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Technical Specification

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Evolved Universal Terrestrial Radio Access (E-UTRA)
and Evolved Packet Core (EPC);
User Equipment (UE) conformance specification;
Part 3: Test suites
(3GPP TS 36.523-3 version 8.0.0 Release 8)

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Foreword

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

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Contents

Foreword

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

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Introduction

The present document is part 3 of a multi-part conformance test specification for the 3GPP evolved User Equipment (UE). The specification contains a TTCN-3 design frame work and the detailed test specifications in TTCN-3 for evolved UE at the UE-E-UTRAN radio interface.

- 3GPP TS 36.523-1 [1]: "User Equipment (UE) conformance specification; Part 1: Protocol conformance specification".
- 3GPP TS 36.523-2 [2]: "User Equipment (UE) conformance specification; Part 2: Implementation Conformance Statement (ICS) proforma specification".
- **3GPP TS 36.523-3: "Test Suites"** (the present document).

1 Scope

The present document specifies the protocol and signalling conformance testing in TTCN-3 for the 3GPP UE at the UE-E-UTRAN radio interface.

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 Abstract Test Suites designed in the document are based on the test cases specified in prose (3GPP TS 36.523-1 [1]). The applicability of the individual test cases is specified in the test ICS proforma specification (3GPP TS 36.523-2 [1]).

The present document is valid for UE implemented according to 3GPP Rel-8 upwards.

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 TS 36.523-1: "User Equipment (UE) conformance specification; Part 1: Protocol conformance specification".

[2] 3GPP TS 36.523-2: "User Equipment (UE) conformance specification; Part 2: Implementation Conformance Statement (ICS) proforma specification".

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

[4] 3GPP TS 36.509: "Terminal logical test interface; Special conformance testing functions".

[5] 3GPP TS 34.123-1: "User Equipment (UE) conformance specification; Part 1: Protocol conformance specification".

[6] 3GPP TS 34.123-2: "User Equipment (UE) conformance specification; Part 2: Implementation Conformance Statement (ICS) proforma specification".

[7] 3GPP TS 34.123-3: "User Equipment (UE) conformance specification; Part 3: Abstract Test Suite (ATS)".

[8] 3GPP TS 34.108: "Common test environments for User Equipment (UE) conformance testing".

[9] 3GPP TS 34.109: "Terminal logical test interface; Special conformance testing functions".

[10] 3GPP TS 51.010-1: "Mobile Station (MS) conformance specification; Part 1: Conformance Specification".

[11] 3GPP TS 51.010-2: "Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification".

[12] 3GPP TS 51.010-5: "Mobile Station (MS) conformance specification; Part 5: Inter-RAT (GERAN to UTRAN) Abstract Test Suite (ATS)".

[13] ETSI ES 201 873-1: "Methods for Testing and Specification (MTS); The Tree and Tabular Combined Notation version 3; Part 1: TTCN-3 Core Language".

[14] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); "UE Procedures in Idle Mode".

[15] 3GPP TS 36.306 "Evolved Universal Terrestrial Radio Access (E-UTRA); "UE Radio Access Capabilities".

[16] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); "Medium Access Control (MAC) protocol specification".

[17] 3GPP TS 36.322:"Evolved Universal Terrestrial Radio Access (E-UTRA); "Radio Link Control (RLC) protocol specification".

[18] 3GPP TS 36.323: "Evolved Universal Terrestrial Radio Access (E-UTRA); "Packet Data Convergence Protocol (PDCP) Specification".

[19] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

[20] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core Network Protocols; Stage 3".

[21] 3GPP TS 24.301: "Non-Access-Stratum (NAS) Protocol for Evolved Packet System (EPS); Stage 3".

[22] 3GPP TS 24.303: "Mobility Management based on DSMIPv6; User Equipment (UE) to network protocols; Stage 3".

[23] 3GPP TS 24.304: "Mobility management based on Mobile IPv4; User Equipment (UE) - foreign agent interface; Stage 3".

[24] 3GPP TS 33.401: "3GPP System Architecture Evolution (SAE); Security architecture".

[25] 3GPP TS 33.402: "3GPP System Architecture Evolution (SAE); Security aspects of non-3GPP accesses".

[26] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

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

[28] ETSI ES 201 873-5: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 5: TTCN-3 Runtime Interface (TRI)".

[29] ETSI ES 201 873-6: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 6: TTCN-3 Control Interface (TCI)".

[30] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".

[31] 3GPP TS 27.005: "Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE-DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)".

[32] 3GPP TS 27.007: "AT command set for 3G User Equipment (UE)".

[33] 3GPP TS 27.060: "Packet domain; Mobile Station (MS) supporting Packet Switched services".

[34] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [26] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [26] apply.

4 E-UTRAN/SAE system architecture and test models

4.1 Test system architecture

4.1.1 General system architecture

The general system architecture is shown in figure 4.1.1-1.

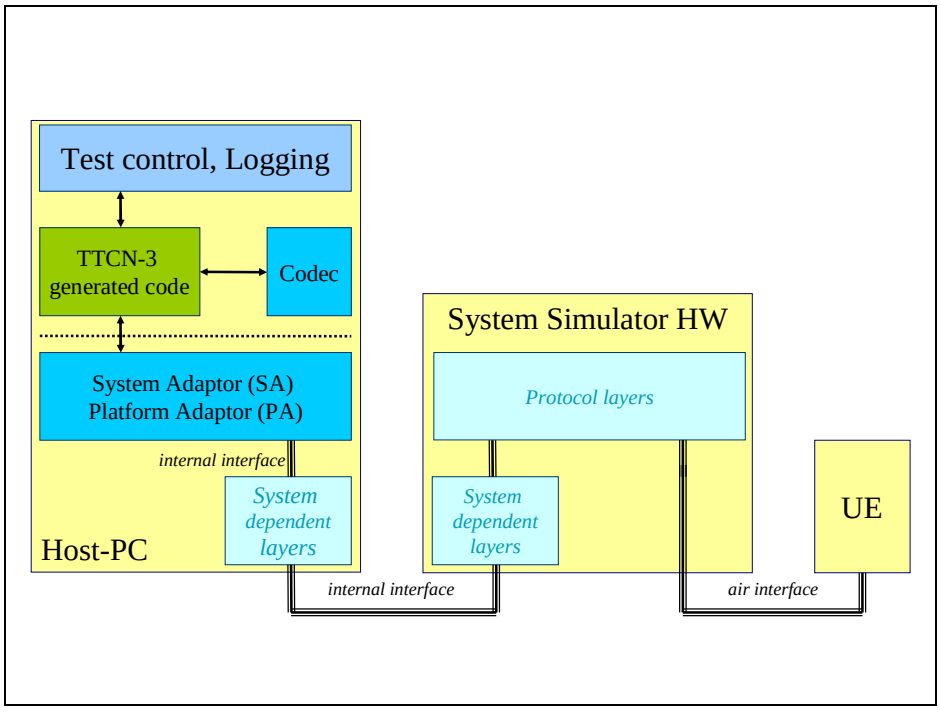

Figure 4.1.1-1: Architecture of system simulator

The scope of the present document is the TTCN-3 implementation of conformance tests. Specifications and definitions of the present document affect the codec and the system adaptor (SA). Test control and logging are out of scope as well as the interface between the TTCN-3 generated code and the system adaptor which can be either standardised TRI or proprietary.

The main assumptions regarding the system architecture are:

- TTCN-3 code runs on the host system only:
  - No TTCN-3 components are downloaded to system simulator HW.
  - Layer 2 tests (MAC, RLC) are controlled by appropriate configuration primitives in TTCN-3 but neither layer 2 nor parts of it are implemented in TTCN-3; the system simulator performs low layer procedure autonomously but all system simulator implementations shall result in the same test pattern at the air interface.
- Proprietary interfaces e.g. instead of the TRI are not considered in the test model.
- The timing considerations of the conformance tests shall be supported by appropriate timing information (e.g. system frame number) provided from/to the system simulator rather than by timing measurements in TTCN-3.

4.1.2 Component architecture

For E-UTRAN conformance tests each access technology (RAT) is hosted by a separate TTCN-3 parallel component (PTC):

- E-UTRAN.
- UTRAN.
- GERAN.
- Other technologies like 3GPP2 UTRAN.

The PTCs are controlled by the TTCN-3 master test component (MTC) which:

- is independent from the RAT;
- may host the upper tester for MMI and AT commands;
- creates, synchronises and terminates the PTCs;
- starts and terminates test cases.

Figure 4.1.2-1 shows this component architecture for a E-UTRAN and UTRAN scenario.

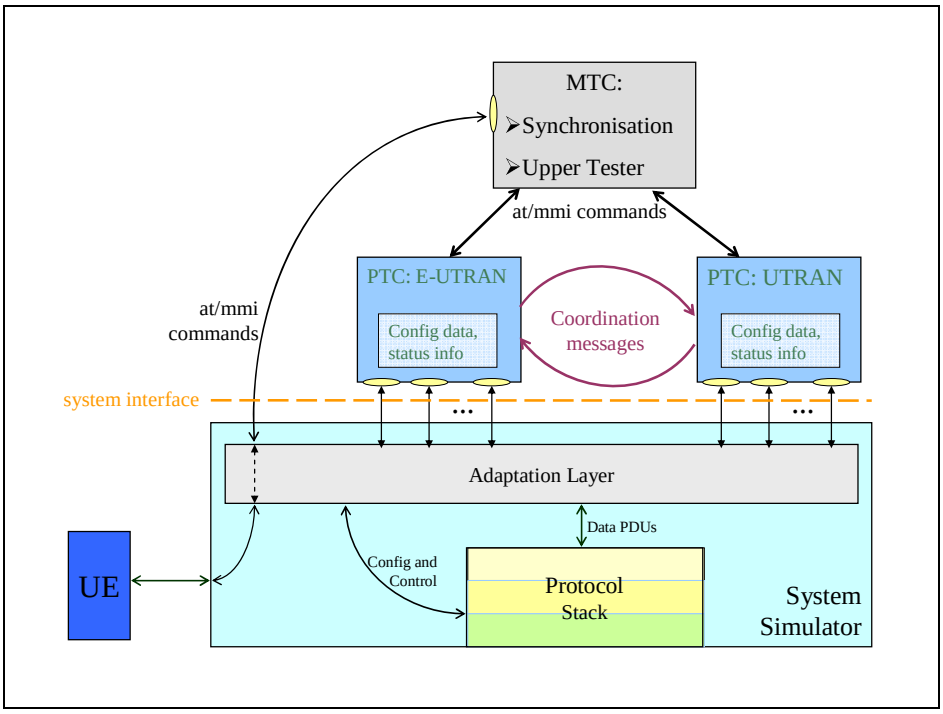

Figure 4.1.2-1:E-UTRAN-UTRAN component model

According to this model there are different interfaces to be considered:

MTC - PTC:

- common synchronisation of PTCs;
- upper tester primitives.

MTC - System Interface:

- upper tester primitives.

PTC - PTC:

- primitives containing information for IRAT handover.

PTC - System Interface:

- primitives containing peer-to-peer message;
- configuration primitives.

4.2 E-UTRAN test models

4.2.1 Layer 2 test models

When test loop mode is used for the Layer 2 tests the DRB ports at the SS side is referred to the raw DRB ones. At the SS side, DRBs are initially configured with default modes and parameters. For the purpose of L2-testing the DRBs may be reconfigured later on as indicated in the subsequent test models (see below).

4.2.1.1 MAC test model

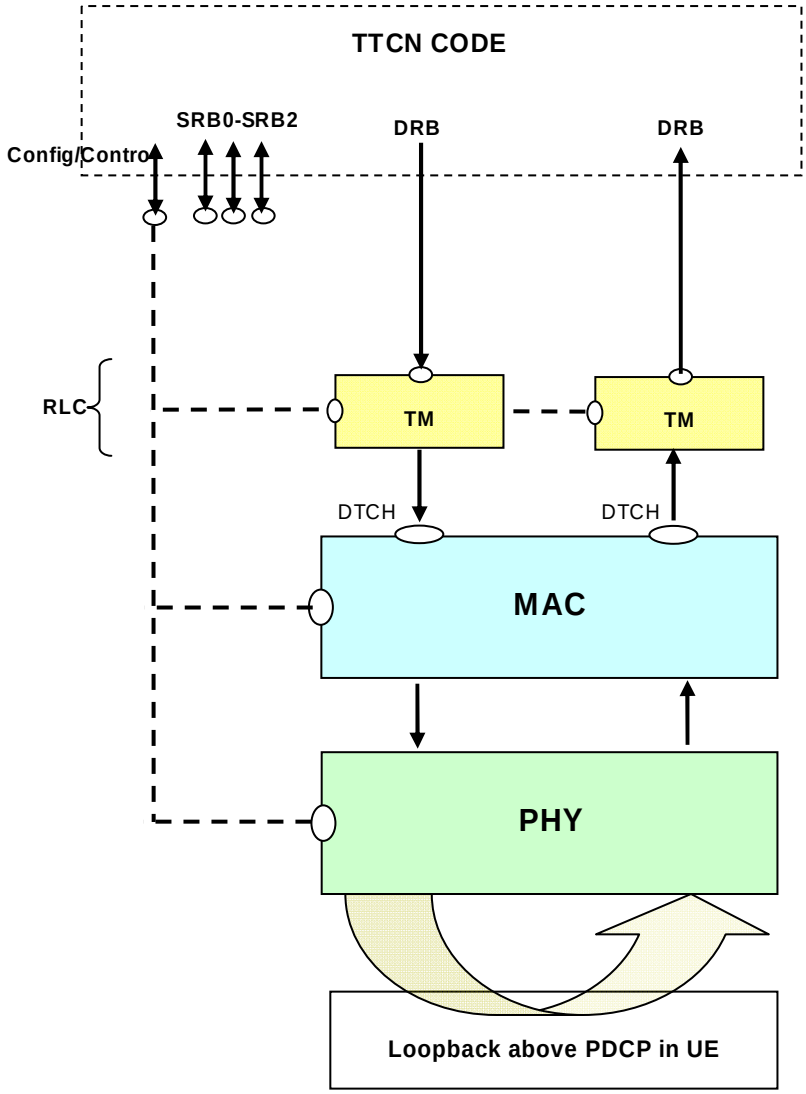

Figure 4.2.1.1-1: Test model for MAC testing

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled (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 is configured in the normal way. MAC is configured in a special mode, where it does not add any MAC headers in DL and not remove any MAC headers on UL directions respectively. In this case, the TTCN shall provide the final PDU, including padding. Except for this, the MAC layer shall perform all of its other functions.

The RLC is configured in transparent mode. Hence with this configuration PDU's out of SS RLC are same as the SDU's in it. There is no PDCP configured on SS Side. The ports are directly above RLC.

The PDU's exchanged between TTCN and SS, shall be the final MAC PDU's 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 MAC, RLC and PDCP layers. During testing of Multiple DRBs on UE side, it shall still be possible to configure only one DRB on SS side with configuration in the figure 4.2.1.1-1. Other DRBs will not be configured, to facilitate routing UL TBSs. Multiplexing/de-multiplexing of PDU's meant/from different DRB's shall be performed in TTCN.

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 reception of RACH preambles is reported by SS over port [FFS].

4.2.1.2 RLC test model

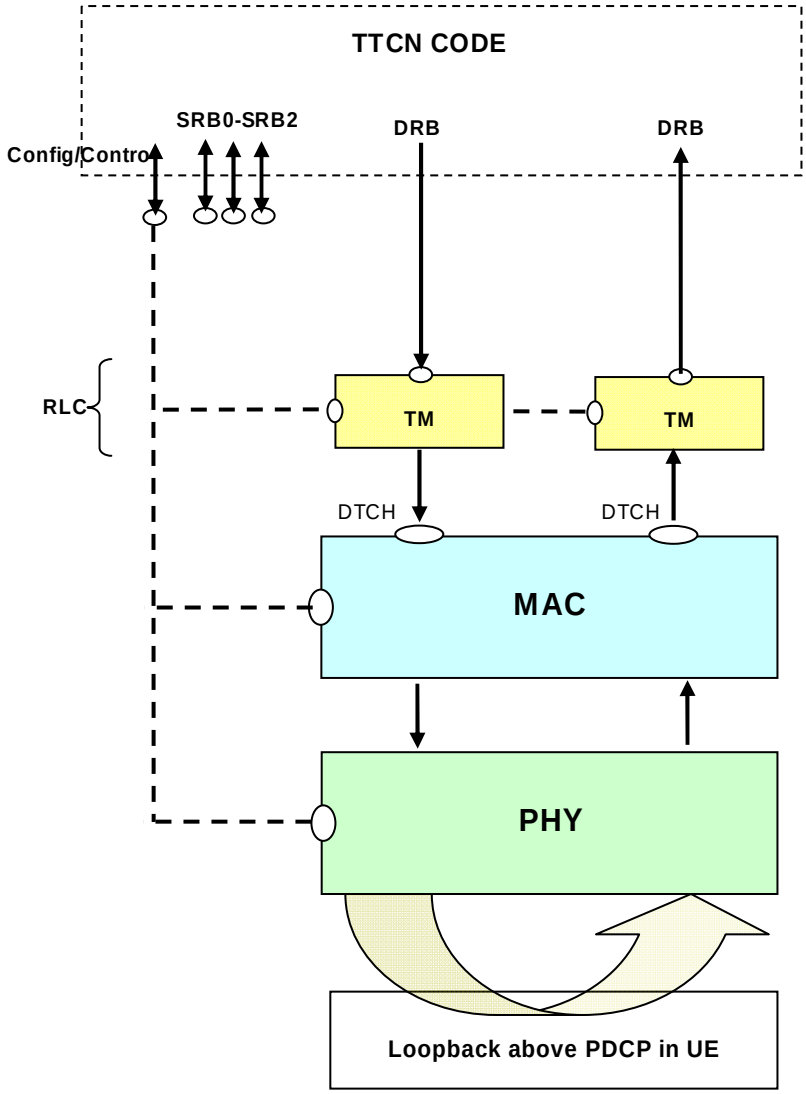

Figure 4.2.1.2.3-1: Test model for RLC AM/UM testing

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 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.

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

4.2.1.3 PDCP test model

4.2.1.3.1 PDCP ROHC test model

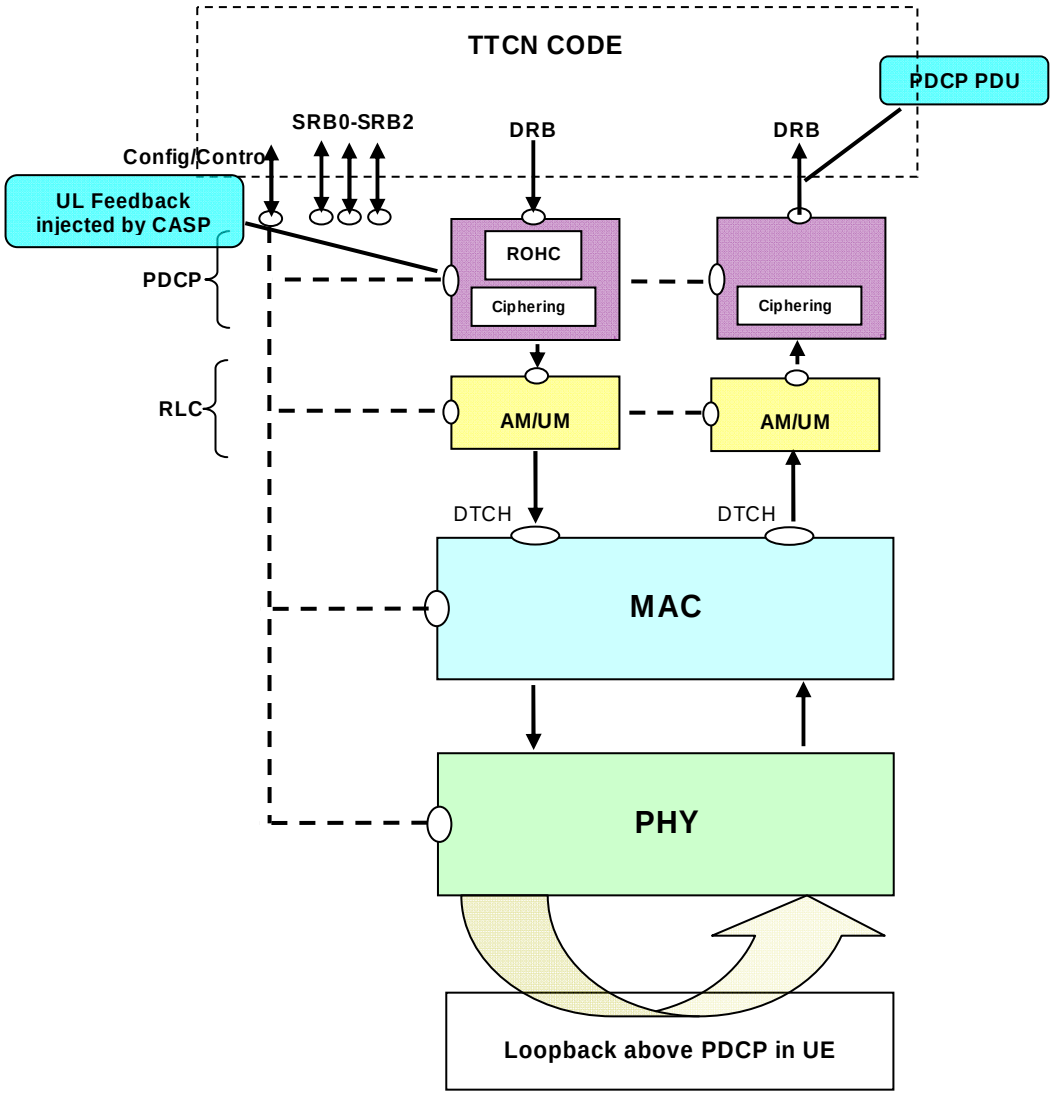

Figure 4.2.1.3.1-1: Test model for PDCP ROHC testing

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. On UE side Ciphering is enabled and ROHC is configured.

