3 Union Type		
Name	**IPSEC_CONFIG_CNF**	
Comment		
Confirm	Null_Type	confirm IPSEC_CONFIG_REQ
Error	Null_Type	to indicate invalid configuration of IPsec

IP_SOCKET_CTRL_REQ

TTCN-3 Record Type			
Name	**IP_SOCKET_CTRL_REQ**		
Comment			
ConnectionId	IP_Connection_Type		
Req	IP_CtrlRequest_Type		

IP_SOCKET_DATA_REQ

TTCN-3 Record Type			
Name	**IP_SOCKET_DATA_REQ**		
Comment			
ConnectionId	IP_Connection_Type		
Req	IP_DataRequest_Type		

IP_SOCKET_CTRL_IND

TTCN-3 Record Type			
Name	**IP_SOCKET_CTRL_IND**		
Comment			
ConnectionId	IP_Connection_Type		
Ind	IP_CtrlIndication_Type		

IP_SOCKET_DATA_IND

TTCN-3 Record Type			
Name	**IP_SOCKET_DATA_IND**		
Comment			
ConnectionId	IP_Connection_Type		
Ind	IP_DataIndication_Type		

IP_SOCKET_REQ

TTCN-3 Union Type		
Name	**IP_SOCKET_REQ**	
Comment		
CTRL	IP_SOCKET_CTRL_REQ	
DATA	IP_SOCKET_DATA_REQ	

IP_SOCKET_IND

TTCN-3 Union Type		
Name	**IP_SOCKET_IND**	
Comment		
CTRL	IP_SOCKET_CTRL_IND	
DATA	IP_SOCKET_DATA_IND	

IP_CONTROL_PORT

TTCN-3 Port Type		
Name	**IP_CONTROL_PORT**	
Comment		
out	DRBMUX_CONFIG_REQ	
in	DRBMUX_COMMON_IND_CNF	

IPSEC_CONTROL_PORT

TTCN-3 Port Type		
Name	**IPSEC_CONTROL_PORT**	
Comment		
out	IPSEC_CONFIG_REQ	
in	IPSEC_CONFIG_CNF	

IP_SOCKET_PORT

TTCN-3 Port Type		
Name	**IP_SOCKET_PORT**	
Comment		
out	IP_SOCKET_REQ	
in	IP_SOCKET_IND	

D.6 NR_PDCP_TypeDefs

D.6.1 NR_PDCP_Config_Parameters

Parameters defined in or related to NR ASN.1 type PDCP-Config

NR_PDCP_SN_Size_Type

TTCN-3 Enumerated Type	
Name	**NR_PDCP_SN_Size_Type**
Comment	PDCP Sequence Number
PDCP_SNLength12	TS 38.323 clause 6.2.2.1 and clause 6.2.2.2
PDCP_SNLength18	TS 38.323 clause 6.2.2.3

NR_PDCP_DRB_HeaderCompression_Type

TTCN-3 Union Type		
Name	**NR_PDCP_DRB_HeaderCompression_Type**	
Comment	place holder for header compression	
None	Null_Type	

NR_PDCP_DRB_Config_Parameters_Type

TTCN-3 Record Type			
Name	**NR_PDCP_DRB_Config_Parameters_Type**		
Comment	parameters corrsponding to NR ASN.1 PDCP-Config.drb; the following parameter are not included and may be added if needed: - integer DiscardTimer (timer value in milliseconds) - boolean StatusReportRequired - boolean OutOfOrderDelivery		
SN_SizeUL	NR_PDCP_SN_Size_Type		PDCP-Config.drb.pdcp-SN-SizeUL
SN_SizeDL	NR_PDCP_SN_Size_Type		PDCP-Config.drb.pdcp-SN-SizeDL
HeaderCompression	NR_PDCP_DRB_HeaderCompression_Type		PDCP-Config.drb.headerCompression
IntegrityProtectionEnabled	boolean		PDCP-Config.drb.integrityProtection

NR_PDCP_RB_Config_Parameters_Type

TTCN-3 Union Type		
Name	**NR_PDCP_RB_Config_Parameters_Type**	
Comment		
Srb	Null_Type	no SRB specific parameters in NR ASN.1 PDCP-Config
Drb	NR_PDCP_DRB_Config_Parameters_Type	DRB specific parameters corrsponding to NR ASN.1 PDCP-Config.drb

NR_PDCP_Config_Parameters_Type

TTCN-3 Record Type			
Name	**NR_PDCP_Config_Parameters_Type**		
Comment	parameters corrsponding to NR ASN.1 PDCP-Config: the following parameter are not included and may be added if needed: - integer TReorderingTimer (timer value in milliseconds)		
Rb	NR_PDCP_RB_Config_Parameters_Type		

D.6.2 NR_PDCP_Configuration

NR_PDCP_TransparentMode

TTCN-3 Record Type			
Name	**NR_PDCP_TransparentMode**		
Comment			
SN_Size	NR_PDCP_SN_Size_Type		

NR_PDCP_RbConfig_Type

TTCN-3 Union Type		
Name	**NR_PDCP_RbConfig_Type**	
Comment		
Params	NR_PDCP_Config_Parameters_Type	PDCP configuration parameters corresponding to UE configuration
TransparentMode	NR_PDCP_TransparentMode	PDCP configuration for transparent (test) mode: used for PDCP tests (TS 38.523-3, cl. 5.1.2.1): the SS does not apply ciphering, not apply integrity protection and does not maintain PDCP sequence numbers and state variables; ROHC is not not applied by the SS. Note: a reconfiguration of a RB from transparent mode to 'normal' mode is not foreseen (i.e. there is no mechanism to restore Ciphering, PDCP sequence numbers and state variables at the SS) (in UL PDCP PDUs are decoded depending on SN_Size)