On the SS Side L1, MAC and RLC are configured in normal way. They shall perform all of their functions. The ports are above PDCP.

The PDCP is configured in special mode, with no header manipulation. Ciphering is configured in both directions. ROHC is configured in DL direction only. UL ROHC feedback can be injected by control ASP. It shall be possible to configure 'no header manipulation' mode independently in UL and DL directions. When configured in special mode, SS shall not add PDCP header (DL) and remove PDCP Header (UL). PDCP state variables shall be maintained by SS PDCP layer. It shall be possible for SS PDCP to update state variables based on the PDU's in both directions, even though headers are not added/removed. Also, it shall be possible to read or set the PDCP internal state variables, by control primitives.

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.

4.2.1.3.2 PDCP test model (Non ROHC)

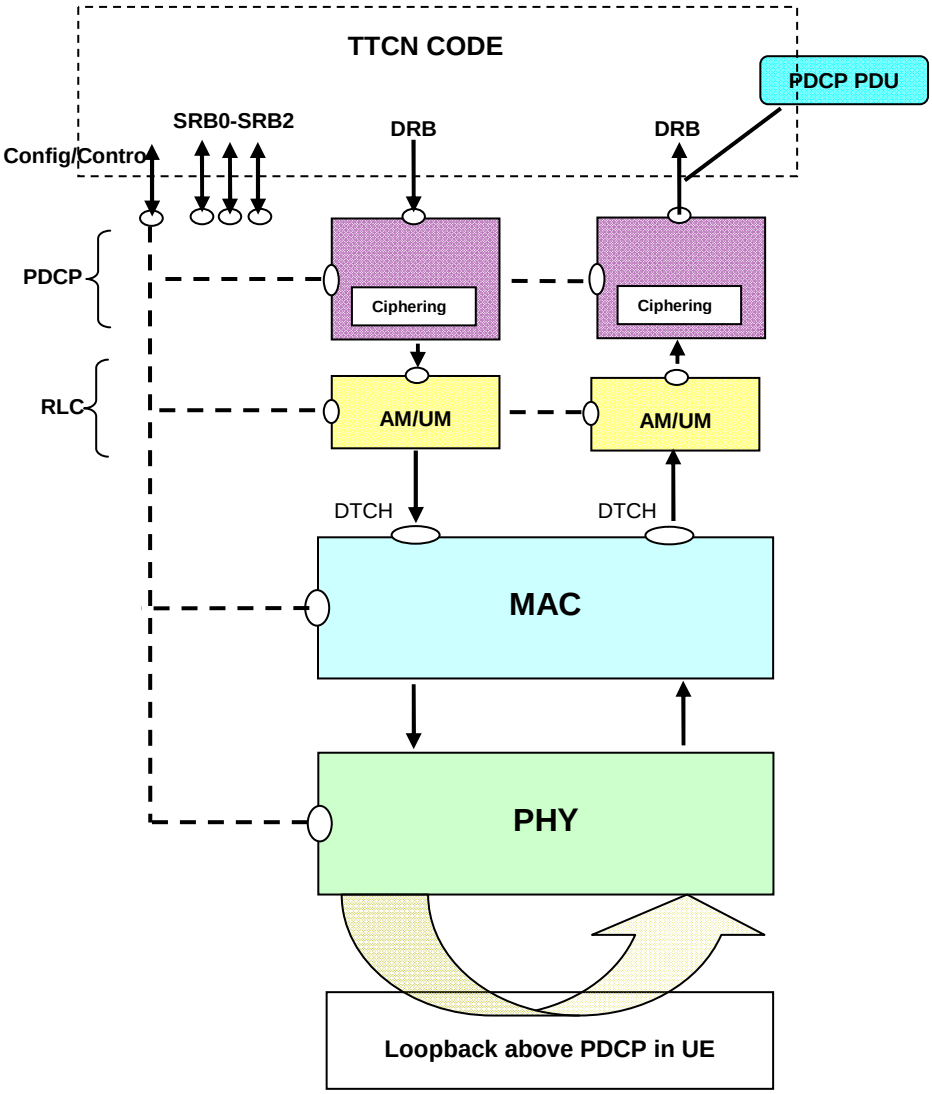

Figure 4.2.1.3.2-1: Test model for PDCP [Non ROHC] testing

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

On the SS Side L1, MAC and RLC are configured in normal way. They shall perform all of their functions. The ports are above PDCP.

The PDCP is configured in special mode, with no header manipulation. Ciphering is configured in both directions. ROHC is not configured. PDCP internal status variables can be read and set over control ASP. When configured in special mode, SS shall not add PDCP header(DL) and remove PDCP Header (UL). 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.

4.2.2 RRC test model

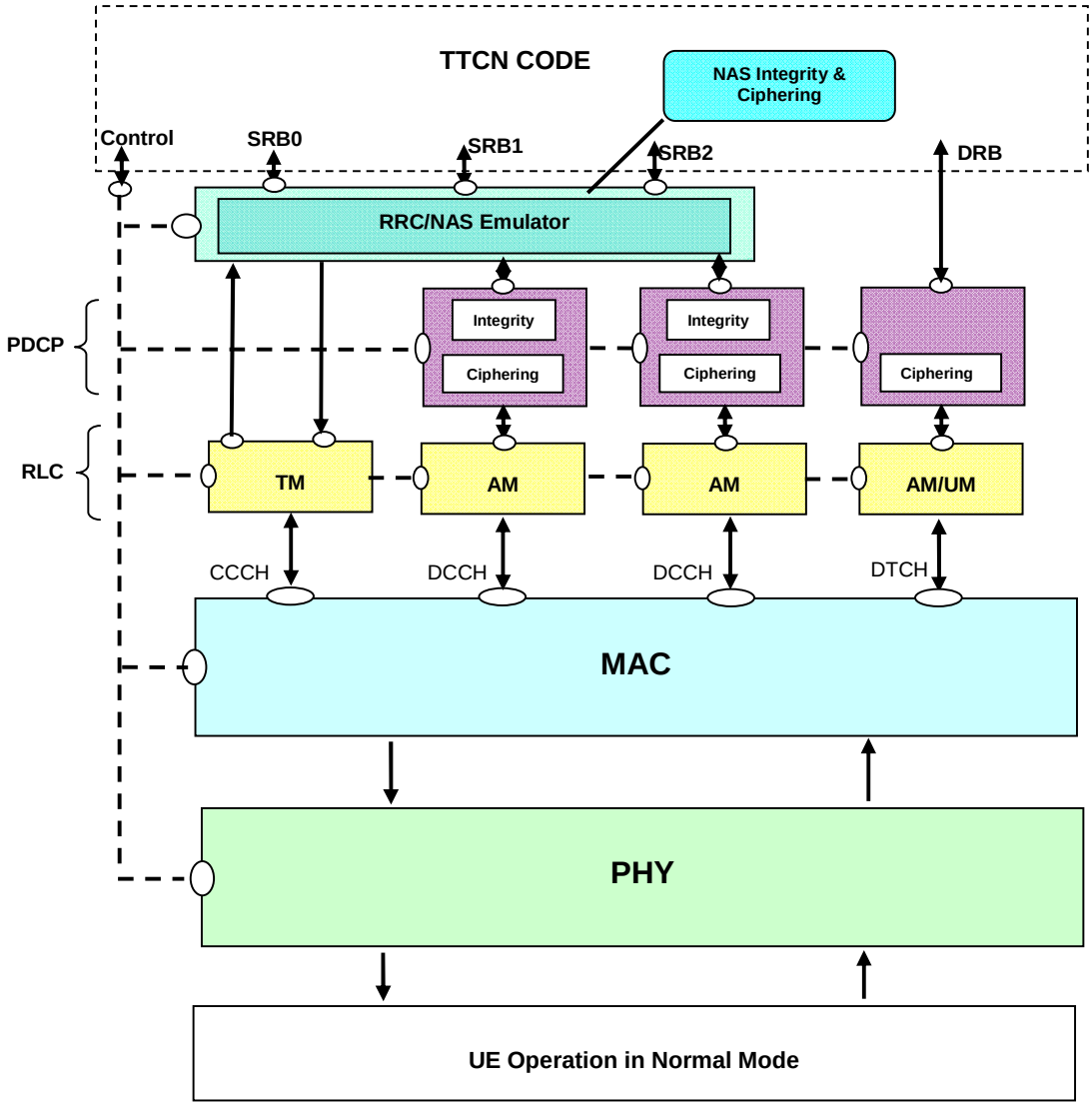

Figure 4.2.2-1: Test model for RRC testing

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

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

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.

4.2.3 DRB test model

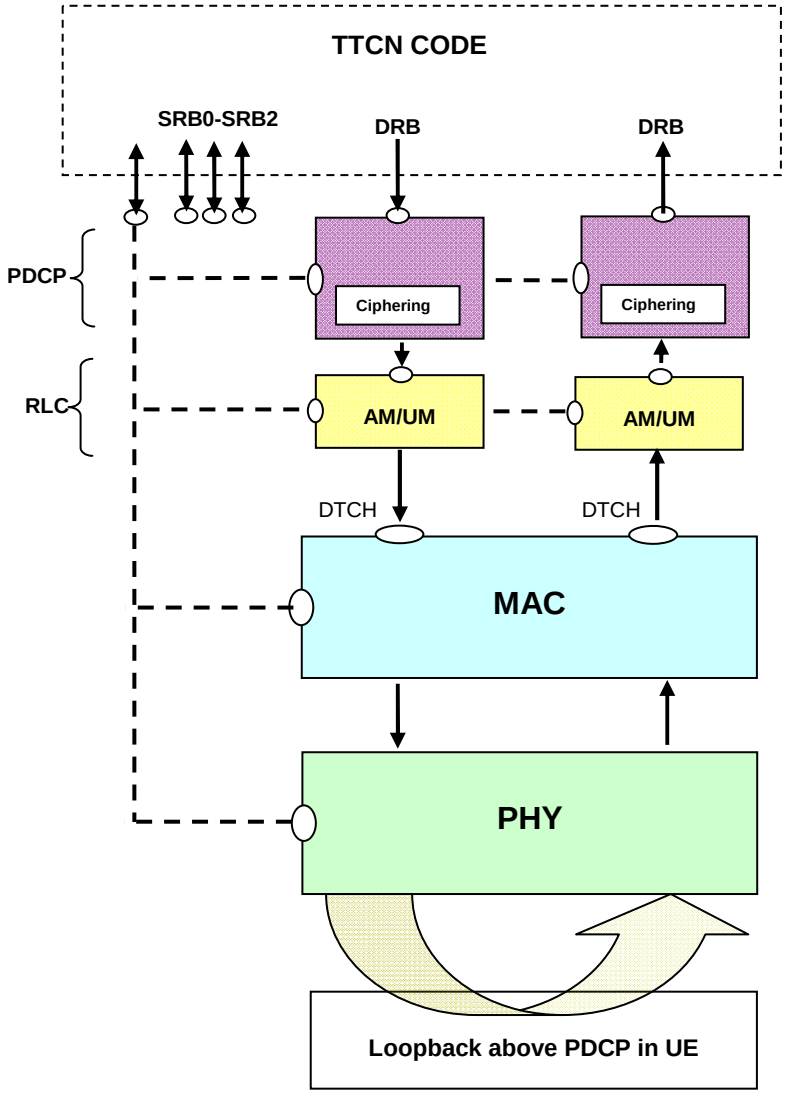

Figure 4.2.3-1: Test model for DRB testing

The UE is configured in Test Loop Mode, to loop back the user domain data above PDCP layer. Ciphering is optionally configured on UE side. In TTCN the DRB data is considered as raw data and there is no IP handling while the UE is in loopback mode.

On the SS Side L1, MAC, RLC and PDCP are configured in normal way. They shall perform all of their functions. The ports are above PDCP. When test loop mode is used for the DRB ports at the SS side is referred to the raw DRB ones.Ciphering is enabled and ROHC is not configured on SS Side.

SS shall send in DL all PDU's received from different RB's but with same timing control information in one MAC PDU and in one 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.

4.2.4 IP Test Model

Depending on different test scenarios user plane data can be distinguished in:

- Raw user data upon EUTRA PDCP (Raw mode);
- IP user data (IP mode).

The raw user data are applied for L2 or DRB tests, no IP protocols are involved. The UL user data is directly routed to the EUTRA_PTC.

The IP user data are applied when IP packets data are handled in TTCN. A DRB can have one or more Transport and Internet protocols configured.

Whether a DRB is in IP or in raw mode depends on the configuration of the routing table in the DBR-Mux. This is controlled by the IP_CTRL port and independent from the configuration of the IP connections (IP_SOCKET).

4.2.4.1 IP user data

To allow the usage of common protocol implementations at the system adaptor the related interfaces in TTCN-3 are based on the Sockets API.

There can be one or several sockets (server or client) for each DRB: TCP, UDP and ICMP.

Each socket can be clearly identified by the IPaddress, port number and the protocol (tcp|udp\icmp). It implies that a TCP socket can be either server or client.

It is assumed that:

- Different DRBs are not using the same sockets.
- The UE behaviours of a single IP-based protocol on a specific socket like DHCP can be included in conformance tests.
- Other protocols like ESP is not considered but can easily be introduced later, if necessary, by using the same socket approach.

The routing of IP packets from the IP stack to the DRBs in DL and from the DRBs either to the DRB port (E_DRB in case of EUTRA) or to the IP stack in UL is done by the DRB-Mux. This behaviour is controlled by the DRB-Mux's routing table.

The general architecture of the IP test model is shown in figure 4.2.4.1-1 (with a DHCP server as example for IP handling).

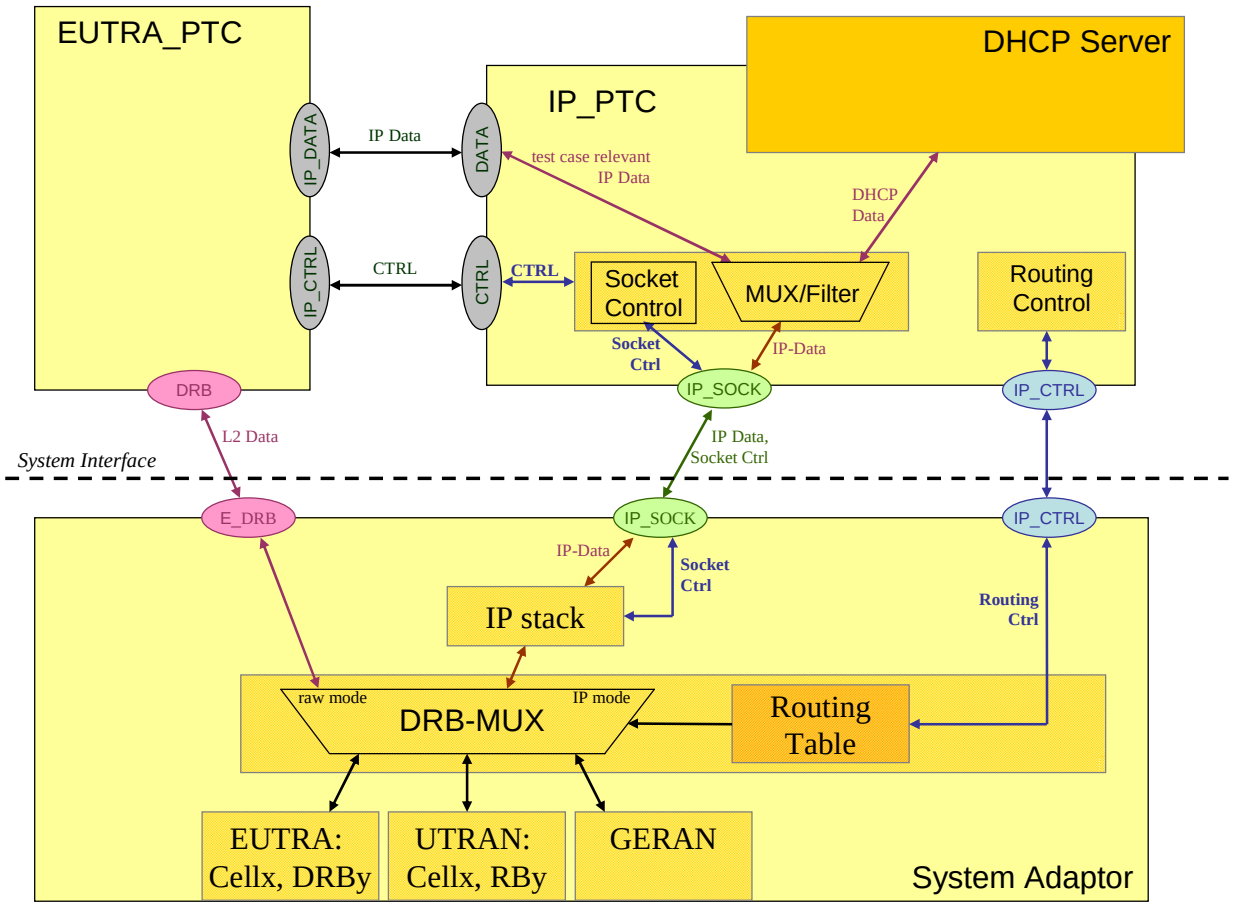

Figure 4.2.4.1-1

4.2.4.2 Configuration of Sockets

The following configurations are controlled by the IP_PTC (IP_SOCKET_REQ). The socket configuration and the sending/receiving of data are done with the same ASP on the system port IP_SOCK.

4.2.4.2.1 Socket Establishment

TCP server

TCP socket configured as server: the socket 'listens' to a 'connect' from the UE. The socket can be configured by using the following system calls of the Berkeley Sockets API:

- socket (AF_INET | AF_INET6, SOCK_STREAM, 0);
- setsockopt;
- bind (local IP address Port);
- listen.

NOTE: 'setsockopt' can be used e.g. in case of IPsec (FFS).

When the UE connects to the server the connection is accepted with the 'accept' system call.

TCP client

A TCP connection is established to an existing TCP server at the UE side. This can be done with the following system calls:

- socket (AF_INET|AF_INET6, SOCK_STREAM, 0);
- setsockopt;
- connect(remote Server Addr of the UE = IP-Addr + Port).

NOTE: 'setsockopt' can be used e.g. in case of IPsec (FFS).

UDP socket

A UDP socket can be established with the system calls

- socket (AF_INET|AF_INET6, SOCK_DGRAM, 0);
- setsockopt;
- bind (local IP address Port);
- connect.

NOTE 1: 'setsockopt' can be used to set the option SO_BROADCAST to allow broadcast messages (e.g. for DHCP).

NOTE 2: Usage of 'connect' depends on implementation of the system adaptor.

4.2.4.2.2 Socket Release

A socket is released:

- in case of TCP when the remote entity closes the connection;
- when it is closed explicitly by the IP_PTC (system call 'close').

NOTE: In general the sockets are independent from the configuration of the DRBs. Especially in case of UDP or ICMP the sockets can exist even without any DRB being configured.

4.2.4.3 Handling of IP data

Sending and receiving of IP data is done by the same ASPs as the socket establishment on IP_SOCK. In TTCN the IP data are handled by a separate TTCN component: IP_PTC. This PTC can deal with the data according to the respective protocol, e.g. DHCP. In general, this is out of scope for the (signalling conformance) test case in terms of pass/fail assignment.

The IP_PTC will receive data from sockets being configured for the corresponding IP protocols. Any unrecognised IP packets are discarded by the IP stack in the system adaptor.