NR_PDCP_RBTerminating_Type

TTCN-3 Record Type			
Name	**NR_PDCP_RBTerminating_Type**		
Comment	RB terminating PDCP configuration: the PDCP may be linked - to a local RLC bearer: RLC bearer is configured for the same cell - to the RLC bearer of some other cell group: LinkToOtherCellGroup is not "None" - the both (in case of split bearer): RLC bearer is configured for the same cell and LinkToOtherCellGroup is not "None"		
RbConfig	NR_PDCP_RbConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
LinkToOtherCellGroup	RlcBearerRouting_Type	opt	mandatory for initial configuration; omit means "keep as it is" None: no link to other cell group (normal case, non-split bearer) RAT/cellId: PDCP is linked to RLC bearer of another cell group (same or other RAT): split bearer or PDCP and RLC bearer being configured at different cells NOTE: applicable also for PDCP split bearer test cases when PDCP is in transparent mode => test case body may be implemented at one PTC

NR_PDCP_Proxy_Type

TTCN-3 Record Type			
Name	**NR_PDCP_Proxy_Type**		
Comment	proxy to route PDCP data between terminating PDCP entity and RLC bearer of another cell (group)		
LinkToOtherNode	RlcBearerRouting_Type		RAT/cellId to address the radio bearer terminating node (PDCP) (None is not applicable)

NR_PDCP_Configuration_Type

TTCN-3 Union Type		
Name	**NR_PDCP_Configuration_Type**	
Comment		
None	Null_Type	for SRB0 no PDCP is configured; furthermore the PDCP may not be configured e.g. for DRBs tested in RLC or MAC test cases
RBTerminating	NR_PDCP_RBTerminating_Type	PDCP entity at the terminating node: handling of PDCP protocol for the given bearer (normal or split beaerer)
Proxy	NR_PDCP_Proxy_Type	proxy to be configured above RLC instead of a normal PDCP entity when the RLC bearer is not in the same cell (group) as the terminating PDCP entity

D.6.3 NR_PDCP_DrbDefs

NR_PDCP_DrbDefs: Basic Type Definitions

TTCN-3 Basic Types		
NR_PDCP_SDU_Type	octetstring	
NR_PDCP_CtrlPduType_Type	B3_Type	PDU type according to TS 38.323 clause 6.3.8: 000 PDCP status report 001 Interspersed ROHC feedback 010-111 Reserved

NR_PDCP_SDUList_Type

TTCN-3 Record of Type	
Name	**NR_PDCP_SDUList_Type**
Comment	
record of NR_PDCP_SDU_Type	

NR_PDCP_DataPduSN12Bits_Type

TTCN-3 Record Type			
Name	**NR_PDCP_DataPduSN12Bits_Type**		
Comment	Data PDU for DRBs with 12 bits PDCP SN (TS 38.323, clause 6.2.2.2)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Reserved	B3_Type		3 bits reserved
SequenceNumber	B12_Type		12 bits sequence number
SDU	NR_PDCP_SDU_Type		content (octetstring)
MAC_I	B32_Type	opt	message authentication code according to TS 38.323, clause 6.3.4; MAC-I field is present only when the DRB is configured with integrity protection; in this case it is up to TTCN to provide the valid MAC_I in DL and to check it in UL

NR_PDCP_DataPduSN18Bits_Type

TTCN-3 Record Type			
Name	**NR_PDCP_DataPduSN18Bits_Type**		
Comment	Data PDU for DRBs with 18 bits PDCP SN (TS 38.323, clause 6.2.2.3)		
D_C	B1_Type		1 bit, '1'B for Data PDU
Reserved	B5_Type		5 bits reserved
SequenceNumber	B18_Type		18 bits sequence number
SDU	NR_PDCP_SDU_Type		content (octetstring)
MAC_I	B32_Type	opt	message authentication code according to TS 38.323, clause 6.3.4; MAC-I field is present only when the DRB is configured with integrity protection; in this case it is up to TTCN to provide the valid MAC_I in DL and to check it in UL

NR_PDCP_CtrlPduStatus_Type

TTCN-3 Record Type			
Name	**NR_PDCP_CtrlPduStatus_Type**		
Comment	Control PDU for PDCP status report (TS 38.323, clause 6.2.3.1)		
D_C	B1_Type		1 bit, '0'B for Ctrl PDU
PDU_Type	NR_PDCP_CtrlPduType_Type		3 bits, '000'B for PDCP status report
Reserved	B4_Type		4 bits reserved
FirstMissingCount	B32_Type		32 bits, TS 38.323, clause 6.3.9 FMC
Bitmap	octetstring	opt	Bitmap according to TS 38.323, clause 6.3.10

NR_PDCP_CtrlPduRohcFeedback_Type

TTCN-3 Record Type			
Name	**NR_PDCP_CtrlPduRohcFeedback_Type**		
Comment	Control PDU for Interspersed ROHC feedback (TS 38.323, clause 6.2.3.2)		
D_C	B1_Type		1 bit, '0'B for Ctrl PDU
PDU_Type	NR_PDCP_CtrlPduType_Type		3 bits, '001'B for Interspersed ROHC feedback
Reserved	B4_Type		4 bits reserved
RohcFeedback	octetstring		ROHC packet that is not associated with a PDCP SDU

NR_PDCP_PDU_Type

TTCN-3 Union Type		
Name	**NR_PDCP_PDU_Type**	
Comment		
DataPduSN12Bits	NR_PDCP_DataPduSN12Bits_Type	
DataPduSN18Bits	NR_PDCP_DataPduSN18Bits_Type	
CtrlPduStatus	NR_PDCP_CtrlPduStatus_Type	
CtrlPduRohcFeedback	NR_PDCP_CtrlPduRohcFeedback_Type	

NR_PDCP_PDUList_Type

TTCN-3 Record of Type	
Name	**NR_PDCP_PDUList_Type**
Comment	
record of NR_PDCP_PDU_Type	