When the IP data are relavant for the test purpose, e.g. the test purpose is to test DHCP, the IP data are routed to the EUTRA_PTC. This allows generic protocol implementations for the common case, i.e. IP_PTC and DHCP server are independent from test case specific implementations.

The interface between EUTRA_PTC and IP_PTC is a pure TTCN implementation issue and independent of the system interface. Furthermore it is irrelevant for the system interface whether e.g. the DHCP server is part of the IP_PTC or implemented as a separate PTC.

- For TCP, the primitives to send and receive data correspond to the 'send' and 'recv' system calls.
- For UDP and ICMP, the primitives correspond to the 'sendto' and 'recvfrom' system calls.
- For both UDP and TCP the system adaptor may send ("in-band") error indications in case of system errors. That results in an assignment of inconc by the IP_PTC.

4.2.4.4 Routing of IP Data

The routing of IP data is done in the DRB-Mux which gets a routing table configured. This table associates the address and protocol information of IP packets (protocol, local IP address, local port, remote IP address, remote port) with the radio bearer (RAT, cell, DRB id).

In UL a DRB is considered being in raw mode when there is no entry found in the routing table. It is considered being in IP mode when there is any entry regardless of the protocol and address information being stored (i.e. SS does not need to evaluate the IP header what would cause problems in case of loopback data).

In DL the IP packets of the IP stack are routed to the DRBs acc. to the routing information in the routing table (see annex D for details).

4.3 SAE Test Model

4.3.1 NAS Test Model

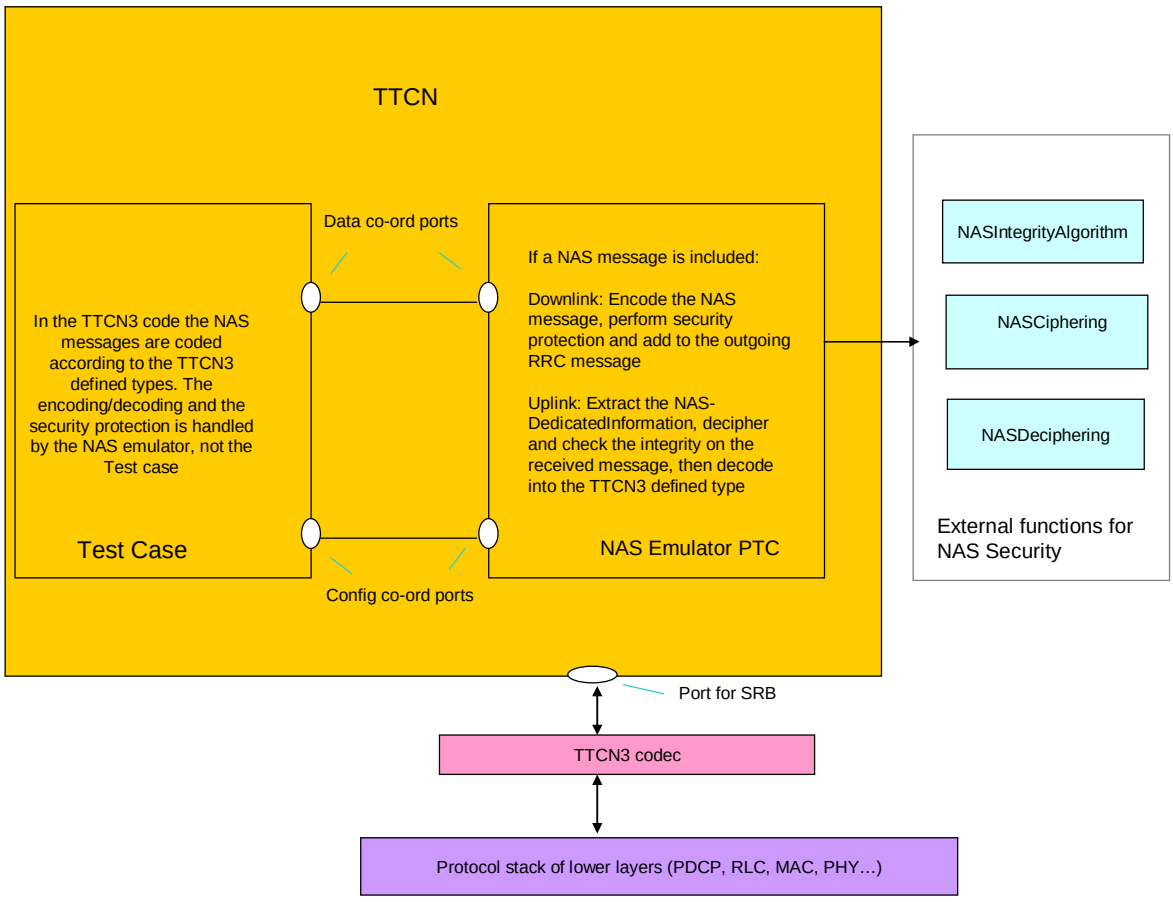

Figure 4.3.1-1

The NAS emulator is a parallel test component which handles NAS security, with the help of external functions to perform the integrity and (de)ciphering.

The interface between the emulator and the TTCN (co-ordination messages) handle data as TTCN-3 values. The interface between the emulator and the SS handles the RRC messages as TTCN-3 values, containing (where applicable) secure, encoded NAS messages.

The NAS emulator is not part of the test case in terms of verdict assignment (i.e. it does not check the correctness of any protocol message). Nevertheless, in case of fatal errors such as encode/decode errors, the NAS emulator sets the verdict

to inconclusive and terminates immediately - which causes the test case to terminate. i.e. the NAS emulator does not resolve error situations.

4.4 Inter RAT Test Model

4.4.1 E-UTRAN-UTRAN Inter RAT Test Model

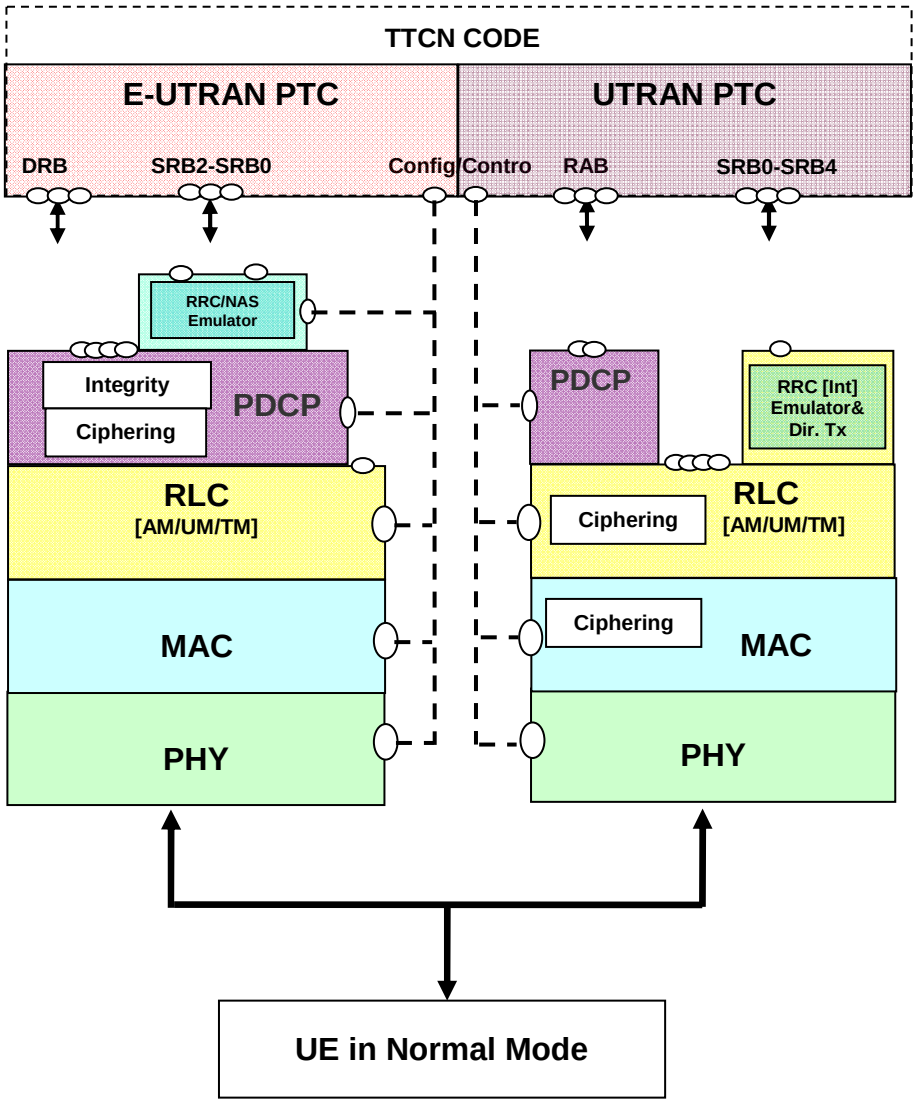

Figure 4.4.1-1: Test model for Inter RAT E-UTRAN-UTRAN testing

The model consists of dual protocol stack one for E-UTRANand one for UTRAN. The TTCN implementation for E-UTRANand UTRAN functionalities will be in separate Parallel Test Components.The SS E-UTRAN part is same as the model defined in clause 4.2.2 for RRC testing.

The SS UTRAN part consist of L1, MAC, RLC and PDCP (IF PS user RB established only), are configured in normal mode. They shall perform all of their functions normally. Ciphering is enabled and shall be performed in RLC (AM/UM) and MAC (TM RLC). Integrity is enabled, and SS shall provide RRC emulator for integrity protection calculation and checking and 'Direct transfer' adaptation. Ports are above RLC (CS RAB and SRB0), PDCP (PS RAB) and RRC Emulator (SRB1 to SRB4).

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

4.4.2 E-UTRAN-GERAN Inter RAT Test Model

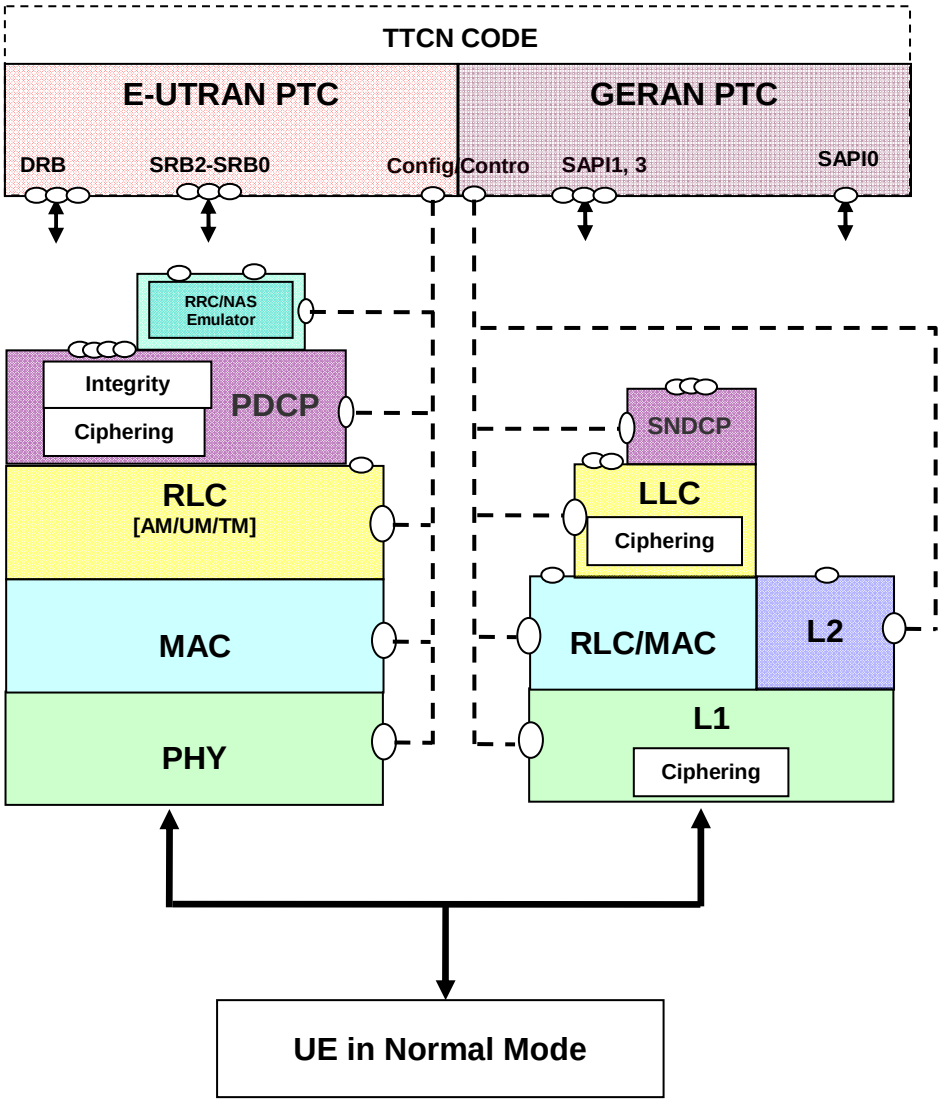

Figure 4.4.2-1: Test model for Inter RAT E-UTRAN-GERAN testing

The model consists of dual protocol stack one for E-UTRAN and one for GERAN. The TTCN implementation for E-UTRAN and GERAN functionalities will be in separate Parallel Test Components. The SS E-UTRAN part is the same as the model defined in clause 4.2.2 for RRC testing.

The SS GERAN model for GPRS consists of L1, MAC/ RLC and LLC, configured in normal mode. SNDCP may also be configured. They shall perform all of their functions normally. Ciphering is enabled and shall be performed in LLC. Ports are above RLC (GRR messages), LLC (NAS and Data) and SNDCP (User Data).

The SS GERAN model for GSM consists of L1, L2 (MAC/ RLC), configured in normal mode. They shall perform all of their functions normally. Ciphering is enabled and shall be performed in L1. Ports are above L2.

The UE is configured in normal mode. Ciphering/Integrity (PDCP and NAS) is enabled and ROHC is not configured in E-UTRAN. Ciphering is enabled in GERAN.

4.4.3 E-UTRAN-CDMA2000 Inter RAT Test Model

FFS.

4.4.4 E-UTRAN FDD-TDD Inter RAT Test Model

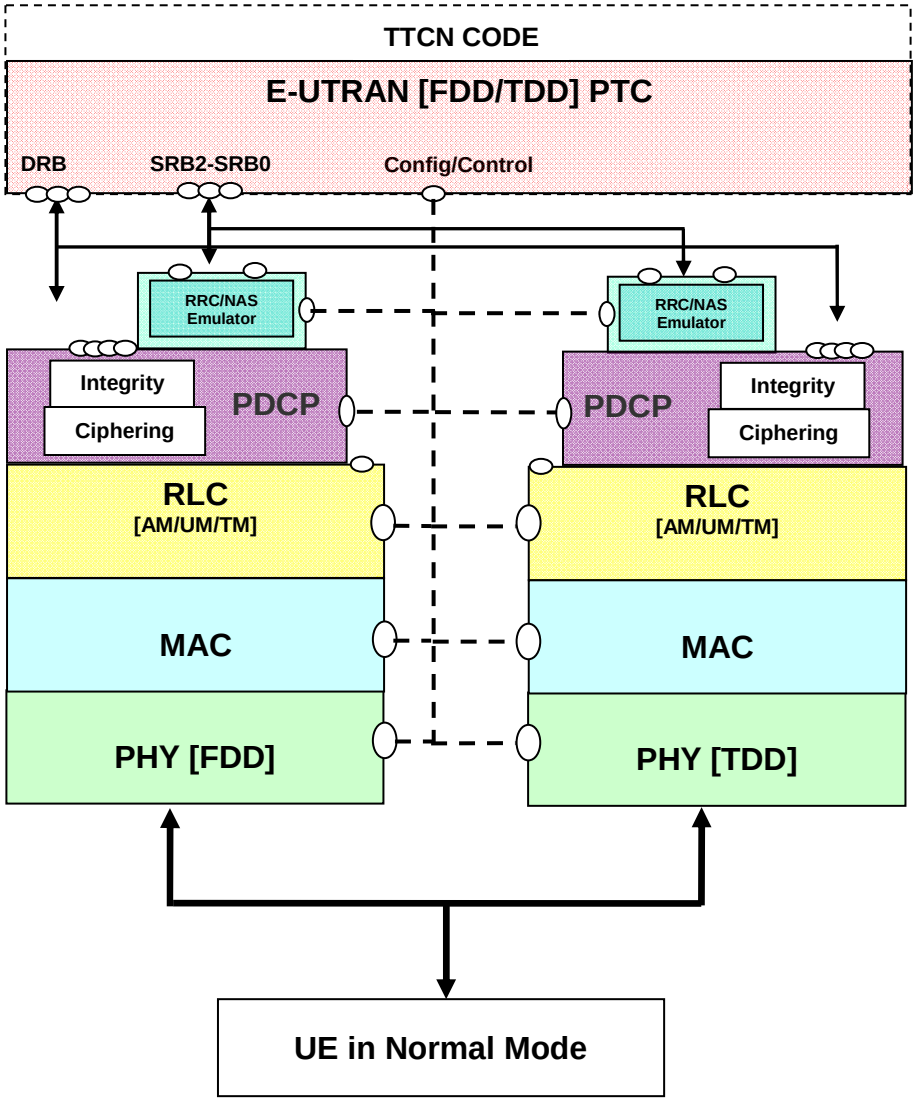

Figure 4.4.4-1: Test model for Inter RAT E-UTRANFDD-TDD testing

The model consists of dual protocol stack one for E-UTRANFDD and one for E-UTRANTDD. The TTCN implementation for E-UTRANFDD and TDD functionalities will be in the same Parallel Test Component. The SS E-UTRAN (both FDD and TDD) part is the same as the model defined in clause 4.2.2 for RRC testing. SS E-UTRANFDD and TDD shall be configured as separate cells.

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

4.4.5 E-UTRAN-UTRAN-GERAN Inter RAT Test Model

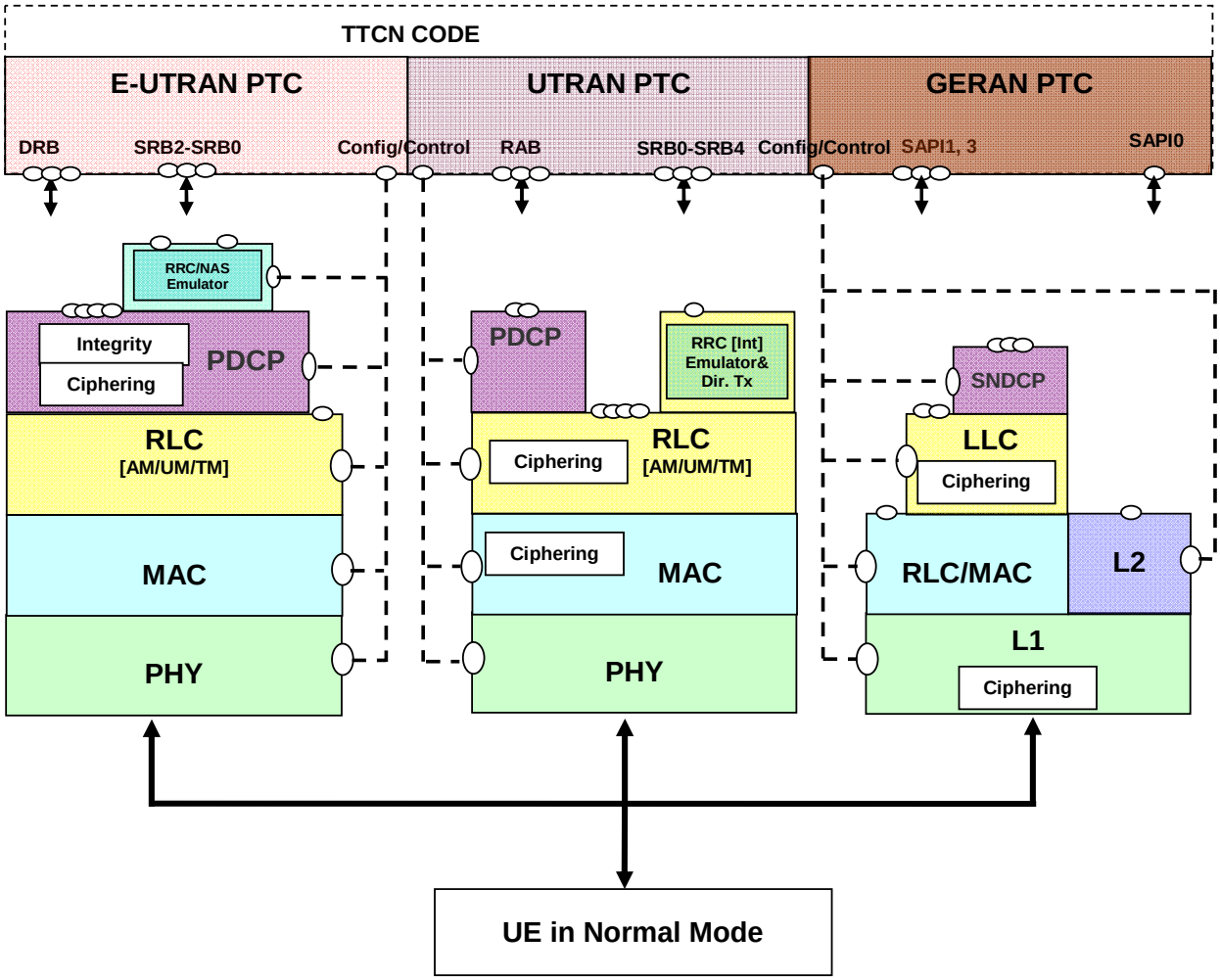

Figure 4.4.5-1: Test model for Inter RAT E-UTRANFDD-TDD testing

The model consists of integrated protocol stack supporting E-UTRAN, UTRAN and GERAN. The TTCN implementation for E-UTRAN, UTRAN and GERAN functionalities will be in separate Parallel Test Components. The SS E-UTRAN part is the same as the model defined in clause 4.2.2 for RRC testing. The SS UTRAN part is the same as the model defined in clause 4.4.1. The SS GERAN part is same as the model defined in clause 4.4.2.