D.7 SDAP_TypeDefs

D.7.1 SDAP_Configuration

SDAP_Header_Type

TTCN-3 Enumerated Type	
Name	**SDAP_Header_Type**
Comment	
Present	
Absent	

QFI_List_Type

TTCN-3 Record of Type	
Name	**QFI_List_Type**
Comment	
record of integer	

SdapConfig_Type

TTCN-3 Record Type			
Name	**SdapConfig_Type**		
Comment			
Pdu_SessionId	integer		
Sdap_HeaderDL	SDAP_Header_Type	opt	mandatory for initial configuration; omit means "keep as it is" when set to 'Present', unless specifically triggered otherwise, the SS shall set the RDI and RQI fields to 0
Sdap_HeaderUL	SDAP_Header_Type	opt	mandatory for initial configuration; omit means "keep as it is"
MappedQoS_Flows	QFI_List_Type	opt	mandatory for initial configuration; omit means "keep as it is"

SdapConfigInfo_Type

TTCN-3 Union Type		
Name	**SdapConfigInfo_Type**	
Comment		
SdapConfig	SdapConfig_Type	SDAP configuration parameters for the DRB
TransparentMode	Null_Type	SDAP configuration for transparent (test) mode, used for SDAP tests: SS does not add any SDAP headers in DL and does not remove any SDAP headers in UL

SDAP_Configuration_Type

TTCN-3 Union Type		
Name	**SDAP_Configuration_Type**	
Comment		
None	Null_Type	
Config	SdapConfigInfo_Type	

D.7.2 SDAP_DrbDefs

SDAP_DrbDefs: Basic Type Definitions

TTCN-3 Basic Types		
SDAP_SDU_Type	octetstring	

SDAP_SDUList_Type

TTCN-3 Record of Type	
Name	**SDAP_SDUList_Type**
Comment	
record of SDAP_SDU_Type	

SDAP_DL_PduHeader_Type

TTCN-3 Record Type			
Name	**SDAP_DL_PduHeader_Type**		
Comment	TS 37.324 Figure 6.2.2.2-1		
RDI	B1_Type		TS 37.324 Figure 6.3.7: The RDI bit indicates whether QoS flow to DRB mapping rule should be updated 1 bit: '0'B No action '1'B To store QoS flow to DRB mapping rule
RQI	B1_Type		TS 37.324 clause 6.3.6: The RQI bit indicates whether NAS should be informed of the updated of SDF to QoS flow mapping rules 1 bit: '0'B No action '1'B To inform NAS that RQI bit is set to 1
QFI	B6_Type		TS 37.324 clause 6.3.4: The QFI field indicates the ID of the QoS flow to which the SDAP SDU belongs

SDAP_UL_PduHeader_Type

TTCN-3 Record Type			
Name	**SDAP_UL_PduHeader_Type**		
Comment	TS 37.324 Figure 6.2.2.3-1 or 6.2.3-1		
DC	B1_Type		TS 37.324 clause 6.3.3: The D/C bit indicates whether the SDAP PDU is an SDAP Data PDU or an SDAP Control PDU 1 bit: '0'B Control PDU '1'B Data PDU
R	B1_Type		TS 37.324 clause 6.3.5: Reserved. In this version of the specification reserved bits shall be set to 0. Reserved bits shall be ignored by the receiver
QFI	B6_Type		TS 37.324 clause 6.3.4: The QFI field indicates the ID of the QoS flow to which the SDAP SDU belongs

SDAP_PDU_DL_Type

TTCN-3 Record Type			
Name	**SDAP_PDU_DL_Type**		
Comment	TS 37.324 clause 6.2.2 Data PDU		
Header	SDAP_DL_PduHeader_Type	opt	present for DL Data PDU with SDAP header (clause 6.2.2.2), omitted for Data PDU without SDAP header (clause 6.2.2.1)
Data	SDAP_SDU_Type		

SDAP_PDU_UL_Type

TTCN-3 Record Type			
Name	**SDAP_PDU_UL_Type**		
Comment	TS 37.324 clause 6.2.2 Data PDU or clause 6.2.3 End-Marker Control PDU		
Header	SDAP_UL_PduHeader_Type	opt	present for: UL Data PDU in default DRB or UL Data PDU with SDAP header in a non-default DRB (clause 6.2.2.3) or End-Marker Control PDU (clause 6.2.3); omitted for UL Data PDU without SDAP header in a non-default DRB (clause 6.2.2.1)
Data	SDAP_SDU_Type	opt	present for UL Data PDU (clause 6.2.2.1 or 6.2.2.3), omitted for End-Marker Control PDU (clause 6.2.3)

SDAP_PDU_Type

TTCN-3 Union Type		
Name	**SDAP_PDU_Type**	
Comment	TS 37.324 clause 6.2.2 Data PDU or 6.2.3 End-Marker Control PDU	
DL	SDAP_PDU_DL_Type	Data PDU in DL
UL	SDAP_PDU_UL_Type	Data PDU in UL or End-Marker Control PDU

SDAP_PDUList_Type

TTCN-3 Record of Type	
Name	**SDAP_PDUList_Type**
Comment	
record of SDAP_PDU_Type	

D.9 CommonDefs

CommonDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_UInt16Max	integer	65535	
tsc_UInt32Max	integer	4294967295	

CommonDefs: Basic Type Definitions

TTCN-3 Basic Types		
B1_Type	bitstring length(1)	
B2_Type	bitstring length(2)	
B3_Type	bitstring length(3)	
B4_Type	bitstring length(4)	
B5_Type	bitstring length(5)	
B6_Type	bitstring length(6)	
B7_Type	bitstring length(7)	
B8_Type	bitstring length(8)	
B12_Type	bitstring length(12)	
B14_Type	bitstring length(14)	
B16_Type	bitstring length(16)	
B18_Type	bitstring length(18)	
B32_Type	bitstring length(32)	
B48_Type	bitstring length(48)	
B128_Type	bitstring length(128)	
B128_Key_Type	B128_Type	128 bit security key
O1_Type	octetstring length(1)	
Null_Type	boolean (true)	dummy type for 'typeless' fields in unions
UInt_Type	integer (0 .. infinity)	
UInt16_Type	integer (0 .. tsc_UInt16Max)	
UInt32_Type	integer (0 .. tsc_UInt32Max)	
IP_DrbId_Type	integer	DRB identity type common for all RATs: - for EUTRA it corresponds to the ASN.1 type DRB-Identity - for UTRAN it corresponds to the ASN.1 type RB-Identity and values are as defined in TS 34.123-3 Table 8.2.4.1 - for GERAN the NSAPI value (type record NSAPI) may be used NOTE: this is introduced to simplify the dependencies (i.e. to keep IP_ASP_TypeDefs independent from any RAT specific type definitions)
PdcpCountValue_Type	B32_Type	
RNTI_Value_Type	UInt16_Type	corresponds to NR ASN.1: RNTI-Value ::= INTEGER (0..65535)
RNTI_B16_Type	B16_Type	