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

5 Upper Tester Interface

This clause describes the handling of AT commands and MMI Commands at the system interface. The internal handling of those commands in TTCN is out of scope.

In the TTCN, the Upper Tester is located at the MTC; therefore there is one interface to the system adaptor common for all RATs.

There is one primitive defined carrying either an MMI or an AT command to be sent to the system adaptor and one common confirmation primitive to be sent by the system adaptor.

TTCN-3 ASP Definition			
Type Name	**UT_SYSTEM_REQ**		
TTCN-3 Type	Record		
Cmd	**TTCN-3 Type**	union	
AT	charstring carrying the AT command as defined in TS 27.007 [32], TS 27.005 [31] and TS 27.060 [33]		
MMI	• Cmd (charstring) • List of parameters: o Name (charstring) o Value (charstring)		
CnfRequired	**TTCN-3 Type**	boolean	
	true: system adaptor shall reply with confirmation received from the UE **false:** SS shall swallow any confirmation generated by the UE **Note:** In the TTCN, a confirmation shall only be requested in cases when there is no signalling from the UE being triggered by the MMI/AT command		

TTCN-3 ASP Definition		
Type Name	**UT_COMMON_CNF**	
TTCN-3 Type	Record	
Result	**TTCN-3 Type**	boolean
	true: success **false:** failure	
ResultString	**TTCN-3 Type**	charstring
	response by the UE for commands which request the UE to return a result, optional	

All mandatory and optional AT commands are sent as AT command strings as defined above. If an optional AT command is not implemented in the UE, the system adaptor needs to parse the AT command and map it to an appropriate MMI command (which is out of scope for this document).

The following MMI commands are defined.

Table 5-1: MMI commands

Command	Parameters	
	Name	**Value**
"SWITCH_ON"	(none)	
"SWITCH_OFF"	(none)	
"POWER_ON"	(none)	
"POWER_OFF"	(none)	
"INSERT_USIM"	(none)	
"REMOVE_USIM"	(none)	
"REQUEST_MO_CALL"	(none)	
"REQUEST_CS_CALL"	(none)	
"CHECK_PLMN"	"PLMN"	<PLMN ID>
"PLMN_MANUAL"	"PLMN"	<PLMN ID>
"PLMN_AUTOMATIC"	(none)	
"ACTIVATE_BEARER"	(none)	
"REQUEST_ADDITIONAL_PDN"	(none)	
"REQUEST_MO_CALL_TO2ndPDN"	(none)	

AT commands are refered to TS 27.005 [31], TS 27.007 [32] and TS 27.060 [33].

6 ASP specifications

6.1 General Requirements and Assumptions

The following common requirements affect ASP definitions:

- The definition of ASPs shall have no impact on the common system architecture or on the performance.
- The codec implementation is out of scope of the present document.
- For peer-to-peer PDUs contained in an ASP encoding rules need to be considered acc. to the respective protocol:
  - ASN.1 BER and PER.
  - Tabular notation for NAS PDUs or layer 2 data PDUs.

There are no encoding rules being defined for top level ASP definitions and information exchanged between the test executable and the System Adaptor (SA) only. Instead encoding depends on implementation of the codec and the SA.

There are no encoding rules being defined for ASPs between TTCN-3 components. This is implementation dependent.

Info elements defined in the protocol specifications (e.g. RRC) shall be re-used in configuration ASPs as far as possible.

For optional fields within the configuration ASPs, the following rules will be applied:

- For ASN.1 fields - these will follow the same rules as defined in the RRC specification [19].
- For TTCN-3 fields - when the current configuration of an optional field is to be 'kept as it is' then the field will be set to omit.
- For TTCN-3 fields - when the current configuration of an optional field is to be released/deleted then a separate option is provided in a union.

6.2 E-UTRAN ASP Definitions

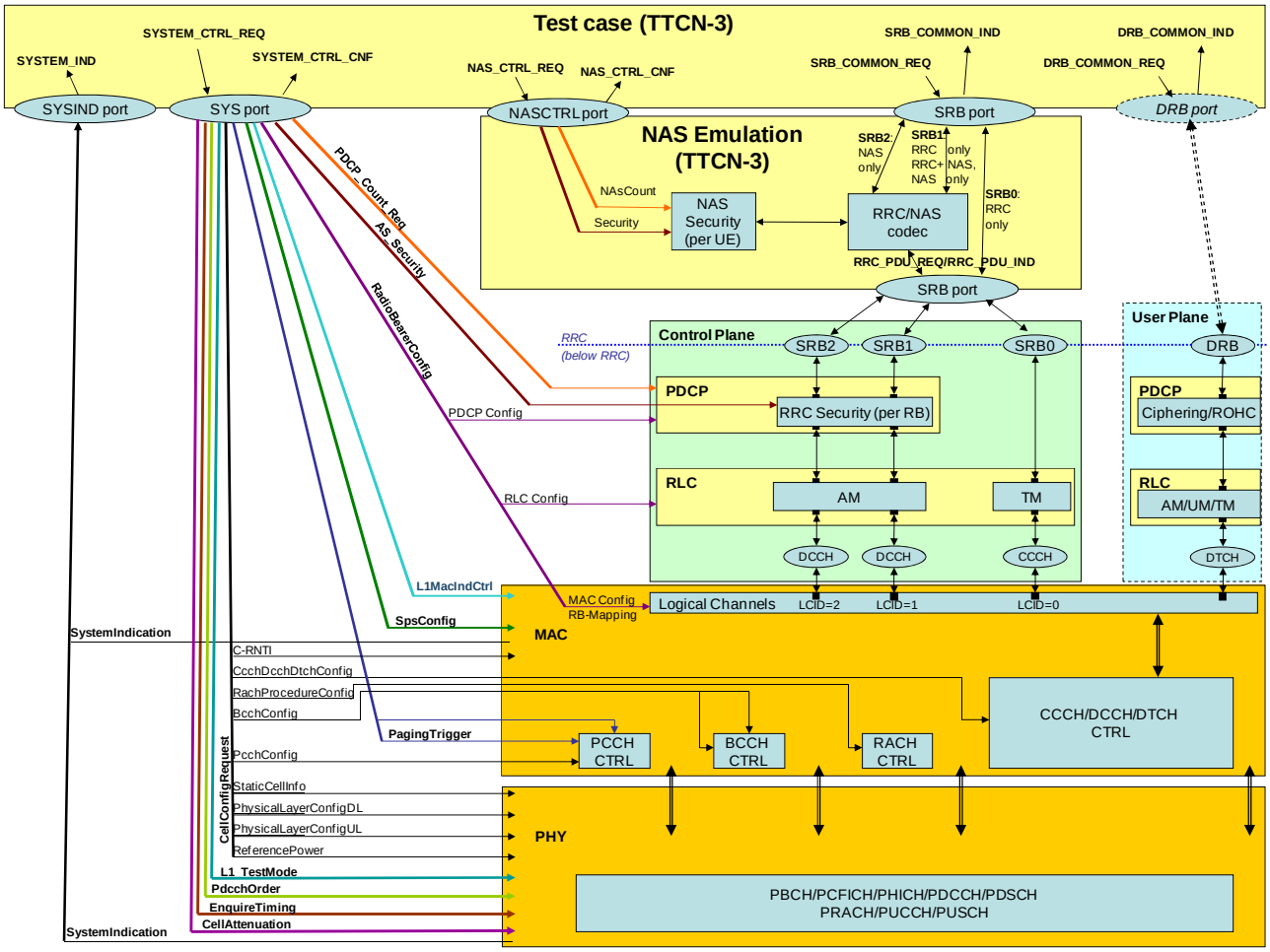

Figure 6.2-1: E-UTRAN ASP Test Model

6.2.1 Configuration Primitives

Annex D contains the ASP definitions for configurations.

6.2.2 Signalling Primitives

Annex D contains the ASP definitions for configurations.

6.2.3 Co-ordination Messages between NAS Emulation PTC and EUTRA PTC

TTCN-3 ASP Definition			
Type Name	**SRB_COMMON_REQ**		
TTCN-3 Type	Record		
Common Part		**TTCN-3 Type**	record
CellId		cell id	
RoutingInfo		SRB0, SRB1, SRB2	
TimingInfo		system frame number and sub-frame number or "Now"	
ControlInfo		CnfFlag: (normally false) FollowOnFlag: **true:** Indicates that the message(s) to be sent on the same TTI will follow NOTE: If the same TimingInfo is not used in the messages to be sent on the same TTI, the SS shall produce an error **false:** Indicates that no more message(s) will follow.	
Signalling Part		**TTCN-3 Type**	record
Rrc		**TTCN-3 Type**	union
		omit: NAS message shall be present; NAS message shall be sent in DLInformationTransfer **present, NAS message present:** (piggybacked) NAS PDU shall be security protected (if necessary) and inserted in RRC PDU's NAS_DedicatedInformation **present, NAS message omit:** (RRC message does not contain NAS information)	
Ccch		DL_CCCH_Message as define in TS 36.331 [19], clause 6.2.1	
Dcch		DL_DCCH_Message as define in TS 36.331 [19], clause 6.2.1	
Nas		**TTCN-3 Type**	record
		omit: RRC message shall be present; RRC message does not contain (piggybacked) NAS PDU **present, RRC message omit:** NAS message shall be sent embedded in DLInformationTransfer **present, RRC message present:** NAS message is piggybacked in RRC message NOTE: In case of RRC message being sent on CCCH or does not have IE NAS_DedicatedInformation NAS message shall be omitted.	
SecurityProtectionInfo		security status (if protected with integrity and/or ciphering, if at all)	
NAS message		union of all NAS messages define for DL except SECURITY PROTECTED NAS MESSAGE	

TTCN-3 ASP Definition			
Type Name	**SRB_COMMON_IND**		
TTCN-3 Type	Record		
Common Part		**TTCN-3 Type**	record
CellId		cell id	
RoutingInfo		SRB0, SRB1, SRB2	
TimingInfo		system frame number; sub-frame number when PDU has been received	
Signalling Part		**TTCN-3 Type**	record
Rrc		**TTCN-3 Type**	union
		omit: NAS message shall be present; NAS message is received in ULInformationTransfer **present, NAS message present:** NAS_DedicatedInformation contains unstructured and security protected NAS PDU and the NAS message contains the deciphered message in structured format **present, NAS message omit:** (RRC message does not contain NAS information)	
Ccch		UL_CCCH_Message as define in TS 36.331 [19], clause 6.2.1	
Dcch		UL_DCCH_Message as define in TS 36.331 [19], clause 6.2.1	

TTCN-3 ASP Definition		
Nas	**TTCN-3 Type**	record
	omit RRC message shall be present; RRC message does not contain (piggybacked) NAS PDU **present, RRC message omit** NAS message has been received in ULInformationTransfer **present, RRC message present** NAS message is piggybacked in RRC message	
SecurityProtectionInfo	security status (if protected with integrity and/or ciphering, if at all), nas count	
NAS message	union of all NAS messages define for UL except SECURITY PROTECTED NAS MESSAGE	

TTCN-3 ASP Definition		
Type Name	**NAS_CTRL_REQ**	
TTCN-3 Type	Record	
Common Part	**TTCN-3 Type**	record
CellId	cell id	
RoutingInfo	(not used for configuration)	
TimingInfo	current system frame number; sub-frame number (always provided by the SS)	
Result	Success or error (in case of error an SS specific error code shall be provided; this will not be evaluated by TTCN but may be useful for validation)	
Primitive specific Part	**TTCN-3 Type**	union
Security	Start/Restart Integrity Ciphering NasCountReset Release	
NAS Count	get set	

TTCN-3 ASP Definition		
Type Name	**NAS_CTRL_CNF**	
TTCN-3 Type	Record	
Common Part	**TTCN-3 Type**	record
CellId	cell id	
RoutingInfo	(not used for configuration)	
TimingInfo	current system frame number; sub-frame number (always provided by the SS)	
Result	Success or error (in case of error an SS specific error code shall be provided; this will not be evaluated by TTCN but may be useful for validation)	
Primitive specific Part	**TTCN-3 Type**	union
Security	(contains no further information)	
NAS Count	get set	

6.3 UTRAN ASP Definitions

6.3.1 ASPs for Control Primitive Transmission

TTCN-3 ASP Definition	
Type Name	**U_CPHY_ CONFIG_REQ**
TTCN-3 Type	union
Port	U_CPHY
CPHY_RL_Setup_FDD_REQ	TS 34.123-3, clause 7.3.2.2.11
CPHY_RL_Setup_TDD_REQ	TS 34.123-3, clause 7.3.2.3.1
CPHY_RL_Modify_FDD_REQ	TS 34.123-3, clause 7.3.2.2.9
CPHY_RL_Modify_TDD_REQ	TS 34.123-3, clause 7.3.2.3.1
CPHY_RL_Release_REQ	TS 34.123-3, clause 7.3.2.2.10
CPHY_TrCH_Config_FDD_REQ	TS 34.123-3, clause 7.3.2.2.13
CPHY_TrCH_Config_TDD_REQ	TS 34.123-3, clause 7.3.2.2.13
CPHY_TrCH_Release_REQ	TS 34.123-3, clause 7.3.2.2.14
CPHY_Cell_Config_FDD_REQ	TS 34.123-3, clause 7.3.2.2.2
CPHY_Cell_Config_TDD_REQ	TS 34.123-3, clause 7.3.2.3.1
CPHY_Cell_Release_REQ	TS 34.123-3, clause 7.3.2.2.3
CPHY_Ini_REQ	TS 34.123-3, clause 7.3.2.2.4
CPHY_Cell_TxPower_Modify_REQ	TS 34.123-3, clause 7.3.2.2.5
CPHY_Frame_Number_REQ	TS 34.123-3, clause 7.3.2.2.6

TTCN-3 ASP Definition	
Type Name	**U_CPHY_ CONFIG_CNF**
TTCN-3 Type	union
Port	U_CPHY
CPHY_RL_Setup_CNF	TS 34.123-3, clause 7.3.2.2.11
CPHY_RL_Modify_CNF	TS 34.123-3, clause 7.3.2.2.9
CPHY_RL_Release_CNF	TS 34.123-3, clause 7.3.2.2.10
CPHY_TrCH_Config_CNF	TS 34.123-3, clause 7.3.2.2.13
CPHY_TrCH_Release_CNF	TS 34.123-3, clause 7.3.2.2.14
CPHY_Cell_Config_CNF	TS 34.123-3, clause 7.3.2.2.2
CPHY_Cell_Release_CNF	TS 34.123-3, clause 7.3.2.2.3
CPHY_Ini_CNF	TS 34.123-3, clause 7.3.2.2.4
CPHY_Cell_TxPower_Modify_CNF	TS 34.123-3, clause 7.3.2.2.5
CPHY_Frame_Number_CNF	TS 34.123-3, clause 7.3.2.2.6
CPHY_Sync_IND	TS 34.123-3, clause 7.3.2.2.12
CPHY_Out_of_Sync_IND	TS 34.123-3, clause 7.3.2.2.7

TTCN-3 ASP Definition	
Type Name	**U_CMAC_ CONFIG_REQ**
TTCN-3 Type	union
Port	U_CMAC
CMAC_Config_FDD_REQ	TS 34.123-3, clause 7.3.2.2.17
CMAC_Config_TDD_REQ	TS 34.123-3, clause 7.3.2.2.17
CMAC_SYSINFO_Config_REQ	TS 34.123-3, clause 7.3.2.2.22
CMAC_SecurityMode_Config_REQ	TS 34.123-3, clause 7.3.2.2.20
CMAC_Ciphering_Activate_REQ	TS 34.123-3, clause 7.3.2.2.16
CMAC_PAGING_Config_FDD_REQ	TS 34.123-3, clause 7.3.2.2.18
CMAC_PAGING_Config_TDD_REQ	TS 34.123-3, clause 7.3.2.2.18
CMAC_MACes_Config_REQ	TS 34.123-3, clause 7.3.2.2.17d
CMAC_MACe_Config_FDD_REQ	TS 34.123-3, clause 7.3.2.2.17b
CMAC_MACe_Config_TDD_REQ	TS 34.123-3, clause 7.3.2.2.17b
CMAC_MACe_NodeB_CellMapping_REQ	TS 34.123-3, clause 7.3.2.2.17c
CMAC_MAChs_MACehs_TFRCconfigure_FDD_REQ	TS 34.123-3, clause 7.3.2.2.17a
CMAC_MAChs_MACehs_TFRCconfigure_TDD_REQ	TS 34.123-3, clause 7.3.2.3.1

TTCN-3 ASP Definition		
Type Name	**U_CMAC_ CONFIG_CNF**	
TTCN-3 Type	union	
Port	U_CMAC	
CMAC_Config_CNF		TS 34.123-3, clause 7.3.2.2.17
CMAC_SYSINFO_Config_CNF		TS 34.123-3, clause 7.3.2.2.22
CMAC_SecurityMode_Config_CNF		TS 34.123-3, clause 7.3.2.2.20
CMAC_Ciphering_Activate_CNF		TS 34.123-3, clause 7.3.2.2.16
CMAC_PAGING_Config_CNF		TS 34.123-3, clause 7.3.2.2.18
CMAC_MACes_Config_CNF		TS 34.123-3, clause 7.3.2.2.17d
CMAC_MACe_Config_CNF		TS 34.123-3, clause 7.3.2.2.17b
CMAC_MACe_NodeB_CellMapping_CNF		TS 34.123-3, clause 7.3.2.2.17c
CMAC_MAChs_MACehs_TFRCconfigure_CNF		TS 34.123-3, clause 7.3.2.2.17a

TTCN-3 ASP Definition		
Type Name	**U_CRLC_ CONFIG_REQ**	
TTCN-3 Type	union	
Port	U_CRLC	
CRLC_Config_REQ		TS 34.123-3, clause 7.3.2.2.24
CRLC_Sequence_Number_REQ		TS 34.123-3, clause 7.3.2.2.29
CRLC_SecurityMode_Config_REQ		TS 34.123-3, clause 7.3.2.2.28
CRLC_Ciphering_Activate_REQ		TS 34.123-3, clause 7.3.2.2.23
CRLC_Integrity_Activate_REQ		TS 34.123-3, clause 7.3.2.2.25
CRLC_SetRRC_MessageSN_REQ		TS 34.123-3, clause 7.3.2.2.28a
CRLC_RRC_MessageSN_REQ		TS 34.123-3, clause 7.3.2.2.27a
CRLC_Resume_REQ		TS 34.123-3, clause 7.3.2.2.27
CRLC_Suspend_REQ		TS 34.123-3, clause 7.3.2.2.31