B8_List_Type

TTCN-3 Record of Type	
Name	**B8_List_Type**
Comment	
record of B8_Type	

IntegerList_Type

TTCN-3 Record of Type	
Name	**IntegerList_Type**
Comment	
record of integer	

IndicationAndControlMode_Type

TTCN-3 Enumerated Type	
Name	**IndicationAndControlMode_Type**
Comment	
enable	
disable	

NR_CellId_Type

TTCN-3 Enumerated Type	
Name	**NR_CellId_Type**
Comment	
nr_Cell_NonSpecific	
nr_Cell1	
nr_Cell2	
nr_Cell3	
nr_Cell4	
nr_Cell6	
nr_Cell10	
nr_Cell11	
nr_Cell12	
nr_Cell13	
nr_Cell14	
nr_Cell23	
nr_Cell28	
nr_Cell29	
nr_Cell30	
nr_Cell31	

NR_CellIdList_Type

TTCN-3 Record of Type	
Name	**NR_CellIdList_Type**
Comment	NOTE: there seems to be no need for any length restriction
record of NR_CellId_Type	

EUTRA_CellId_Type

TTCN-3 Enumerated Type	
Name	**EUTRA_CellId_Type**
Comment	
eutra_Cell_NonSpecific	
eutra_Cell1	
eutra_Cell2	
eutra_Cell3	
eutra_Cell4	
eutra_Cell6	
eutra_Cell10	
eutra_Cell11	
eutra_Cell12	
eutra_Cell13	
eutra_Cell14	
eutra_Cell23	
eutra_Cell28	
eutra_Cell29	
eutra_Cell30	
eutra_Cell31	
eutra_CellA	
eutra_CellB	
eutra_CellC	
eutra_CellD	
eutra_CellE	
eutra_CellG	
eutra_CellH	
eutra_CellI	
eutra_CellJ	
eutra_CellK	
eutra_CellL	
eutra_CellM	

IP_EUTRA_DrbInfo_Type

TTCN-3 Record Type			
Name	**IP_EUTRA_DrbInfo_Type**		
Comment			
CellId	EUTRA_CellId_Type		data is routed to a specific cell regardless of whether the same DRB is configured in any other cell
DrbId	IP_DrbId_Type	opt	mandatory at the system interface

IP_UTRAN_GERAN_DrbInfo_Type

TTCN-3 Record Type			
Name	**IP_UTRAN_GERAN_DrbInfo_Type**		
Comment			
CellId	integer		
DrbId	IP_DrbId_Type	opt	mandatory at the system interface

IP_WLAN_DrbInfo_Type

TTCN-3 Record Type			
Name	**IP_WLAN_DrbInfo_Type**		
Comment			
CellId	integer		

IP_ePDG_IPsecTunnelInfo_Type

TTCN-3 Record Type			
Name	**IP_ePDG_IPsecTunnelInfo_Type**		
Comment			
PdnId	PDN_Index_Type		'index name' of PDN associated to the IPsec tunnel, e.g. for SS to distinguish routing of IP packets in case of more than one IPsec tunnel NOTE: In general only 'ePDG_XXX' values shall be used

QosFlow_Identification_Type

TTCN-3 Record Type			
Name	**QosFlow_Identification_Type**		
Comment			
PDU_SessionId	integer		TS 24.007 clause 11.2.3.1b
QFI	integer		TS 24.501 Table 11.2.3.1c.1

IP_NR_QosFlowInfo_Type

TTCN-3 Record Type			
Name	**IP_NR_QosFlowInfo_Type**		
Comment			
CellId	NR_CellId_Type		data is routed to a specific cell regardless of whether the same DRB is configured in any other cell
QosFlow	QosFlow_Identification_Type	opt	mandatory at the system interface

IP_EUTRA_QosFlowInfo_Type

TTCN-3 Record Type			
Name	**IP_EUTRA_QosFlowInfo_Type**		
Comment			
CellId	EUTRA_CellId_Type		data is routed to a specific cell regardless of whether the same DRB is configured in any other cell
QosFlow	QosFlow_Identification_Type	opt	mandatory at the system interface

IP_NR_DrbInfo_Type

TTCN-3 Record Type			
Name	**IP_NR_DrbInfo_Type**		
Comment			
CellId	NR_CellId_Type		
DrbId	IP_DrbId_Type	opt	mandatory at the system interface

IP_DrbInfo_Type

TTCN-3 Union Type		
Name	**IP_DrbInfo_Type**	
Comment		
Eutra	IP_EUTRA_DrbInfo_Type	
Eutra5GC	IP_EUTRA_QosFlowInfo_Type	used when SDAP is configured in non-transparent mode at the SS
Utran	IP_UTRAN_GERAN_DrbInfo_Type	
Geran	IP_UTRAN_GERAN_DrbInfo_Type	
Nr5GC	IP_NR_QosFlowInfo_Type	used when SDAP is configured in non-transparent mode at the SS
NrEPC	IP_NR_DrbInfo_Type	used when SDAP is configured in transparent mode at the SS, or when NR is connected to EPC (S1-U interface)
Wlan	IP_WLAN_DrbInfo_Type	
IPsecTunnel	IP_ePDG_IPsecTunnelInfo_Type	
FBBA	Null_Type	

PDN_Index_Type

TTCN-3 Enumerated Type	
Name	**PDN_Index_Type**
Comment	'index name' associated to a PDN: The major purpose is to associate a PDN specific set of IP addresses to the given PDN (e.g. UE addresses, P-CSCF address etc.); in general there are one or two PDNs configured at the same time and - from TTCN point of view - the IMS PDN is considered to be the first one; a second PDN may be configured in case of emergency call or e.g. for XCAP signalling; the 'internet PDN' (according to TS 36.508 clause 4.5.2) is considered as (optional) second PDN during initial registration and gets released after initial registration; in case of WLAN a separate group of index names is used to distinguish the different configuration of the emulated IP network
PDN_1	"default" PDN being kept connected to during a test case (in case of LTE in general the IMS PDN)
PDN_2	second PDN: during initial registration (TS 36.508 clause 4.5.2) for LTE and "multiple PDN' this is the internet PDN; after initial registration it is used if needed according to the test purpose (e.g. emergency call)
PDN_2a	used for the special case when the UE IP address of the second PDN changes in a test case
PDN_Internet	mainly used as alias for PDN2 during initial registration
ePDG_IMS1	WLAN: PDN for 'normal' IMS
ePDG_IMS2	WLAN: PDN for emergency IMS (in general)
ePDG_XCAP	WLAN: PDN for XCAP in case of XCAP server being part of 3GPP-network NOTE: In contrast to LTE for WLAN there is a different IP architecture to be consider by TTCN for XCAP and IMS emergency
ePDG_Internet	place-holder for WLAN-offload scenarios

D.10 CommonAspDefs

D.10.1 Cell_Configuration_Common

CellTimingInfo_Type

TTCN-3 Record Type			
Name	**CellTimingInfo_Type**		
Comment	Cell Timing		
TcOffset	integer (0..63)	opt	For NR according to TS 38.211 clause 4.1 Ts/Tc = 64 with Tc = 1/(480000 * 4096) and Ts = 1/(15000 * 2048) as for EUTRA; => for NR to specify granularity per Tc; for EUTRA to be set to 0 (and/or to be ignored by the SS)
Tcell	integer (0..307199)		frame duration Tf = 307200 * Ts = 10ms; System Time Unit Ts = 1/(15000 * 2048)
SfnOffset	integer (0..1023)		
HsfnOffset	integer (0..1023)		

D.10.2 MAC_Layer

ULGrant_Period_Type

TTCN-3 Union Type		
Name	**ULGrant_Period_Type**	
Comment		
OnlyOnce	Null_Type	grant is sent out only once; no period
Duration	integer (1..infinity)	duration of the grant period in number of sub-frames (1ms) for EUTRA and number of slots for NR

TransmissionRepetition_Type

TTCN-3 Union Type		
Name	**TransmissionRepetition_Type**	
Comment		
Continuous	Null_Type	
NumOfCycles	integer (1..infinity)	

PeriodicGrant_Type

TTCN-3 Record Type			
Name	**PeriodicGrant_Type**		
Comment			
Period	ULGrant_Period_Type		time period after which UL Grant need to be automatically transmitted or 'OnlyOnce'
NoOfRepetitions	TransmissionRepetition_Type		number of UL Grant repetitions to be automatically transmitted or continuous repetition

UL_GrantConfig_Type

TTCN-3 Union Type		
Name	**UL_GrantConfig_Type**	
Comment		
OnSR_Reception	Null_Type	SS transmits UL Grant as configured by DciInfoUL_Type at every reception of SR; to be used in non L2 Test
Periodic	PeriodicGrant_Type	SS transmits UL Grant as configured by DciInfoUL_Type periodically; to be used in L2 tests; MAC tests testing Grants might set the period as infinite and num grant as 1
PeriodicOnSR_Reception	PeriodicGrant_Type	SS transmits UL Grant as configured by DciInfoUL_Type periodically; the periodic grant transmission is started/restarted on reception of a SR from UE to be used in non L2 Test to enable large UL data transmission for lower category UEs (Cat<=1)
None	Null_Type	disable any grant transmission

RAR_RapIdCtrl_Type

TTCN-3 Union Type		
Name	**RAR_RapIdCtrl_Type**	
Comment		
Automatic	Null_Type	SS shall automatically use same RAPID as received from the UE
Unmatched	Null_Type	SS shall use RAPID being different from preamble sent by the UE; SS shall calculate this RAPID acc. to RAPID := (RAPID + 3..63) mod 64 if single RAR is transmitted in a MAC PDU then only 3 is added if multiple RAR's are transmitted in MAC PDU, then for first unmatched RAR 3 is added, second unmatched 4 is added, third unmatched 5 is added and so on

D.10.3 System_Indications

HARQ_Type

TTCN-3 Enumerated Type	
Name	**HARQ_Type**
Comment	ack represents HARQ ACK; nack represents HARQ NACK
ack	
nack	

D.10.4 ASP_CommonPart

Definition of ASP common parts for REQ-, CNF- and IND-ASPs

D.10.4.1 ASP_CommonPart_Definitions

D.10.4.1.1 Routing_Info

CommonAspDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_SRB0	integer	0	
tsc_SRB1	integer	1	
tsc_SRB2	integer	2	
tsc_SRB3	integer	3	
tsc_SRB4	integer	4	

Routing_Info: Basic Type Definitions

TTCN-3 Basic Types		
SRB_Identity_Type	integer (tsc_SRB0, tsc_SRB1, tsc_SRB2, tsc_SRB3, tsc_SRB4)	

RlcBearerRouting_Type

TTCN-3 Union Type		
Name	**RlcBearerRouting_Type**	
Comment	data routing e.g. in case of split bearer (split DRB or split SRB); applicable for multi-RAT Dual Connectivity (MR-DC) as well as single-RAT Dual Connectivity	
EUTRA	EUTRA_CellId_Type	
NR	NR_CellId_Type	
None	Null_Type	normal case: PDCP and RLC are configured at the same cell