TTCN-3 ASP Definition		
Type Name	**U_CRLC_ CONFIG_CNF**	
TTCN-3 Type	union	
Port	U_CRLC	
CRLC_Config_CNF		TS 34.123-3, clause 7.3.2.2.24
CRLC_Sequence_Number_CNF		TS 34.123-3, clause 7.3.2.2.29
CRLC_SecurityMode_Config_CNF		TS 34.123-3, clause 7.3.2.2.28
CRLC_Ciphering_Activate_CNF		TS 34.123-3, clause 7.3.2.2.23
CRLC_integrity_Activate_CNF		TS 34.123-3, clause 7.3.2.2.25
CRLC_Integrity_Failure_IND		TS 34.123-3, clause 7.3.2.2.26
CRLC_SetRRC_MessageSN_CNF		TS 34.123-3, clause 7.3.2.2.28a
CRLC_RRC_MessageSN_CNF		TS 34.123-3, clause 7.3.2.2.27a
CRLC_Resume_CNF		TS 34.123-3, clause 7.3.2.2.27
CRLC_Suspend_CNF		TS 34.123-3, clause 7.3.2.2.31

6.4 GERAN ASP Definitions

6.4.1 ASPs for Control Primitive Transmission

TTCN-3 ASP Definition		
Type Name	**G__CPHY_ CONFIG_REQ**	
TTCN-3 Type	Union	
Port	G_CL1	
G_CL1_CreateCell_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_DeleteCell_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_CreateBasicPhyCh_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_CreateMultiSlotConfig_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_DeleteChannel_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_ChangePowerLevel_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_CipheringControl_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_CipherModeModify_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_ChModeModify_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL1_ComingFN_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL2_HoldPhyInfo_REQ		TS 34.123-3, clause 7.3.4.3.2.2
G_CL1_L1Header_REQ		TS 34.123-3, clause 7.3.4.3.2.1
G_CL2_MeasRptControl_REQ		TS 34.123-3, clause 7.3.4.3.2.2
G_CL2_NoUAforSABM_REQ		TS 34.123-3, clause 7.3.4.3.2.2
G_CL2_ResumeUAforSABM_REQ		TS 34.123-3, clause 7.3.4.3.2.2
G_CL2_Release_REQ		TS 34.123-3, clause 7.3.4.3.2.2
G_CL1_SetNewKey_REQ		TS 34.123-3, clause 7.3.4.3.2.1

TTCN-3 ASP Definition		
Type Name	**G_CPHY_CONFIG_CNF**	
TTCN-3 Type	Record	
Port	G_CL1	
ComingFN		RFN, optional
L1Header		L1Header, optional

TTCN-3 ASP Definition		
Type Name	**G_CRLC_ CONFIG_REQ**	
TTCN-3 Type	Union	
Port	G_CRLC	
G_CRLC_CreateRLC_MAC_REQ		TS 34.123-3, clause 7.3.4.3.2.3
G_CRLC_DeleteRLC_MAC_REQ		TS 34.123-3, clause 7.3.4.3.2.3
G_CRLC_DL_TBF_Config_REQ		TS 34.123-3, clause 7.3.4.3.2.3
G_CRLC_UL_TBF_Config_REQ		TS 34.123-3, clause 7.3.4.3.2.3

TTCN-3 ASP Definition	
Type Name	**G_CRLC_ CONFIG CNF**
TTCN-3 Type	empty record
Port	G_CRLC

TTCN-3 ASP Definition		
Type Name	G_CLLC_ CONFIG_REQ	
TTCN-3 Type	Union	
Port	G_CLLC	
G_CLLC_Assign_REQ		TS 34.123-3, clause 7.3.4.3.2.4
G_CLLC_Reassign_REQ		TS 34.123-3, clause 7.3.4.3.2.4
G_CLLC_CreateLLE_REQ		TS 34.123-3, clause 7.3.4.3.2.4
G_CLLC_DeleteLLE_REQ		TS 34.123-3, clause 7.3.4.3.2.4

TTCN-3 ASP Definition	
Type Name	**G_CLLC_ CONFIG_CNF**
TTCN-3 Type	empty record
Port	G_CLLC

6.4.2 ASPs for Data Transmission and Reception

TTCN-3 ASP Definition		
Type Name	**G__L2_DATAMESSAGE_REQ**	
TTCN-3 Type	Union	
Port	G_L2	
G_L2_UNITDATA_REQ		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_Release_REQ		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_SYSINFO_REQ		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_Paging_REQ		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_PagingGPRS_REQ		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_DATA_REQ		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_GTTP_REQ		TS 34.123-3, clause 7.3.4.3.1.1

TTCN-3 ASP Definition		
Type Name	**G__L2_DATAMESSAGE_IND**	
TTCN-3 Type	Union	
Port	G_L2	
G_L2_UNITDATA_IND		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_Release_CNF		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_Release_IND		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_Estab_IND		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_GTTP_IND		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_DATA_IND		TS 34.123-3, clause 7.3.4.3.1.1
G_L2_ACCESS_IND		TS 34.123-3, clause 7.3.4.3.1.1

TTCN-3 ASP Definition		
Type Name	**G__RLC_ DATAMESSAGE_REQ**	
TTCN-3 Type	Union	
Port	G_RLC	
G__RLC_ControlMsg_REQ		TS 34.123-3, clause 7.3.4.3.1.2

TTCN-3 ASP Definition		
Type Name	**G__RLC_ DATAMESSAGE_IND**	
TTCN-3 Type	Union	
Port	G_RLC	
G__RLC_ControlMsg_IND		TS 34.123-3, clause 7.3.4.3.1.2

TTCN-3 ASP Definition		
Type Name	**G__LLC_ DATAMESSAGE_REQ**	
TTCN-3 Type	Union	
Port	G_RLC	
G_LLC_UNITDATA_REQ		TS 34.123-3, clause 7.3.4.3.1.3
G_LLC_XID_RES		TS 34.123-3, clause 7.3.4.3.1.3

TTCN-3 ASP Definition		
Type Name	**G__LLC_ DATAMESSAGE_IND**	
TTCN-3 Type	Union	
Port	G_RLC	
G_LLC_UNITDATA_IND		TS 34.123-3, clause 7.3.4.3.1.3
G_LLC_XID_IND		TS 34.123-3, clause 7.3.4.3.1.3

7 Test Methods and Design Considerations

7.1 Channel Mapping

Figure 7.1 shows the channel type mapping that is used for the configuration of the SS. In layer 2 test cases non default channel mapping can be applied on SS, as explained in clause 4.2.1.

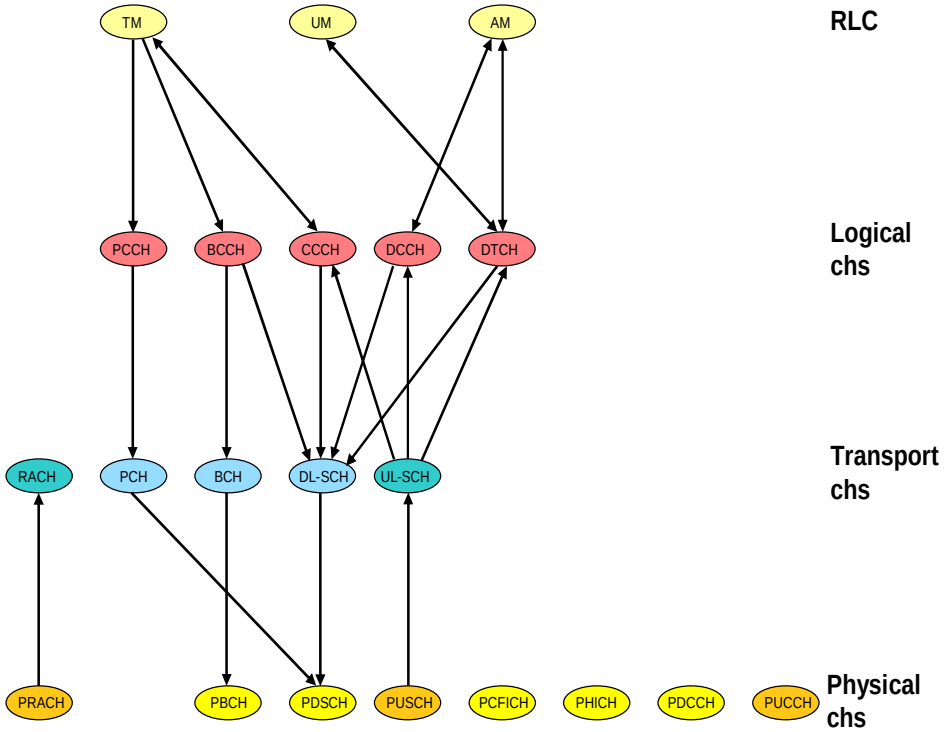

Figure 7.1-1: Channel type mapping for the default configuration of the SS

7.1.1 PDCCH Candidate Selection

In this clause following abbreviations are used:

- Common search Space Aggregation: CS_Agr.
- UE-Specific Search Space Aggregation: UE_Agr.
- Total number of CCEs available in a subframe: Max_CCE.

SS shall apply defined rules below in a DL subframe for PDCCH candidates selection.

- Scheduled transmissions on SI-RNTI / P-RNTI / RA-RNTI, use Common Search Space. UL and DL Scheduled transmissions on C-RNTI/ SPS C-RNTI, and DL Scheduled transmissions on Temp. C-RNTI, use UE-Specific

Search Space. Transmissions on TPC-PUCCH-RNTI / TPC-PUSCH-RNTI and UL Scheduled transmissions on Temp. C-RNTI are not considered for default CCE management.

- If a transmission on SI-RNTI is scheduled, PDCCH candidate corresponding to CCEs betwen 0..(CS_Agr-1) is used. This PDCCH candidate is reserved for SI-RNTI, and left vacant if no SI-RNTI transmission is scheduled.

- PDCCH candidates corresponding to CCEs betwen CS_Agr..(2*CS_Agr-1) can be used either for the transmission on P-RNTI or RA-RNTI. In conformance test cases with single UE, there is no requirement for transmissions scheduled for both P-RNTI and RA-RNTI in one DL subframe.

- For DL transmission for C-RNTI/SPS-RNTI/Temp C-RNTI the lowest value of m =m' which has a PDCCH available from CCEs betwen 2*CS_Agr .. (Max_CCE-1) shall be used. 'm' is defined in TS 36.213 [30], clause 9.1.1.

- For UL transmission for C-RNTI/SPS-RNTI the lowest value of m =m">m'which has a PDCCH available from CCEs betwen 2*CS_Agr .. (Max_CCE-1) shall be used, irrespective of PDCCH candidate corresponding to m' is used or not.

NOTE: If m' or m" cannot be allocated in any TTI, it is a TTCN error due to X-RNTI not properly allocated. The error shall be reported to TTCN. The TTCN will exit the test case assigning an inconclusive verdict.

Table 7.1.1-1 gives the CCE resources utilized for m' and m" for default values of common search space aggreagation level =4, UE-specific search space aggregation L=2 resulting in 6 PDCCH candidates m=0..5 and default Bandwidth of 5 Mhz. This give Max_CCE =20 for FDD. The table also gives the corresponding CCE start indices of PDCCH candidates for m' and m".

It is FFS if the values are also suitable for TDD.

Table 7.1.1-1: CCE Start indices/m' & m'' to be used for various C-RNTIs

C-RNTI	Value		SF0	SF1	SF2	SF3	SF4	SF5	SF6	SF7	SF8	SF9
tsc_C_RNTI_Def	'1001'H 4097	m'	0	1	0	0	0	3	4	0	0	0
		CCE_St_Ind'	12	8	14	8	12	8	8	8	14	10
		m''	1	2	1	1	1	4	5	1	1	1
		CCE_St_Ind''	14	10	16	10	14	10	10	10	16	12
tsc_C_RNTI_Def2	'1034'H 4148	m'	0	0	2	0	0	4	4	1	0	0
		CCE_St_Ind'	12	16	8	14	10	8	8	8	18	16
		m''	1	1	3	1	1	5	5	2	5	1
		CCE_St_Ind''	14	18	10	16	12	10	10	10	8	18
tsc_C_RNTI_Def3	'1111'H 4369	m'	0	0	0	2	3	0	0	0	0	4
		CCE_St_Ind'	16	10	14	8	8	10	14	8	18	8
		m''	1	1	1	3	4	1	1	1	5	5
		CCE_St_Ind''	18	12	16	10	10	12	16	10	8	10
tsc_C_RNTI_Def4	'1FF1'H 8177	m'	0	0	0	0	3	0	0	0	2	4
		CCE_St_Ind'	12	12	18	16	8	18	18	18	8	8
		m''	1	1	5	1	4	5	5	5	3	5
		CCE_St_Ind''	14	14	8	18	10	8	8	8	10	10
tsc_C_RNTI_Def5	'04D2'H 1234	m'	0	2	0	4	0	2	3	0	1	0
		CCE_St_Ind'	10	8	10	8	14	8	8	14	8	10
		m''	1	3	1	5	1	3	4	1	2	1
		CCE_St_Ind''	12	10	12	10	16	10	10	16	10	12
tsc_C_RNTI_Def6	'0929'H 2345	m'	4	0	4	0	0	1	3	3	4	2
		CCE_St_Ind'	8	10	8	12	14	8	8	8	8	8
		m''	5	1	5	1	1	2	4	4	5	3
		CCE_St_Ind''	10	12	10	14	16	10	10	10	10	10
tsc_C_RNTI_Def7	'0D80'H 3456	m'	2	0	2	0	0	0	3	0	0	2
		CCE_St_Ind'	8	16	8	18	14	14	8	16	14	8
		m''	3	1	3	5	1	1	4	1	1	3
		CCE_St_Ind''	10	18	10	8	16	16	10	18	16	10
tsc_C_RNTI_Def8	'11D7'H 4567	m'	0	0	0	2	0	0	3	2	0	2
		CCE_St_Ind'	8	16	8	8	14	16	8	8	8	8
		m''	1	1	1	3	1	1	4	3	1	3
		CCE_St_Ind''	10	18	10	10	16	18	10	10	10	10
tsc_C_RNTI_Def9	'162E'H 5678	m'	0	3	0	0	0	2	0	0	3	2
		CCE_St_Ind'	12	8	12	16	8	8	16	18	8	8
		m''	1	4	1	1	1	3	1	5	4	3
		CCE_St_Ind''	14	10	14	18	10	10	18	8	10	10
tsc_C_RNTI_Def10	'1A85'H 6789	m'	0	0	0	3	0	1	0	1	3	2
		CCE_St_Ind'	16	8	16	8	8	8	16	8	8	8
		m''	1	1	1	4	1	2	1	2	4	3
		CCE_St_Ind''	18	10	18	10	10	10	18	10	10	10

7.2 Uplink Grant

The Network/SS informs the UE if it is allowed to make Uplink Data transmission by transmitting 'DCI format 0' on PDCCH. The UE shall transmit (4 TTI later for FDD or variable for TDD) a Transport block of exactly the same size as specified in DCI format 0. The UE has no control of its own on TB size, and has to merely follow the network, even if that means lots of MAC padding or resource starving.

The UE has the following means to communicate if it has UL data ready for transmission and subsequently the estimate of quantity of data to be transmitted.

RACH procedure: UE in idle mode, handed over to a new cell or connected mode but PUCCH is unsynchronized (sometimes referred to as PUCCH is not configured) will trigger RACH procedure on data ready for transmission in UL.

Scheduling Request: UE in connected mode, no grant configured, PUCCH is synchronized and has data ready for transmission in UL, will transmit a scheduling request on PUCCH.

Buffer Status Reports: UE in connected mode, PUCCH synchronized, has a configured grant for current TTI, but grant is not sufficient to transmit all the data will include MAC control element BSR in the UL MAC PDU.

RACH and SR indicate on data availability and BSR provides an estimate of data available for transmission.

Hence to determine the exact need of the grant requirement of the UE a network/SS needs to act on all three of the above. This eventually complicates the SS implementation and hence the grant allocation procedure is simplified such that SS needs only to react on reception of SR.

The SS, if configured for maintaining PUCCH synchronization at UE, shall periodically transmit automatically MAC PDUs containing the MAC control element 'Timing Advance'. The period as configured by the TTCN should be 80 % of the 'Time Alignment Timer' Value configured at UE. This guarantees that UE will remain PUCCH synchronized as long as SS transmits Timing Advance control elements. This prevents the UE from performing the RACH procedure for the grant request.

Additionally the SS can be configured to automatically transmit a 'configured' UL grant at every reception of a Scheduling Request. This grant should be selected under the following restrictions:

- All UE categories can handle this i.e. (TBS < 5160).
- It is sufficiently large that most of uplink signalling messages can be transmitted. In case the grant is not sufficient to fit the whole UL data, the UE will have to wait for the expiry of RETX_BSR_TIMER and retransmit a SR. And hence the procedure is repeated.

The following 4 types of grant allocation configurations are possible. Grant allocation Types 1 to 3 are applicable, when the UE is in connected state. Grant allocation Type 4 is applicable when UE is establishing the RRC Connection.

Grant Allocation Type 1:

- SS is configured to maintain PUCCH Synch.
- SS is configured to send an automatically 'configured Grant' (in terms of I_{MCS} and N_{PRB}) to the UE on every reception of a Scheduling Request, within 10 subframes.
- This type of grant allocation is suitable for RRC and NAS test cases and the registration (preamble) of all tests.

Grant Allocation Type 2:

- Configure SS to maintain PUCCH Synch.
- Configure SS to periodically transmit a grant (I_{MCS} and N_{PRB}). Number of grants (1 or more) and period configured by TTCN. First grant transmitted as specified in timing information.
- This type of grant allocation is suitable for RLC, PDCP and few MAC test cases.
- No additional grant is allocated on reception of any SRs.

Grant Allocation Type 3:

- SS may or may not be configured to maintain PUCCH Synch.
- Configure SS to transmit a one time grant (I_{MCS} and N_{PRB}) in the time requested by TTCN. The one time transmission is achieved by setting Number of grants=1 and period =∞
- This type of grant allocation is suitable for MAC and DRB tests when UE is in UL Synchronised state

Grant Allocation Type 4 (RACH configuration):

- In addition to the 3 types of UL grant allocations, a fourth type of grant allocation during the RACH procedure is also possible, where the SS behaves as per the RACH procedure configured and allocates the configured grant during the RACH procedure.

All the UL grant allocation methods define grant allocation in terms of I_{MCS} and N_{PRB} to be used. The SS shall allocate RBs corresponding to PRB indices 0..(N_{PRB}-1).

7.3 Downlink Resource Allocation

The DL resource allocation is an SS emulation function. In order to ensure similar DL behaviours (within defined tolerances) on the different SS platforms in the timing stringent requirements, all downlink resource allocation schemes specified in the present clause shall be supported by the SS.

When the DL data is to be sent with a specific scheduling requirement, for instance, in a TTI in advance rather than "now", the TTCN shall ensure that the data is scheduled 100 ms in advance. The 100 ms time covers all time delays, from the time DL data is sent by the TTCN to the completion of the transmission at the SS (TTCN delays, codec delays, adaptor delays and SS processing delays at various protocol Layers).

NOTE: The DL data means DL signalling and/or data in the present clause.

7.3.1 PDCCH DCI default formats

Two types of DCI combinations are identified as default formats for the signalling and protocol test.

DCI combination 1 uses:

- DCI format 1A, resource allocation type 2 localised, for all DL scheduling types.

DCI combination 2 uses:

- DCI format 1C, resource allocation type 2 distributed, for scheduling of PCCH/BCCH/RAR; and
- DCI format 1 resource allocation type 0, for UE dedicated scheduling.

7.3.2 Radio parameters configured

The SS shall support DL QPSK, 16QAM and 64QAM modulation schemes. The configured radio parameters, including DCI format, resource allocation types, maximum allowed modulation scheme, first virtual / physical resource block to be used, maximum available resource blocks and redundancy version, are provided to the SS.

In the normal signalling test condition, DL RLC and HARQ retransmissions are rare. The redundancy version is provided to allow the occasional HARQ retransmissions. In case of AM RLC retransmissions, the SS shall indicate to the TTCN the RLC retransmissions.

7.3.3 General DL scheduling scheme

The rules in the present clause, unless particularly specified, are applied to both default DCI combinations.

The default bandwidth of 5 MHz makes 25 available physical resource blocks. The 25 resource blocks are divided into three distinct sets. Exact set sizes and the elements contained in the individual sets depend upon the DCI combination to be applied.

- The first set is reserved for BCCH mapped to DL-SCH (SI-RNTI).
- The second set is reserved for PCCH mapped to DL-SCH (P-RNTI).
- The third set is used for one of mutually exclusive transmissions of:
  - 'Random Access Response' mapped to DL-SCH (RA-RNTI); or
  - UE-dedicated scheduling mapped to DL-SCH (C-RNTI/ SPS C-RNTI/ Temp C-RNTI).

For each subframe for which data of one or more types is scheduled, the SS shall select a Transport Block Size (TBS), independently for each type of data scheduled, such that:

- All the scheduled data is transmitted respecting the timing information.
- If TimingInfo is 'now' SS shall schedule the data for transmission in the nearest available sub-frame.
- Not more than MaxRbCnt resource blocks are used, for DCI format 1C, N_{PRB} = MaxRbCnt.

- Minimum MAC Padding is performed.
- If all scheduled Data cannot be transmitted in the indicated subframe, for example due to TDD and half duplex configuration, it shall be transmitted in the next available subframe.

7.3.3.1 Additional rules for BCCH scheduling scheme

This scheme is applicable for Data transmission on logical channel BCCH mapped to DL-SCH, PDCCH scrambled by SI-RNTI. For both DCI combinations 4 physical resource blocks are reserved for BCCH transmission. The maximum modulation scheme is restricted to QPSK.

Following additional rules are applied for TBS selection:

- The Max TBS, the maximum TBS allowed for the scheduling scheme, is restricted to 600. (nearest value achievable for I_{TBS} = 9 and N_{PRB} = 4, as per table 7.1.7.2.1-1 of TS 36.213 [30]).
- If the scheduled Data cannot fit into a TBS smaller or equal to Max TBS, SS generates an error (it's a TTCN error). TTCN should gracefully exit the test case as a fatal error, assigning inconclusive verdict.
- Rules in clause 7.3.3.1.1 for DCI combination 1 and in clause 7.3.3.1.2 for DCI combination 2 shall be applied.

7.3.3.1.1 BCCH with DCI combination 1

TS 36.213 [30], table 7.1.7.2.1-1, rows with I_{TBS} =0..26 and columns with N_{PRB} =2 (corresponding to TPC LSB =0) and N_{PRB} =3 (corresponding to TPC LSB =1), TBS <Max TBS are applicable.

Distinct TBSs and all (TPC LSB, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

If a TBS can have two (TPC LSB, I_{TBS}) combinations, the combination with TPC LSB =0 is selected.

RIV(=36) indicates 4 PRBs with index 0..3 allocated.

7.3.3.1.2 BCCH with DCI combination 2

TS 36.213 [30], table 7.1.7.2.1-3 , I_{TBS} =0..17 with TBS <Max TBS are applicable.

RIV(=12) indicates 4 virtual RBs with index 0..3 allocated. These correspond to the physical RBs with index 0, 6, 12, 18 in even slots and 12, 18, 0, 6 in odd slots.

7.3.3.2 Additional rules for PCCH specific scheduling scheme

This scheme is applicable for Data transmission on logical channel PCCH mapped to DL-SCH, PDCCH scrambled by P-RNTI. For DCI combination 1, one physical resource block is reserved. For DCI combination 2, two physical resource blocks are reserved. The maximum modulation scheme is restricted to QPSK.

Following additional rules are applied for TBS selection:

- If the scheduled Data cannot fit into Max TBS, SS generates an error (it's a TTCN error). TTCN should gracefully exit the test case as a fatal error, assigning inconclusive verdict.
- Rules in clause 7.3.3.2.1 for DCI combination 1 and clause 7.3.3.2.2 for DCI combination 2 shall be applied.

7.3.3.2.1 PCCH with DCI combination 1

TS 36.213 [30], table 7.1.7.2.1-1, rows with I_{TBS} =0..26 and columns with N_{PRB} =2 (corresponding to TPC LSB =0) and 3 (corresponding to TPC LSB =1) TBS < Max TBS are applicable.

The Max TBS is restricted to 120 (nearest value achievable for I_{TBS} = 9 and N_{PRB} =1, as per table 7.1.7.2.1-1 of TS 36.213 [30]).

Distinct TBSs and all (TPC LSB, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

If a TBS can have two (TPC LSB, I_{TBS}) combinations, the combination with TPC LSB =0 is selected.

RIV(=5) indicates 1 PRBs with index 4 allocated.

7.3.3.2.2 PCCH with DCI combination 2

TS 36.213 [30], table 7.1.7.2.1-3, I_{TBS} =0..11 with TBS < Max TBS are applicable.

The Max TBS is restricted to 296 bits (nearest value achievable for I_{TBS} = 9 and N_{PRB} =2).

RIV(=2) indicates two virtual RBs with index 4 and 5 allocated. These correspond to physical RBs with index 1 and 7 in even slots and 13 and 19 in odd slots.

7.3.3.3 Additional rules for RAR specific scheduling scheme

This scheme is applicable for transmission of Random Access Response mapped to DL-SCH, PDCCH scrambled by RA-RNTI. For both DCI combinations four physical resource blocks are reserved. The maximum modulation scheme is restricted to QPSK.

Following additional rules are applied for TBS selection:

- The Max TBS is restricted to 600 bits (nearest value achievable for I_{TBS} = 9 and N_{PRB} =4, as per table 7.1.7.2.1-1 of TS 36.213 [30]).
- If the scheduled Data cannot fit into Max TBS, SS generates an error (it's a TTCN error). TTCN should gracefully exit the test case as a fatal error, assigning inconclusive verdict.
- Rules in clause 7.3.3.3.1 for DCI combination 1 and clause 7.3.3.3.2 for DCI combination 2 shall be applied.

7.3.3.3.1 RAR with DCI combination 1

TS 36.213 [30], table 7.1.7.2.1-1, rows with I_{TBS} = 0..26 and columns with N_{PRB} = 2 (corresponding to TPC LSB = 0) and 3 (corresponding to TPC LSB = 1) TBS < Max TBS are applicable

Distinct TBSs and all (TPC LSB, I_{TBS}) combinations for each distinct TBS are listed in the sheet.

If a TBS can have two (TPC LSB, I_{TBS}) combinations, the combination with TPC LSB =0 is selected.

RIV(=41) indicates 4 PRBs with index 5..8 are allocated.

7.3.3.3.2 RAR with DCI combination 2

TS 36.213 [30], table 7.1.7.2.1-3 , I_{TBS} = 0..17 with TBS < Max TBS are applicable.

RIV (=15) indicates 4 virtual RBs with index 6..9 allocated. These corresponds to physical RB with index 13, 19, 2, 8 in even slots and 1, 7, 14, 20 in odd slots.

7.3.3.4 Additional rules for UE-dedicated scheduling scheme in normal mode

The UE-dedicated DL scheduling can work in the normal mode or in the explicit mode. The two resource allocation schemes shall be reconfigurable from each other when the UE and SS are not sending and receiving data, for instance, at end of the test preamble and before the beginning of the test body.

The present clause is specified for the use of the normal mode. The explicit mode is referred to clause 7.3.3.6.

The scheme specified in the present clause is applicable for transmission of data dedicated to a UE, mapped to DL-SCH, PDCCH scrambled by C-RNTI/ SPS C-RNTI/ Temp C-RNTI etc. when spatial multiplexing MIMO mode is not configured. The maximum modulation scheme is restricted to 64QAM. For the DCI combination 1, 20 physical resource blocks (5 to 24), and for the DCI combination 2, 17 physical resource blocks are reserved. In the case when three intra frequency cells are applied to the test in the DCI combination 1, for the purpose of interference reduction, only 9 PRBs (16 to 24) are reserved.

The following additional rules are applied for TBS selection:

- Multiple ASPs can also carry same explicit timing information; indicating different ASP payloads, eventually needs to be transmitted in 1 TTI.
- The Max TBS is restricted to 10296 bits (Max supported by UE category type 1).

For the DCI combination 1 with 20 PRBs or DCI combination 2, the TBS 5352, 8248, 8760, 9528 and 10296 are blocked as they result in coding rates higher than 0.93.

For special DCI combination 1 with 9 PRBs, the TBS 2216, 5992 and 6712 are blocked as they result in coding rates higher than 0.93.

The blocked TBS are considered to be not available for selection.

- Data pending for transmission in a given sub-frame consists of (listed in transmission priority order):
  - MAC Control Elements that the SS needs to send.
  - AMD STATUS PDU(s) that the SS needs to send.
  - Data not sent in previous subframe(s).
  - Fresh Data scheduled for transmission in this subframe for all logical channels.
- Distinct TBSs and all (N_{PRB}, I_{TBS}) combinations for each distinct TBS are listed in the sheet.
- If a TBS size can be achieved with more than one combination of I_{MCS} (I_{TBS}) and N_{PRB}:
  - Select combination with lowest delta between N_{PRB} and I_{MCS}.
  - If still more than one combination remain, select combination with highest N_{PRB}.
- Not more than one RLC Data PDU shall be placed in a MAC PDU per logical channel (i.e. minimize RLC segmentation).
- In a subframe, in case there is data pending for transmission from more than one logical channel, for each type of data pending for transmission as defined above, priority shall be given to the logical channel with the lowest logical channel priority value. In case of more than one logical channel with the same logical channel priority value, these logical channels should be served equally. Data pending for transmission from more than one logical channel will rarely happen for the signalling and protocol test.
- Data not transmitted within a subframe is scheduled as pending for transmission in the next available subframe according to the priorities given above. Pending data for transmission will rarely happen for the signalling and protocol test.
- TBS selected in a context by various platforms shall be within an allowed deterministic tolerance of:
  - 2 bytes for potential Timing Advance Command MAC Control Element (1 byte data + 1 byte MAC sub header).
  - 4 bytes each for AMD STATUS PDU (2 bytes data + 2 bytes MAC subheader).
  - Therefore in the worst case the SS may add up to (2 + 4 x N_{AMRB}) bytes to the data scheduled for transmission in a certain subframe, where N_{AMRB} is the number of AM radio bearers (SRB or DRB) actively sending DL data in the test, in any subframe.
- For DCI combination 1 RIV is calculated based on physical resource blocks corresponding to N_{PRB} of the selected TBS and (N_{PRB}, I_{TBS}) combination. The physical resource blocks that can be allocated are the first N_{PRB} resources of index range 5..24.
- For DCI combination 2, RBG assignment is calculated based on physical resource blocks corresponding to N_{PRB} of the selected TBS and (N_{PRB}, I_{TBS}) combination. The physical resource blocks that can be allocated are RBG1(2,3), RBG3(4,5), RBG5(8,9), RBG6(10,11), RBG8(14,15), RBG9(16,17), RBG10(20,21), RBG11(22,23) & RBG12(24). If N_{PRB} is even, the first N_{PRB} /2 RBGs are allocated. If N_{PRB} is odd, then first (N_{PRB} -1)/2 RBGs and RBG 12 are allocated.

7.3.3.5 DL Resource allocation bitmaps

7.3.3.5.1 DCI combination 1

Table 7.3.3.5.1-1: Physical resource allocation bitmap for DCI combination 1 with 20 PRBs

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BCCH																									
PCCH																									
RAR																									
UE-Dedicated																									

Table 7.3.3.5.1-2: Physical resource allocation bitmap for DCI combination 1 with 9 PRBs

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BCCH																									
PCCH																									
RAR																									
UE-Dedicated																									

7.3.3.5.2 DCI combination 2

Table 7.3.3.5.2-1: Physical resource allocation bitmap for DCI combination 2

N_{PRB}	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
BCCH-Even	0						1						2						3						
BCCH-Odd	2						3						0						1						
PCCH-Even		4						5																	
PCCH-Odd														4						5					
RAR-Even			8						9					6						7					
RAR-Odd		6						7							8						9				
UE-Dedicated																									

NOTE: Odd and even refer to slots.

7.3.3.6 UE-dedicated scheduling scheme in explicit mode

This scheme applies to MIMO configurations or to non-MIMO configuration where the normal mode scheduling scheme is inappropriate.

SS is configured with an exact TBS (modulation and coding scheme, I_{mcs}, and number of resource blocks, N_{prb}) to use.

Other parameters, such as the HARQ process number and redundancy version to use for each transmission, are also configured by the TTCN.

All data scheduled for a certain subframe shall be transmitted in the single indicated subframe, using configured parameters. The TTCN shall ensure that the configured parameters are consistent, in particular that the scheduled data size and the configured TBS match each other.

It is **FFS** how the SS shall handle scheduled transmissions colliding with MAC Control Elements or AMD STATUS PDUs, scheduled independently by the SS.

7.4 Cell Configurations

7.4.1 Cell Configuration Types

Three cell configurations are defined in 3GPP TS 36.508 [3] clause 6.3.3: Full Cell, Minimum Uplink Cell and Broadcast Only Cell; however the TTCN always considers all cells as Full Cells, and thus always provides the complete cell configuration parameters.

The SS may:

- always configure a cell as a 'Full Cell' based on the complete information; or
- configure the cell based on the 'CellConfig_Type' flag taking only the required configuration parameters and ignoring the others.

For a given value of the 'CellConfig_Type' flag, the TTCN shall:

- For Full Cell Configuration:
  - expect normal SS behaviour.
- For Minimum Uplink Cell Configuration:
  - Configure the SS to report Preamble detection.
  - Assign verdicts based on the PRACH Preamble Indications.
  - Consume any uplink SRB0 messages (if the SS is configured as a Full Cell).
- For Broadcast Only Cell Configuration:
  - Not configure the SS to report Preamble detection.
  - Consume any uplink SRB0 messages (if the SS is configured as a Full Cell).

7.4.2 Cell Power Change

To set and adjust the cell power at the two test ports, Reference Power and Attenuation, are provided in the record Reference Power.

The field Reference Power is only set when the cell is created and is not updated during the test case execution. The SS applies the Reference Power when the cell is fully configured.

To adjust the power level in the test case, the field Attenuation is used. After intitial configuration of a cell the attenuation corresponds to the value "off". Power attenuation of one or several cells can be configured at the same time according to the time instances for power level changes specified in TS 36.523-1 [1]. Power level changes shall be done within a maximum of 100 ms (10 frames).

When adjusting the power level in the test case, separate templates will be used in order to improve code readability.

The SS shall ensure the power level at the test ports conform to the required downlink signal levels specified in clause 6.2.2.1 of TS 36.508 [3].

7.4.3 E-UTRAN cell identity

7.4.3.1 Timing parameters of cells

For RRC and Idle mode test, the timing parameters in table 7.4.3.1-1 is applied. The specification of Cell 1 - Cell 23 can be found in TS 36.508 [3].

Table 7.4.3.1-1: Timing parameters of FDD simulated cells

cell ID	SFN offset	Tcell (*Ts*)
Cell 1	0	0
Cell 2	124	30 720
Cell 3	257	150 897
Cell 4	1 000	61 440
Cell 6	657	524
Cell 10	129	43 658
Cell 11	957	92 160
Cell 12	1 015	181 617
Cell 13	890	31 244
Cell 14	680	300 501
Cell 23	383	212 337

Table 7.4.3.1-2 is applied to the NAS test when more than one PLMN exists in a test case. Further cell parameters can be found in table 7.4.4-1.

Table 7.4.3.1-2: Timing parameters of FDD simulated cells for NAS TCs in different PLMNs

cell ID	SFN offset	Tcell (*Ts*)
Cell A	0	0
Cell B	124	30 720
Cell C	257	61 400
Cell D	1 000	92 160 (see note)
Cell E	657	92 160 (see note)
Cell F	129	122 880 (see note)
Cell G	957	631
Cell H	1 015	31 351
Cell I	890	127 200
Cell J	680	1 327
Cell K	383	157 920
Cell L	562	188 640
Cell M	471	122 880 (see note)
NOTE: Avoid coexistence of Cell F and cell M at the same time, and of Cell E and Cell D at the same time; otherwise shifting radio frame transmission timing of intra-frequency cells by 1 subframe (in terms of Tcell) cannot be applied.		

Figure 7.4.3.1-1 illustrates shifting DL transmission timing offset by Tcell = 1 subframe, between multiple NAS FDD cells on the same frequency (table 7.4.4-1) in the same PLMN.

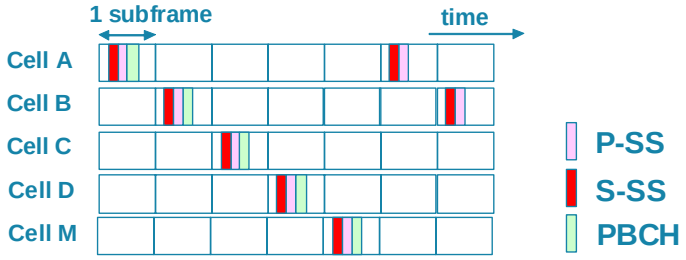

Figure 7.4.3.1-1: Timing offset between FDD cells on the same frequency

Table 7.4.3.1-3 is applied to the NAS test when all NAS cells in a test case belong to the same PLMN. Further cell parameters can be found in table 7.4.4-2.

Table 7.4.3.1-3: Timing parameters of FDD simulated cells for NAS TCs in same PLMN

cell ID	SFN offset	Tcell (*Ts*)
Cell A	0	0
Cell B	124	30 720
Cell C	257	150 897
Cell D	1 000	61 440
Cell E	657	524
Cell F	129	181 617
Cell G	NA	NA
Cell H	NA	NA
Cell I	NA	NA
Cell J	NA	NA
Cell K	NA	NA
Cell L	NA	NA
Cell M	471	31 244

Shifting radio frame trasmission timing by one subframe can eliminate the following interference between the FDD intra frequency cells:

- P-SS/S-SS to P-SS/S-SS, RS, PBCH, PCFICH, PDCCH and PHICH.
- PBCH to PBCH.
- PBCH to PCFICH, PDCCH and PHICH.
- PDSCH to PCFICH, PDCCH, PHICH.

For TDD cells, the SFN offset is applied and the Tcell shall be set to 0.

7.4.4 Cell configurations for NAS test cases

Table 7.4.4-1: Cell identifiers for NAS test cases in different PLMNs

NAS cell ID	PLMN acc. to TS 36.508 [3]	Frequency	E-UTRAN Cell Identifier		Physical layer cell identity
			eNB Identifier	Cell Identity	
Cell A	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0000 0001'B	1
Cell B	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0000 0010'B	2
Cell C	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0000 0011'B	3
Cell D	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0000 0100'B	4
Cell E	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0000 0110'B	6 (see note)
Cell F	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0001 0010'B	18 (see note)
Cell G	MCC = MCC in USIM MNC=02	f2	'0000 0000 0000 0010 0010'B	'0000 1011'B	11
Cell H	MCC= MCC in USIM MNC=02	f2	'0000 0000 0000 0010 0010'B	'0000 1100'B	12
Cell I	MCC=002 MNC=101	f3	'0000 0000 0000 0010 0011'B	'0000 1101'B	13
Cell J	MCC=003 MNC=101	f4	'0000 0000 0000 0010 0100'B	'0000 1110'B	14
Cell K	MCC=002 MNC=101	f3	'0000 0000 0000 0010 0011'B	'0000 1111'B	15
Cell L	MCC=002 MNC=101	f3	'0000 0000 0000 0010 0011'B	'0001 0000'B	16
Cell M	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0010 0001'B	'0001 0001'B	17
NOTE: Avoid co-existance of Cell E and Cell F at the same time, otherwise shifting of PCI for reduction interference of intra-frequency cells cannot be acheived.					

Table 7.4.4-2: Cell identifiers for NAS test cases in same PLMN

NAS cell ID	PLMN acc. to TS 36.508 [3]	Frequency	E-UTRAN Cell Identifier		Physical layer cell identity
			eNB Identifier	Cell Identity	
Cell A	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0001 0001'B	'0000 0001'B	1
Cell B	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0001 0001'B	'0000 0010'B	2
Cell C	MCC/MNC= MCC/MNC in USIM	f2	'0000 0000 0000 0001 0010'B	'0000 0011'B	3
Cell D	MCC/MNC= MCC/MNC in USIM	f1	'0000 0000 0000 0001 0001'B	'0000 0100'B	4
Cell E	MCC/MNC= MCC/MNC in USIM	f3	'0000 0000 0000 0001 0011'B	'0000 0110'B	6
Cell F	MCC/MNC= MCC/MNC in USIM	f2	'0000 0000 0000 0001 0010'B	'0001 0010'B	18
Cell G	MCC = MCC in USIM MNC=02	NA	NA	NA	NA
Cell H	MCC= MCC in USIM MNC=02	NA	NA	NA	NA
Cell I	MCC=002 MNC=101	NA	NA	NA	NA
Cell J	MCC=003 MNC=101	NA	NA	NA	NA
Cell K	MCC=002 MNC=101	NA	NA	NA	NA
Cell L	MCC=002 MNC=101	NA	NA	NA	NA
Cell M	MCC/MNC= MCC/MNC in USIM	f3	'0000 0000 0000 0010 0001'B	'0001 0001'B	17

The allocation of Physical layer cell identifiers to the individual cells is according to (*PCI mode 6*) being differential for the cells working on the same radio frequency. The way of PCI allocation can reduce the inteference between the intra-frequency cells for reference signal to reference signal, PCFICH to PCFICH and PHICH to PHICH. The definition of Cell A - Cell M can be found in TS 36.508 [3].