D.10.4.1.2 Timing_Info

Timing_Info: Basic Type Definitions

TTCN-3 Basic Types		
SystemFrameNumber_Type	integer (0..1023)	
SubFrameNumber_Type	integer (0..9)	
HyperSystemFrameNumberInfo_Type	SystemFrameNumberInfo_Type	

SubFrameInfo_Type

TTCN-3 Union Type		
Name	**SubFrameInfo_Type**	
Comment		
Number	SubFrameNumber_Type	
Any	Null_Type	no specific sub-frame (valid for REQ ASPs only)

SystemFrameNumberInfo_Type

TTCN-3 Union Type		
Name	**SystemFrameNumberInfo_Type**	
Comment		
Number	SystemFrameNumber_Type	
Any	Null_Type	no specific frame number (valid for REQ ASPs only)

SlotOffset_Type

TTCN-3 Union Type		
Name	**SlotOffset_Type**	
Comment	slots per subframe according to TS 38.211 Table 4.3.2-1	
Numerology0	Null_Type	mu=0; only one slot per subframe
Numerology1	integer (0..1)	mu=1; 2 slots per subframe
Numerology2	integer (0..3)	mu=2; 4 slots per subframe
Numerology3	integer (0..7)	mu=3; 8 slots per subframe
Numerology4	integer (0..15)	mu=4; 16 slots per subframe

SlotTimingInfo_Type

TTCN-3 Union Type		
Name	**SlotTimingInfo_Type**	
Comment	EUTRA, NBIOT: REQ ASPs: TTCN shall set the SlotTimingInfo to "FirstSlot" for EUTRA, NBIOT addressing the whole subframe IND ASPs: TTCN shall ignore the SlotTimingInfo sent by the SS for EUTRA, NBIOT NR: REQ ASPs: Any:=true only if the slot number is not relevant, in which case the SS may choose the next available slot of the given subframe IND ASPs: Any:=true only if there is no slot information available for the particular kind of indication	
SlotOffset	SlotOffset_Type	to address a particular slot in a subframe
FirstSlot	Null_Type	to address the first slot independent from the numerology (REQ ASPs only) or for REQ ASPs in EUTRA and NBIOT
Any	Null_Type	for IND ASPs in EUTRA and NBIOT or if slot number is not relevant or not available

SubFrameTiming_Type

TTCN-3 Record Type			
Name	**SubFrameTiming_Type**		
Comment			
SFN	SystemFrameNumberInfo_Type		
Subframe	SubFrameInfo_Type		
HSFN	HyperSystemFrameNumberInfo_Type		
Slot	SlotTimingInfo_Type		

TimingInfo_Type

TTCN-3 Union Type		
Name	**TimingInfo_Type**	
Comment		
SubFrame	SubFrameTiming_Type	
Now	Null_Type	to be used in REQ ASPs when there is no 'activation time'
None	Null_Type	only to be used in SYSTEM_CTRL_CNF or NR_SYSTEM_CTRL_CNF but not for EnquireTiming

D.10.4.2 REQ_ASP_CommonPart

ReqAspControlInfo_Type

TTCN-3 Record Type			
Name	**ReqAspControlInfo_Type**		
Comment			
CnfFlag	boolean		true => SS shall send CNF: when the REQ is with no timing information (no activation time), SS shall send the confirmation when the configuration is done, i.e. when the test case may continue. Example: when there is a configuration followed by a send event it shall not be necessary to have a wait timer in between but the CNF triggers the send event. If there are other triggers e.g. like the UE sending a message, CnfFlag shall be set to false by the test case to avoid racing conditions with the CNF and the signalling message. When there is an activation time SS shall send the CNF after the configuration has been scheduled; that means SS shall not wait until the activation time has been expired.
FollowOnFlag	boolean		false => no further (related) information true: further related information will be sent to SS (semantics depending on respective ASP)

D.10.4.3 CNF_ASP_CommonPart

ConfirmationResult_Type

TTCN-3 Union Type		
Name	**ConfirmationResult_Type**	
Comment		
Success	Null_Type	
Error	integer	may contain SS specific error code; this will not be evaluated by TTCN

D.10.4.4 IND_ASP_CommonPart

IntegrityErrorIndication_Type

TTCN-3 Record Type			
Name	**IntegrityErrorIndication_Type**		
Comment			
Nas	boolean		NAS Integrity: set to true when received MAC does not match calculated MAC
Pdcp	boolean		PDCP Integrity: set to true when received MAC does not match calculated MAC

ErrorIndication_Type

TTCN-3 Record Type			
Name	**ErrorIndication_Type**		
Comment			
Integrity	IntegrityErrorIndication_Type		Integrity error: received MAC does not match calculated MAC
System	integer		any other error: may be SS specific error code; this will not be evaluated by TTCN; e.g. an error shall be raised when the UE requests retransmission of an RLC PDU

IndicationStatus_Type

TTCN-3 Union Type		
Name	**IndicationStatus_Type**	
Comment		
Ok	Null_Type	
Error	ErrorIndication_Type	

D.11 References to TTCN-3

References to TTCN-3		
NR_ASP_TypeDefs	NR_Defs/NR_ASP_TypeDefs.ttcn	Rev 24665
NR_ASP_DrbDefs	NR_Defs/NR_ASP_DrbDefs.ttcn	Rev 24710
NR_ASP_SrbDefs	NR_Defs/NR_ASP_SrbDefs.ttcn	Rev 24710
NR_CommonDefs	NR_Defs/NR_CommonDefs.ttcn	Rev 24694
IP_ASP_TypeDefs	IP_PTC/IP_ASP_TypeDefs.ttcn	Rev 23421
NR_PDCP_TypeDefs	Common4G5G/NR_PDCP_TypeDefs.ttcn	Rev 24694
SDAP_TypeDefs	Common4G5G/SDAP_TypeDefs.ttcn	Rev 23764
Common4G5G	Common4G5G/Common4G5G.ttcn	Rev 24711
CommonDefs	Common/CommonDefs.ttcn	Rev 24481
CommonAspDefs	Common/CommonAspDefs.ttcn	Rev 24694

Annex E (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2017-08	R5#76	R5-174121	-	-	-	Introduction of TS 38.523-3.	0.0.1
2018-03	R5#78	R5-180678	-	-	-	Initial Test Model aspects	0.1.0
2018-04	R5#2-5G-NR	R5-182072	-	-	-	EN-DC: Addition of Test Model aspects	0.2.0
2018-05	R5#79	R5-183237	-	-	-	EN-DC: Test Model updates	1.0.0
2018-06	RAN#80	RP-181212	-	-	-	put under revision control as v15.0.0 with small editorial changes	15.0.0
2018-09	RAN#81	R5-184333	0002	-	F	Updates to Annex B	15.1.0
2018-09	RAN#81	R5-184696	0003	-	F	EN-DC Test Model: Addition of further aspects	15.1.0
2018-09	RAN#81	R5-185172	0001	2	F	EN-DC: Test Model updates	15.1.0
2018-09	RAN#81	R5s180525 / RP-181987	0005	-	F	Add updated ASP definitions to 38.523-3 (prose), Annex D	15.1.0
2018-12	RAN#82	R5-186727	0011	-	F	Default NR TBS Tables for SIG test cases	15.2.0
2018-12	RAN#82	R5-186729	0013	-	F	EN-DC: Misc. Test Model updates	15.2.0
2018-12	RAN#82	R5-188105	0010	1	F	EN-DC test model handling of different types of bearers	15.2.0
2018-12	RAN#82	R5-188106	0012	1	F	SA Option2: Initial Test Model aspects	15.2.0
2018-12	RAN#82	R5s180636/ RP-182298	0014	-	F	Add updated ASP definitions to 38.523-3 (prose), Annex D	15.2.0
2019-03	RAN#83	R5-191204	0028	-	F	Common aspects: Test Model updates	15.3.0
2019-03	RAN#83	R5-191206	0030	-	F	EN-DC: Test Model updates	15.3.0
2019-03	RAN#83	R5-192812	0029	1	F	NR/5GC: Test Model updates	15.3.0
2019-03	RAN#83	R5-192858	0031	2	F	Common aspects: Updates to NR TBS handling	15.3.0
2019-03	RAN#83	R5s190019	0022	-	B	Addition of EN-DC RRC test case 8.2.3.1.1 in FR1	15.3.0
2019-03	RAN#83	R5s190024	0023	-	B	Addition of EN-DC RRC test case 8.2.5.2.1 in FR2 path	15.3.0
2019-03	RAN#83	R5s190027	0024	-	B	Addition of EN-DC RRC test case 8.2.5.4.1 in FR1	15.3.0
2019-03	RAN#83	R5s190029	0025	-	B	Addition of EN-DC RRC test case 8.2.5.2.1 in FR1	15.3.0
2019-03	RAN#83	R5s190033	0026	-	F	Rel-15 Dec'18 partial baseline upgrade for 5GS TTCN-3 Test Suites	15.3.0
2019-03	RAN#83	R5s190051	0027	-	F	Corrections for Initialisation of NR ENDC component	15.3.0
2019-03	RAN#83	R5s190060	0032	-	B	Addition of EN-DC RRC test case 8.2.3.5.1 in FR1 path	15.3.0
2019-03	RAN#83	R5s190062	0033	-	B	Addition of EN-DC RRC test case 8.2.3.4.1 in FR1 path	15.3.0
2019-03	RAN#83	R5s190064	0034	-	F	Common Corrections to ENDC testcases	15.3.0
2019-03	RAN#83	R5s190065	0035	-	F	correction to ENDC test case 10.2.1.2	15.3.0
2019-03	RAN#83	R5s190067	0037	-	B	Addition of EN-DC RRC test case 8.2.3.12.1 in FR1 path	15.3.0
2019-03	RAN#83	R5s190069	0038	-	F	Correction to ENDC RRC testcase 8.2.3.1.1	15.3.0
2019-03	RAN#83	R5s190086	0015	1	B	Addition of EN-DC NAS test case 10.2.1.2	15.3.0
2019-03	RAN#83	R5s190087	0016	1	B	Addition of EN-DC NAS test case 10.2.1.1	15.3.0
2019-03	RAN#83	R5s190088	0017	1	B	Addition of EN-DC RRC test case 8.2.5.4.1 in FR2 path	15.3.0
2019-03	RAN#83	R5s190124/ RP-190106	0054	-	F	Add new verified and e-mail agreed TTCN test cases in the TC lists in 38.523-3 (prose), Annex A	15.3.0
2019-06	RAN#84	R5-193993	0095	-	F	NR: TBS updates	15.4.0
2019-06	RAN#84	R5-193994	0096	-	F	NR: Default UL Grants	15.4.0
2019-06	RAN#84	R5-195240	0097	1	F	Intra-NR mobility in RRC_CONNECTED	15.4.0
2019-06	RAN#84	R5-195241	0098	1	F	NR/5GC: Test Model updates	15.4.0
2019-06	RAN#84	R5-195373	0103	1	F	Handling of signalled absolute threshold values for OTA	15.4.0
2019-06	RAN#84	R5s190150	0060	-	F	NR/5GC: Re-verification of 5GC NAS test case 9.1.6.1.1	15.4.0
2019-06	RAN#84	R5s190155	0061	-	B	Addition of EN-DC RRC test case 8.2.3.6.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190157	0062	-	B	Addition of EN-DC RRC test case 8.2.3.7.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190161	0063	-	B	Addition of EN-DC RRC test case 8.2.2.9.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190163	0064	-	B	Addition of EN-DC RLC test case 7.1.2.2.1 in FR1	15.4.0
2019-06	RAN#84	R5s190165	0065	-	B	Addition of EN-DC RLC test case 7.1.2.2.2 in FR1	15.4.0
2019-06	RAN#84	R5s190168	0066	-	F	Correction for EN-DC test cases	15.4.0
2019-06	RAN#84	R5s190169	0067	-	B	Addition of EN-DC RRC test case 8.2.3.8.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190177	0068	-	F	Correction of EN-DC RRC test case 8.2.5.1.1	15.4.0
2019-06	RAN#84	R5s190178	0069	-	F	Correction to EN-DC RRC test cases 8.2.3.1.1 and 8.2.3.12.1	15.4.0
2019-06	RAN#84	R5s190179	0070	-	B	Addition of EN-DC RRC test case 8.2.5.3.1 in FR1	15.4.0
2019-06	RAN#84	R5s190181	0071	-	B	Addition of EN-DC RRC test case 8.2.5.3.1 in FR2	15.4.0
2019-06	RAN#84	R5s190188	0072	-	F	Correction to EN-DC RRC test cases 8.2.2.4.1 and 8.2.2.5.1	15.4.0
2019-06	RAN#84	R5s190192	0073	-	B	Addition of EN-DC RRC test cases 8.2.1.1.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190194	0074	-	B	Addition of EN-DC RRC test case 8.2.1.1.1 in FR2 path	15.4.0
2019-06	RAN#84	R5s190196	0075	-	B	Addition of EN-DC RRC test case 8.2.2.9.1 in FR2 path	15.4.0
2019-06	RAN#84	R5s190198	0076	-	B	Addition of NR5GC RRC test case 8.1.3.1.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190200	0077	-	F	Correction to EN-DC RRC test cases 8.2.3.4.1 and 8.2.3.5.1	15.4.0
2019-06	RAN#84	R5s190205	0079	-	B	NR5GC : Addition of 5GMM test case 9.1.2.1	15.4.0
2019-06	RAN#84	R5s190207	0080	-	B	NR5GC : Addition of 5GMM test case 9.1.5.2.2	15.4.0
2019-06	RAN#84	R5s190209	0081	-	B	NR5GC FR1 : Addition of RRC test case 8.1.1.2.1	15.4.0
2019-06	RAN#84	R5s190214	0082	-	B	NR5GC FR1 : Addition of RRC test case 8.1.1.1.1	15.4.0
2019-06	RAN#84	R5s190216	0083	-	B	Addition of EN-DC RLC test case 7.1.2.3.1 in FR1	15.4.0
2019-06	RAN#84	R5s190219	0084	-	F	Correction to cas_NR_DRB_COMMON_REQ_DataPerSlot	15.4.0
2019-06	RAN#84	R5s190223	0086	-	B	NR5GC : Addition of 5GMM test case 9.1.5.2.4	15.4.0