7.4.5 Configuration of Multi-Cell Environment

When there is more than one EUTRA cell in a test case the following rules are applied in TTCN:

- At the beginning of the preamble, before initial attachment of the UE, all EUTRA cells are configured but switched off.
- In the preamble only the serving cell is switched on; all other cells remain switched off.
- At the end of the preamble the cells are configured according to the initial power level settings (T0) of the test case.

The mapping of cells to physical resources and management of the physical resources are out of TTCN scope. The following principles can be applied to the system simulator:

- Cells being switched off need not to be mapped to physical resources.
- When a cell is switched off mapping to a physical resource may be kept and reused when the cell is switched on again.
- When a cell is switched on it can either already been mapped to a physical resource or it needs to be mapped to a free resource.
- When there are less physical resources than cells it is up to SS implementation to find strategies to dynamically map the cells to the resources.

Independent from the strategies being used the system simulator shall obey timing restrictions for changing power-levels of one or several cells as stated in clause 7.4.2.

7.5 FDD vs. TDD Considerations

LTE options of FDD and TDD will be contained in the same common FDD and TDD test cases, similar to the prose in TS 36.523-1 [1].

7.5.1 FDD vs. TDD implementation

FDD/TDD differences are introduced in the common FDD and TDD test cases using branches at a low level in the test case. The branches are used either:

- to assign a variable;
- to implement a different behaviour;
- to change an FDD or TDD parameter in a template sent to the UE or SS.

The mode under test (FDD or TDD) is based on the value of the bands under test.

7.6 Suppression of RLC Acknowledgements

Two different modes, both applicable per radio bearer, are defined as:

- General suppression:
  - If this mode is activated, no RLC acknowledgements will be generated by the SS. This mode can be switched on and will persist until it is switched off. Afterwards the SS will continue handling the RLC acknowledgements as normal.
- One time suppression
  - If this mode is activated, no RLC acknowledgement will be generated by SS for the next RLC message data PDU received. Once this has been done, the SS continues handling RLC acknowledgements as normal.

7.7 System information

7.7.1 System information broadcasting

The rules for the transmission of BCCH messages are specified in 3GPP TS 36.331 [19], clause 5.2. The current clause provides the implementation guidelines.

The ASPs SYSTEM_CTRL_REQ and SYSTEM_CTRL_CNF are used as interface to SS; the following rules apply:

- The complete system information are provided to SS by using a single ASP.
- SS starts 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 subframeOffset in SYSTEM_CTRL_REQ indicates the exact point in time in the SI window at which SS shall start the transmission of the related SI.
- SS shall set the systemFrameNumber in the MIB to the 8 most significant bits of the SFN. A dummy value is provided by TTCN.
- The system information is sent to SS using the asn.1 types, SS shall encode in unaligned PER and add the necessary padding bits as specified in TS 36.331 [19] clause 9.1.1.1.

7.7.2 Scheduling information

The maximum number of resource blocks as defined in table 7.7.2-1 are used to broadcast the system information.

Table 7.7.2-1: Maximum number of resource blocks

	Maximum number of resource blocks assigned
SIB1	4
for all SIs	4

The subframe offset values used for SI messages are according to table 7.7.2-2.

Table 7.7.2-2: SubframeOffset values

Scheduling Information No. Acc to TS 36.508 [3], clause 4.4.3.1.2	subframeOffset
SI1	1
SI2	3
SI3	3
SI4	7

All SystemInformations are sent only once within the SI-window.

7.7.3 System information modification

For system information modification, the same rules as defined in clause 7.7.1 are applied.

The SFN for the start of modification period is calculated by TTCN. The modified sysinfo and the calculated SFN are provided in the ASP SYSTEM_CTRL_REQ.

7.8 Timers

A timer is set at the beginning of each test case to guard against system failure. Behaviour on expiry of this guard timer shall be consistent for all test cases.

A watchdog timer can be specified for receive statements in order to reduce blocking time when a test case has already failed.

In idle mode operations, an idle mode generic timer is specified for receive statements if the test case specification does not explicitly specify a wait time for the specific test step or test purpose. The expiry of this idle mode generic timer is at least 6 minutes to safely cover most test scenarios.

The watchdog timer and the idle mode generic timer are only to be used inside the test case test body; if the timer expires a fail verdict is applied.

It is the TTCN responsibility to ensure that appropriate timer values are being used.

Tolerances (as described in TS 36.508 [3]) are not applicable to guard timers, idle mode generic timers and watchdog timers.

7.9 Error Indication

There are several situations on lower layer in which SS shall raise an error rather than trying to resolve the problem. This is done by sending a SystemIndication.Error to the test case. SS shall raise an error, e.g. in the following cases:

- RLC retransmission requeste by the UE.
- Paging, System information exceeds max. number of resource blocks.
- Configuration: max. number of resource blocks specified for a channel exceeds system bandwidth.

- When in User-Plane a DL PDCP PDU or SDU not fitting into one TTI is sent with Harq Process being explicitly specified futher error conditions are specified in annex D.

8 External Function Definitions

The following external functions are required to be implemented by the SS:

TTCN-3 External Function		
Name	**fx_KeyDerivationFunction**	
Description	Hashing function for Hashing algorithms as defined in TS 33.401 [24] SHA-256 encoding algorithm is used as KEY Description Function	
Parameters	KDF	KDF_HMAC_SHA_256 (no other KDF defined yet)
	Key	256 bit key
	String	string being constructed acc. to TS 33.401 [24], annex A
Return Value	256 bit derived key	

TTCN-3 External Function		
Name	**fx_NasIntegrityAlgorithm**	
Description	Apply integrity protection algorithm on a given octetstring	
Parameters	NAS PDU	octetstring
	Integrity Algorithm	3 bits as defined in TS 24.301 [21], clause 9.9.3.23
	$KNAS_{int}$	Integrity key
	NAS COUNT	as documented in TS 24.301
	BEARER Id	fix value ('00000000'B) acc. TS 33.401 [24], clause 8.1
	Direction	UL: 1 DL: 0 (acc. to TS 24.301 [21], clause 9.5)
Return Value	Message Authentication Code (4 octets)	

TTCN-3 External Function		
Name	**fx_NasCiphering**	
Description	Apply ciphering on a given octetstring	
Parameters	NAS PDU	octetstring
	Ciphering Algorithm	3 bits as defined in TS 24.301 [21], clause 9.9.3.23
	$KNAS_{enc}$	Ciphering Key
	NAS COUNT	as documented in TS 24.301
	BEARER Id	fixed value ('00000000'B) acc. TS 33.401 [24], clause 8.1
Return Value	ciphered octet string	

TTCN-3 External Function		
Name	**fx_NasDeciphering**	
Description	Apply deciphering on a given octetstring	
Parameters	ciphered NAS PDU	octetstring
	Ciphering Algorithm	3 bits as defined in TS 24.301 [21], clause 9.9.3.23
	$KNAS_{enc}$	Ciphering Key
	NAS COUNT	as documented in TS 24.301 [21]
	BEARER Id	fixed value ('00000000'B) acc. TS 33.401 [24], clause 8.1
Return Value	deciphered octet string	

TTCN-3 External Function		
Name	**fx_GetCurrentTestcaseName**	
Description	external function giving back the name of the test case currently running	
Parameters	None	
Return Value	char string	

9 IXIT Proforma

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

Text in *italics* is a comment for quidance for the production of an IXIT, and is not to be included in the actual IXIT.

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.

9.1 E-UTRAN PIXIT

Table 9.1-1 E-UTRAN PIXIT

Parameter Name	Parameter Type	Default Value	Supported Values	Description
px_eAuthRAND	B128_Type	oct2bit('A3DE0C6D363E30C364A4078F1BF8D577'O)		Random Challenge
px_eDLChannelBandwidth	Dl_Bandwidth_Type	n25		dl E-UTRAN Channel Bandwidth
px_eJapanMCC_Band6	NAS_Mcc	'442'H		Japan MCC code to be used for Band 6. The same value will be used for E-UTRAN and Inter-RAT cells. Type is different to that defined in TS 34.123-3 [7].
px_ePrimaryFrequencyBand	FrequencyBand_Type	1		E-UTRAN primary frequency band
px_eSecondaryFrequencyBand	FrequencyBand_Type	2		E-UTRAN secondary frequency band
px_eULChannelBandwidth	Ul_Bandwidth_Type	n25		ul E-UTRAN Channel Bandwidth
px_NAS_CipheringAlgorithm	B3_Type	001'B		NAS Ciphering Algorithm
px_NAS_IntegrityProtAlgorithm	B3_Type	001'B		NAS Integrity Algorithm
px_RRC_CipheringAlgorithm	CipheringAlgorithm	eea0		Ciphering Algorithm
px_RRC_IntegrityProtAlgorithm	IntegrityProtAlgorithm	eia1		Integrity Algorithm
px_AccessPointName	octetstring			Access Point Name
px_IP_Address	charstring			IP Address (either IPv4 or IPv6, according to px_IPv4Or6)
px_SupportedEutraBands	integer	1		Number of supported E-UTRA operating bands (TS 36.101 [34], table 5.5-1)
px_SupportedInterRatBands	integer	1		Number of supported InterRAT bands

Annex A (normative):
Test Suites

Annex B (informative): Style Guides

B.1 Introduction

This annex is based on the style guide given in TS 34.123-3 [7], annex E but the language for UE conformance tests is TTCN-3.

B.2 General Requirements for TTCN-3 Implementations

The TTCN-3 implementation for UE conformance tests shall be based on the following general design considerations:

- Even though it is not reflected in TTCN-3 anymore in UE conformance tests ASPs and PDUs will still be distinguished. This has impact on type definitions and naming conventions.
- In general, templates for UE conformance tests shall be separated for sending and receiving.
- All local variables shall be declared at the beginning of a function
- The purpose of the test case implementation is conformance testing.
- The common RAN5 approval process needs to be considered.

The TTCN-3 implementation for UE conformance tests shall fulfil the following requirements.

The implementation shall:

- follow ES 201 873-1 [13] (TTCN-3 Core Language) and ES 201 873-4 [27] (TTCN-3 Operational Semantics);
- be independent from interface specifications like TRI (ES 201 873-5 [28]) and TCI (ES 201 873-6 [29]) as well as from proprietary approaches;
- not use or rely on tool dependent features;
- support maintainability and extendibility;
- follow the naming conventions as defined below.

Further requirements:

- Usage of external functions should be avoided.
- Type definitions:
  - Existing ASN.1 type definitions contained in protocol specifications are imported from the respective standards. All other type definitions shall be done within TTCN-3.

B.3 Naming Conventions

Even though these are being used for TTCN-3 the naming conventions provided in the present document are mainly backward compatible to TTCN-2 as defined in TS 34.123-3 [7].

B.3.1 Prefixes and Restrictions for TTCN-3 Objects

Table B.3.1: Prefixes used for TTCN-3 objects

TTCN object	Initial Letter	Prefix/ Postfix	Comment
TTCN module	upper case	(none)	
TTCN group	upper case	(none)	
function parameter	upper case	p_	
function running on a component	upper case	f_	
local function (tree) not to be used by other modules	upper case	fl_	local function not to be used by other modules
external function	upper case	fx_	
Altstep	upper case	a_	(including defaults)
test case selection expression			name as specified in TS 36.523-2 [2] shall be used
global constant	upper case	tsc_	(see note 1)
local constant	upper case	const_	local constant being defined in a function
Enumerated		(none)	there are no restrictions regarding enumerated types
type definition	upper case	_Type	(see note 7)
local variable	upper case	v_	(see note 6)
global (component) variable	upper case	vc_	(see note 2)
port type	upper case		
port name	upper case		
local timer	upper case	t_	
ASP template	upper case	cas_ cads_ car_ cadr_	send ASP modified (derived) send ASP receive ASP modified (derived) receive ASP
PDU template	upper case	cs_ cds_ cr_ cdr_	send PDU modified (derived) send PDU receive PDU modified (derived) receive PDU (see note 3)
CM template	upper case	cms_ cmr_	send coordination message receive coordination message
Template (neither ASP nor PDU nor CM)	upper case	cs_ cds_ cr_ cdr_ crs_	send template modified (derived) send template receive template modified (derived) receive template templates for IEs used in both directions (see note 5)
test suite parameter (PICS)	upper case	pc_	
test suite parameter (PIXIT)	upper case	px_	
test case		TC_	(see note 4)

NOTE 1: Global constants may be defined differently in imported modules (e.g. without any prefix and with lower case initial letter).
NOTE 2: Global variables or timers are those defined within the TTCN-3 components. They are visible to all the functions run in the component.
NOTE 3: Base template may have a second prefix:
- 508: PDU as defined in TS 36.508 [3];
- 108: PDU as defined in TS 34.108 [8].

NOTE 4: Test case names will correspond to the clause in the prose that specifies the test purpose. E.g. TC_8_1.
NOTE 5: Applicable only in case of "quasi-constant" definitions, e.g. to define a (constant) random pattern to be used for sending and receiving when the UE is configured in loopback mode.
NOTE 6: Counter variables do not need to have a prefix.
NOTE 7: Exceptions for type definitions:
- ASP names are fully upper case letters and typically have postfix "_REQ", "_CNF" or "_IND".
- RRC protocol type definitions are extracted and imported from TS 36.331/25.331 and are therefore out of scope.
- NAS protocol type definitions follow the names provided in the tabular notion of the standards and therefore do not have a "_Type" postfix.

B.3.4 Identifiers consisting of more than one Name

When identifiers are a concatenation of several words the words shall start with capital letters:

e.g.:. "px" + "Cell" + "A" + "Cell" + "Id" -> px_CellACellId.

Further details are described in TS 34.123-3 [7], clause E.2.1.

B.4 Implementation Issues

B.4.1 Control part

Even though the control part may not be used in a test campaign but be overruled by the test management system it is used to provide the following information:

- All test cases contained in the test suite.
- For each test case:
  - Test case selection expression.

For maintenance reasons it shall be possible to generate the control part automatically by an appropriate tool.

B.4.2 Top Level Test Case Definitions

The top level test case definitions run on the MTC exclusively. The tasks of these test case definitions are generally the same for each test case:

- Start guard timer.
- Create PTCs.
- Connect PTCs.
- Start PTCs.
- Wait for PTCs having finished.

Additionally the MTC may host the upper tester but this is left open to implementation.

For maintenance reasons it shall be possible to generate the top level test case definitions defined for the MTC automatically by an appropriate tool. To achieve this, the name of a function to be started on particular PTC need derived from the test case name:

e.g. the function for PTC_A in testcase TC_XX_YY_ZZ shall be f_TC_XX_YY_ZZ_A.

Cells are created in an off-state in the preambles of the corresponding PTCs while UE is in the switched off-state.

B.4.3 Inter Component Communication

Communication between PTCs or PTCs and the MTC can be done by messages or by build-in mechanisms as *done* and *kill*. For maintenance reasons and extendibility the inter component communication shall be encapsulated by TTCN-3 implementation.

B.4.4 Encoding Information

For UE conformance tests several encoding rules need to be applied by the TTCN-3 codec. Even though the codec is out of scope of the present document there are aspects with impact on TTCN-3 implementation depending on different type definitions.

Table B.4.4-1

Type definitions	Encoding
ASN.1 types used for RRC signalling	ASN.1 PER
ASN.1 types used by NAS protocols	ASN.1 BER
NAS types	Tabular notated (see note)
DRB Types	Tabular notated (see note)
GPRS Padding	see TS 34.123-3, clause 6.10.2.9.1
GSM Spare Padding	see TS 34.123-3, clause 6.10.2.9.2
LowHigh Rule	see TS 34.123-3, clause 6.10.2.9.3
SACCHSysInfo Spare Padding	see TS 34.123-3, clause 6.10.2.9.5
TTCN-3 types not used at the air interface: - Configuration of system simulator - Coordination between components - Types used internally in TTCN-3	(no specific encoding required)
NOTE: Tabular notated is performed by concatenation of all the present fields in the TTCN-3 template.	

Encoding information may be provided and supported in TTCN-3 by grouping of type definitions and using the *encode* attribute.

B.4.5 Verdict Assignment

In general the following rules shall be applied.

Table B.4.5-1

Verdict	
Pass	shall be assigned for each step defined in the prose of the test case
Fail	shall be assigned due to unexpected behaviour in the body of a test case
Inconc	shall be assigned due to unexpected behaviour outside the body of a test case or in case of TTCN-3 programming errors (e.g. missing *case* in *select* statement)

B.4.6 Default Behaviour

As experience from UMTS conformance tests there shall be one standard default behaviour for each component.

The following rules shall be applied:

- The standard default behaviour is activated during initialisation of the respective component.
  In normal cases a TTCN writer does not need to care about the default.
- In general there is only one default behaviour activated (i.e. the standard default behaviour).
- The standard default behaviour shall cover all ports and timers of the component.
- Whenever possible deviations from the standard default behaviour shall be implemented locally rather than by introducing a new default behaviour.

If for exceptional cases the standard default behaviour needs to be replaced by another default behaviour or another default behaviour needs to be activated on top, the TTCN writer is responsible:

- to avoid side effects;
- to restore the standard behaviour.

B.4.7 Templates for Sending and Receiving

Templates used for sending and receiving shall be separated in general:

- A template shall be either for sending or for receiving; this shall be reflected in the prefix of the identifier.
- Send templates shall use no receive templates and vice versa.
- All parameters of a send template shall be restricted to:
  - values;
  - template (value);
  - template (omit).
- Parameters of receive templates may allow wildcards. They can be:
  - values;
  - unrestricted template parameters;
  - template parameters restricted to be present.
- The only exception to the above rule is for "quasi-constant" definitions, as described in note 5 of table B.3.1. Otherwise, even when the same datas is expected for sending and receiving templates, there shall be different templates and the following rule shall be applied.
- The receive template is assigned the send template e.g.:
  - template My_Type cr_Template := cs_Template
- This results in separate definitions for sending and receiving and improves maintainability.

NOTE 1: For maintenance reasons, a send template shall never be derived from a receive template; and also a receive template shall never be assigned to a send template.

NOTE 2: When a send template is assigned to a receive template, the formal parmeters of the recive template must follow the rules of send templates (i.e. it shall only contain 'template (value)', 'template (omit)' or 'alues only).

B.4.8 Logging

In general no explicit log statements shall be used. As an exception log may be used to report unexpected situations in TTCN-3 like fatal programming error.

B.4.9 Top Level Comments

Comments for functions and altsteps shall be after the function header, rather than before, to allow easier manipulation by tools. Furthermore, nested comments shall be avoided.

B.5 Modularisation

Even though there are no specific rules how to apply modularisation in general some principles can be defined:

- Maintainability and extendibility:
  - Maintainability and extendibility are essential for definition of the modular structure.
- Granularity of modules:
  - Cyclic imports are forbidden in TTCN-3; this has impact on the extendibility:
    - The granularity of modules shall not be too small.
  - Too big modules are hard to handle and may cause increase of compilation time:
    - The granularity of modules shall not be too rough.

NOTE: These are only vague principles since there is no way to define what small or huge modules are.

- General module structure:
  - The following modularisation can be applied independent from the internal structure:
    - Type definitions: TTCN-3, ASN.1.
    - Component definitions.
    - Common Templates: component dependent, component independent.
    - Common behaviour: MTC, PTCs.
    - Test case specific templates.
    - Test case specific behaviour.
- Whether or how these module groups can further be sub-divided is implementation dependent and therefore out of scope of the present document.

Annex C (informative): Design Principles

C.1 ASP Design

All ASPs consist of a common part (defined as a TTCN-3 type) and a specific part.

All ASPs sent by the SS include timing information (SFN, subframe number) in the common part.

Only one ASP is defined per direction per port, but this ASP may contain a union of several sub-ASPs in the specific part.

In general a small number of common ASPs cover all functionality, although other ASPs may be introduced to simplify TTCN-3 implementation and improve readability. Recurrent SS changes, such as power level changes, security activation and MAC scheduling are handled in dedicated ASPs. In addition, special purpose ASPs are used to control special behaviour, for example in L2 tests.

Configuration ASPs re-use ASN.1 definitions defined in the core specs.

No encoding rules are specified for the configuration ASPs; how they are encoded is left up to the SS implementation.

Configuration ASPs are 'procedure-based', rather than 'protocol layer-based' and reflect the state transitions of the SS. The same ASPs are used for reconfiguration and for initial configuration. In the case of reconfiguration the semantics of omit is to keep the configuration as it is; therefore when an IE in a configuration may be left out this is done e.g. by setting the respective field to a special value "None".

Data ASPs for sending/receiving peer-to-peer PDUs and user data all have different ASPs for the different SAPs.

The common part includes (at least):

- Timing Info:
  - SFN.
  - Subframe number (optional).
  - Which timing to use will depend on the test procedure and ASP purpose.
- Control Info:
  - Confirmation Flag.