2019-06	RAN#84	R5s190236	0094	-	B	Addition of EN-DC RLC test case 7.1.2.2.2 in FR2	15.4.0
2019-06	RAN#84	R5s190244	0100	-	F	ENDC : Correction for RRC test case 8.2.5.2.1	15.4.0
2019-06	RAN#84	R5s190245	0101	-	F	Correction for EN-DC test cases	15.4.0
2019-06	RAN#84	R5s190260	0040	1	B	Addition of EN-DC RRC test case 8.2.5.1.1 in FR2	15.4.0
2019-06	RAN#84	R5s190261	0041	1	F	Correction for Rel-15 EN-DC ESM test case 10.2.1.1.	15.4.0
2019-06	RAN#84	R5s190268	0046	1	F	Correction to f_NR_ENDC_PreambleOnEUTRA	15.4.0
2019-06	RAN#84	R5s190269	0047	1	F	Correction to f_EUTRA38_ENDC_GetDRBIdOfMCG	15.4.0
2019-06	RAN#84	R5s190270	0048	1	F	Correction to cs_NR_CellConfigPhysicalLayerUplink	15.4.0
2019-06	RAN#84	R5s190271	0049	1	F	Correction to f_NR_SendRRCReconfigurationContentsToEUTRA	15.4.0
2019-06	RAN#84	R5s190272	0051	1	B	Addition of EN-DC RRC test case 8.2.2.4.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190273	0052	1	B	Addition of EN-DC RRC test case 8.2.2.5.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190274	0053	1	F	Correction to EN-DC TC 10.2.1.1	15.4.0
2019-06	RAN#84	R5s190278	0057	1	B	Addition of EN-DC RRC test case 8.2.2.5.1 in FR2 path	15.4.0
2019-06	RAN#84	R5s190279	0059	1	B	Addition of EN-DC RRC test case 8.2.5.1.1 in FR1	15.4.0
2019-06	RAN#84	R5s190296	0043	1	B	Addition of EN-DC RRC test case 8.2.3.3.1 in FR1 path	15.4.0
2019-06	RAN#84	R5s190297	0044	1	B	Addition of NR5GC NAS test case 9.1.6.1.1	15.4.0
2019-06	RAN#84	R5s190300	0055	1	F	Correction to EN-DC RRC testcase 8.2.3.1.1	15.4.0
2019-06	RAN#84	R5s190301	0056	1	B	Addition of EN-DC RRC test case 8.2.2.4.1 in FR2 path	15.4.0
2019-06	RAN#84	R5s190303	0058	1	F	Correction to checking of SINR reporting in Measurement Report in 5G EN-DC RRC test cases	15.4.0
2019-06	RAN#84	R5s190311	0050	1	F	Correction to EN-DC RRC test case 8.2.3.5.1	15.4.0
2019-06	RAN#84	R5s190309 / RP-190903	0121	-	F	Add new verified and e-mail agreed TTCN test cases in the TC lists in 38.523-3 (prose), Annex A	15.4.0

History

Document history		
V15.0.0	July 2018	Publication
V15.1.0	October 2018	Publication
V15.2.0	April 2019	Publication
V15.3.0	May 2019	Publication
V15.4.0	July 2019	Publication