The RRC ASN.1 IEs used in the specific part of the configuration ASPs:

- are imported using the granularity at the channel structure level or below;
- allow the ASP to be organised according to SS requirements;
- have a name that relates to SS configuration.

The SS specific IEs used in the specific part of the configuration ASPs (i.e. those elements not imported from the RRC ASN.1):

- use a naming convention such that they are easily distinguishable from the RRC ASN.1 IEs;
- are defined in TTCN-3 (i.e. not in ASN.1).

C.2 SS State Model

Figure C.2 shows the basic SS state model. It is basic in the sense that internally the SS may have more states; however, (re)configuration actions (state transitions in the model) should cause the SS to transit between the states defined below.

The following assumptions have been made about this state model:

- It presents a model of states in scope of a single cell. Hence, all configuration activities shall be performed in scope of a single cell.
- It depicts only SS states and SS (re)configuration actions between these states:
  - It does not show events which may trigger state transitions, e.g. L3 messages or procedures - i.e. it is test case and L3 procedure agnostic.
  - It does not show any peer-to-peer (i.e. between SS and UE) messages.
- Triggers for state transitions are always SS configuration messages (ASPs) coming from the test suite:
  - L2 messages coming from the UE can only trigger internal SS sub-state transitions and semi-autonomous procedures.
- L1 and L2 procedures (e.g. random access procedure, scheduling, security activation steps) are semi-autonomously handled by the SS and after being pre-configured do not require interaction with the test case:
  - The majority of test cases do not need to worry about e.g. RA procedure and letting the SS handle it would greatly simplify test case definition and implementation.
  - There may be stringent time requirements in case of some procedures that can be hard to meet in a generic way in the test suite.
  - Semi-autonomous procedures should be flexibly configurable and should have a "manual" mode in which they are handled by the test suite in order to enable testing them. What is the desired level and way of control is FFS.

Most states are stationary states, i.e. the SS can stay in them for a long time or, after performing some procedures, returns to these states. However, there is one state (indicated by dashed lines) which is part of the AS security activation procedure and is transitional, i.e. the SS can only stay in it for a short time until a transition the next stationary state is triggered.

To make the diagram more readable, a separate state called *ANY_STATE* has been introduced, together with some transitions. It shows which transitions are allowed at any point of time in any state.

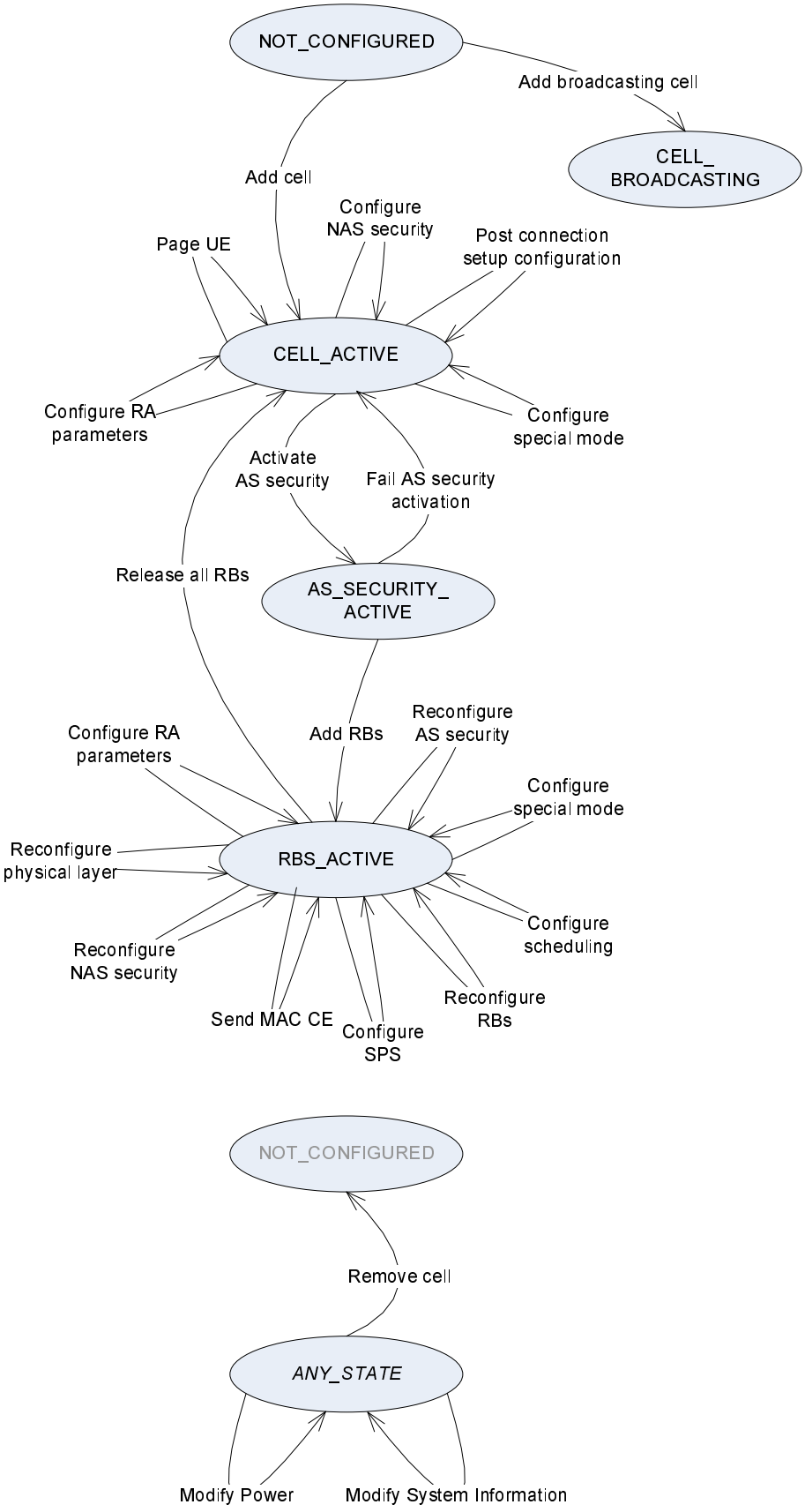

Figure C.2-1: Basic SS state model

Description of states.

Table C.2-1

State	Description
NOT_CONFIGURED	The cell does not exist (is not configured) in the SS
CELL_BROADCASTING	Physical DL channels and signals configured Initial cell configuration done: freq, BW, antennas, MIMO mode, power, etc. Transport and logical channels configured for SI broadcast Cell is broadcasting SI and downlink signals NOTE 1: This type of cell is needed only to serve as a neighbouring cell for measurement purposes, where full cell configuration does not need to be specified. There is no need to be able to promote a broadcasting cell to a full cell. NOTE 2: It is currently open whether a separate cell type with limited PRACH/RACH Rx capability is needed - this depends on whether a justified use case is defined for such a cell type.
CELL_ACTIVE	Cell configured to send and receive data from UE (fully functional) SRB0 defined (default configuration specified in TS 36.508 [3]) SRB1 defined (default configuration specified in TS 36.508 [3])
AS_SECURITY_ACTIVE	The SS has AS security (integrity protection and ciphering) active NOTE: The SS needs to autonomously take care of a temporary state in which integrity protection is applied to an outgoing SMC message, but ciphering is not.
RBS_ACTIVE	SRB2 and/or DRBs are configured for the UE (in addition to SRB0 and SRB1)
ANY_STATE	Represents any of the above states (except NOT_CONFIGURED)

Annex D (normative)
TTCN-3 Definitions

D.1 EUTRA_ASP_TypeDefs

Type definitions for configuration of the system simulator.

Common design principles:

- Semantics of OMIT: for all TTCN-3 type definitions used in ASPs omit means "keep as it is" =>
  - on inital 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.

D.1.1 ASN1_Container

Definitions containing ASN.1 types for backward compatibility.

NOTE 1: PCCH_Message and BCCH_DL_SCH_Message already have a critical extension mechanism by RRC type definition.

NOTE 2: BCCH_BCH_Message contains the MIB and therefore is considered to be not extendable.

NOTE 3: "simple types" are not considered: C_RNTI, PhysCellId, CellIdentity, ARFCN_ValueEUTRA.

TDD_Config_Type

TTCN-3 Union Type		
Name	**TDD_Config_Type**	
Comment		
R8	TDD_Config	

AntennaInfoCommon_Type

TTCN-3 Union Type		
Name	**AntennaInfoCommon_Type**	
Comment		
R8	AntennaInfoCommon	

AntennaInfoDedicated_Type

TTCN-3 Union Type		
Name	**AntennaInfoDedicated_Type**	
Comment		
R8	AntennaInfoDedicated	

PHICH_Config_Type

TTCN-3 Union Type		
Name	PHICH_Config_Type	
Comment		
R8	PHICH_Config	

PRACH_Config_Type

TTCN-3 Union Type		
Name	PRACH_Config_Type	
Comment		
R8	PRACH_Config	

PUCCH_ConfigCommon_Type

TTCN-3 Union Type		
Name	PUCCH_ConfigCommon_Type	
Comment		
R8	PUCCH_ConfigCommon	

PUCCH_ConfigDedicated_Type

TTCN-3 Union Type		
Name	PUCCH_ConfigDedicated_Type	
Comment		
R8	PUCCH_ConfigDedicated	

PUSCH_ConfigCommon_Type

TTCN-3 Union Type		
Name	PUSCH_ConfigCommon_Type	
Comment		
R8	PUSCH_ConfigCommon	

PUSCH_ConfigDedicated_Type

TTCN-3 Union Type		
Name	PUSCH_ConfigDedicated_Type	
Comment		
R8	PUSCH_ConfigDedicated	

SoundingRS_UL_ConfigCommon_Type

TTCN-3 Union Type		
Name	SoundingRS_UL_ConfigCommon_Type	
Comment		
R8	SoundingRS_UL_ConfigCommon	

SoundingRS_UL_ConfigDedicated_Type

TTCN-3 Union Type		
Name	SoundingRS_UL_ConfigDedicated_Type	
Comment		
R8	SoundingRS_UL_ConfigDedicated	

SchedulingRequestConfig_Type

TTCN-3 Union Type		
Name	**SchedulingRequestConfig_Type**	
Comment		
R8	SchedulingRequestConfig	

CQI_ReportConfig_Type

TTCN-3 Union Type		
Name	**CQI_ReportConfig_Type**	
Comment		
R8	CQI_ReportConfig	

RACH_ConfigCommon_Type

TTCN-3 Union Type		
Name	**RACH_ConfigCommon_Type**	
Comment		
R8	RACH_ConfigCommon	

RACH_ConfigDedicated_Type

TTCN-3 Union Type		
Name	**RACH_ConfigDedicated_Type**	
Comment		
R8	RACH_ConfigDedicated	

MeasGapConfig_Type

TTCN-3 Union Type		
Name	**MeasGapConfig_Type**	
Comment		
R8	MeasGapConfig	

PDCP_Config_Type

TTCN-3 Union Type		
Name	**PDCP_Config_Type**	
Comment		
R8	PDCP_Config	

UL_AM_RLC_Type

TTCN-3 Union Type		
Name	**UL_AM_RLC_Type**	
Comment		
R8	UL_AM_RLC	

DL_AM_RLC_Type

TTCN-3 Union Type		
Name	**DL_AM_RLC_Type**	
Comment		
R8	DL_AM_RLC	

UL_UM_RLC_Type

TTCN-3 Union Type		
Name	**UL_UM_RLC_Type**	
Comment		
R8	UL_UM_RLC	

DL_UM_RLC_Type

TTCN-3 Union Type		
Name	**DL_UM_RLC_Type**	
Comment		
R8	DL_UM_RLC	

D.1.2 System_Configuration

Formal ASP Definitions for system configuration.

SystemRequest_Type

TTCN-3 Union Type		
Name	**SystemRequest_Type**	
Comment		
Cell	CellConfigRequest_Type	configure/release a cell
CellAttenuationList	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 100 ms (10 frames) acc. to the tolerances given in TS 36.508 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 eutra_Cell_NonSpecific when there is no activation time
RadioBearerList	RadioBearerList_Type	configure/release one or several SRBs and/or DRBs
EnquireTiming	Null_Type	get SFN and sub-frame number for this cell
AS_Security	AS_Security_Type	StartRestart/Release of AS security
Sps	SpsConfig_Type	to configure/activate or release semi-persistent scheduling
Paging	PagingTrigger_Type	to trigger SS to send paging at the given paging occasion (as calculated in TTCN)
L1MacIndCtrl	L1Mac_IndicationControl_Type	to configure SS to generate indications for L1/MAC events
PdcpCount	PDCP_CountReq_Type	to set or enquire PDCP COUNT for one ore more RBs
L1_TestMode	L1_TestMode_Type	to Set L1/MAC in special Test modes eg. DL CRC, PHICH etc
PdcchOrder	RA_PDCCH_Order_Type	to configure SS to transmit a PDCCH order with configured C-RNTI to the UE to trigger RA procedure; result in DCI Format 1A transmission as in clause 5.3.3.1.3 of TS 36.212

SystemConfirm_Type

TTCN-3 Union Type		
Name	**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	SFN and sub-frame number are included in the TimingInfo
AS_Security	Null_Type	(no further parameters from SS)
Sps	Null_Type	(no further parameters from SS)
Paging	Null_Type	normally not needed but defined for completeness
L1MacIndCtrl	Null_Type	(no further parameters from SS)
PdcpCount	PDCP_CountCnf_Type	as response to 'Get' a list is returned containing COUNT information for the requested RBs
L1_TestMode	Null_Type	confirmation for L1 test mode
PdcchOrder	Null_Type	confirmation for PDCCH Order

SystemIndication_Type

TTCN-3 Union Type		
Name	**SystemIndication_Type**	
Comment		
Error	Null_Type	indicates an error situation in SS; does not explicitly to be handled in TTCN but shall cause an INCONC due to default behaviour; a possible error code shall be signalled in the common part of the ASP
RachPreamble	RachPreamble_Type	RACH preamble being sent by the UE
SchedReq	Null_Type	indication for scheduling request sent by the UE
BSR	BSR_Type	to report the Buffer status report being received
UL_HARQ	HARQ_Type	to report the UL HARQ as received on PUCCH[TTI] for corresponding DL transmission in TTI-x, where x is normally 4; it is FFS if we need some indiction on the HARQ process ID
C_RNTI	C_RNTI	indicates C-RNTI being contained in a MAC PDU sent by the UE
PHR	PHR_Type	to report the Power headroom report received

D.1.3 Cell_Configuration

Specific Info for Cell Configuration Primitive.

D.1.3.1 Cell_Configuration_Common

EUTRA_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_CellAttenuation_Off	Attenuation_Type	{Off:=true}	

Cell_Configuration_Common: Basic Type Definitions

TTCN-3 Basic Types		
EUTRA_FDD_Info_Type	Null_Type	no further parameters defined for FDD
EutraBand_Type	integer (1..40)	E-UTRA Band acc. to TS 36.101, clause 5.2 (common for UL/DL)
CfiValue_Type	integer (1..3)	
AbsoluteCellPower_Type	integer (-145..0)	absolute cell power (dBm)
InitialAttenuation_Type	Attenuation_Type (tsc_CellAttenuation_Off)	Attenuation restricted to 'Off'
ToRS_EPRE_Ratio_Type	integer (-35..0)	any-resource-element to RS ratio in dB (e.g. PDSCH-to-RS ratio; see TS 36.213, clause 5.2)

CellConfigRequest_Type

TTCN-3 Union Type		
Name	**CellConfigRequest_Type**	
Comment		
AddOrReconfigure	CellConfigInfo_Type	for cell configuration - CellId identifier of the cell to be configured RoutingInfo None TimingInfo Now (for initial configuration and for reconfiguration in general) ControlInfo CnfFlag:=true; FollowOnFlag:=false (in general)
Release	Null_Type	to remove a cell completely - CellId identifier of the cell to be configured RoutingInfo None TimingInfo Now ControlInfo CnfFlag:=true; FollowOnFlag:=false (in general)

CellConfigInfo_Type

TTCN-3 Record Type			
Name	**CellConfigInfo_Type**		
Comment	common information for initial cell configuration or reconfiguration; in case of reconfiguration OMIT means 'keep configuration as it is'		
Basic	BasicCellConfig_Type	opt	basic information for a cell (e.g. broadcasting)
Active	ActiveCellConfig_Type	opt	add. configuration for active cell (i.e. cell being capable to receive RACH preamble)

CellConfigCapability_Type

TTCN-3 Enumerated Type	
Name	**CellConfigCapability_Type**
Comment	capabilities af a cell acc. to the initial condition of a test case
broadcastOnlyCell	no detection of RACH preables required; cell is only broadcasting
minimumUplinkCell	detection of RACH preables required but not any further RX capability
fullCell	full TX and RX capabilities

BasicCellConfig_Type

TTCN-3 Record Type			
Name	**BasicCellConfig_Type**		
Comment			
ConfigCapability	CellConfigCapability_Type	opt	mandatory for the initial configuration; to be omitted afterwards
StaticCellInfo	StaticCellInfo_Type	opt	Common information which does not change during a test
PhysicalLayerConfigDL	PhysicalLayerConfigDL_Type	opt	default settings regarding physical control channels: PCFICH, PHICH, PDCCH
InitialCellPower	InitialCellPower_Type	opt	reference cell power for the RS of each antenna in DL NOTES: - the power of the RS of an antenna may be reduced by antenna specific configuration - since in general the power may be adjusted on a per resource element basis all physical channel/signal power settings shall be ajusted 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 adjusted by just changing the reference power
BcchConfig	BcchConfig_Type	opt	configuration of BCCH/BCH; SS is triggered to configure RLC/MAC regardingly; BCCH data on the PDSCH is distiguished by the SI-RNTI PBCH: MIB; PDSCH: scheduling and resource allocation; SIBs
PcchConfig	PcchConfig_Type	opt	configuration of PCCH/PCH; SS is triggered to configure RLC/MAC regardingly; PCCH data on the PDSCH is distiguished by the P-RNTI (needed even to modify SI => shall be configured for CELL_BROADCASTING)

ActiveCellConfig_Type

TTCN-3 Record Type			
Name	**ActiveCellConfig_Type**		
Comment			
C_RNTI	C_RNTI	opt	(pre-)configured C-RNTI; affects scrambling of PDSCH/PUSCH and CRC of PDCCH(s); shall be used implicitly in RACH procedure (i.e. as CE in RAR)
PhysicalLayerConfigUL	PhysicalLayerConfigUL_Type	opt	parameters for PRACH, PUCCH, PUSCH
RachProcedureConfig	RachProcedureConfig_Type	opt	to configure the SS's behaviour for the RACH procedure
CcchDcchDtchConfig	CcchDcchDtchConfig_Type	opt	Parameters related to CCCH/DCCH/DTCH in UL and DL

StaticCellInfo_Type

TTCN-3 Record Type			
Name	**StaticCellInfo_Type**		
Comment	Common information which (normally) does not change during a test; therefore all fields are mandatory		
Common	CommonStaticCellInfo_Type		
Downlink	DownlinkStaticCellInfo_Type		
Uplink	UplinkStaticCellInfo_Type	opt	NOTE: For TDD UL and DL are using the same parameters

CommonStaticCellInfo_Type

TTCN-3 Record Type			
Name	**CommonStaticCellInfo_Type**		
Comment	information common for UL and DL; all fields are mandatory		
RAT	EUTRA_RAT_Type		FDD or TDD; FDD/TDD specific parameters
PhysicalCellId	PhysCellId		N(cell, ID): imported from core spec; -> cell specific reference signals (non-MBSFN) -> scrambling of all DL physical channels: PBCH, PCFICH, PDCCH, PHICH and PDSCH (together with nRNTI)
eNB_CellId	CellIdentity	opt	Placeholder for Cell identity (28 bits): eNB (20 bits) and cell identity (8 bits). The use of that field is FFS
EutraBand	EutraBand_Type		NOTE: - in 3G there are overlapping bands therefore the band needs to be provided; - in EUTRA it is provided as well to be extendable in the future
CellTimingInfo	CellTimingInfo_Type		

EUTRA_TDD_Info_Type

TTCN-3 Record Type			
Name	**EUTRA_TDD_Info_Type**		
Comment			
Configuration	TDD_Config_Type		TDD_Config acc. to RRC ASN.1 (acc. TS 36.331, clause 6.3.2)

EUTRA_HalfDuplexFDD_Info_Type

TTCN-3 Record Type	
Name	**EUTRA_HalfDuplexFDD_Info_Type**
Comment	FFS; guard period ???

EUTRA_RAT_Type

TTCN-3 Union Type		
Name	**EUTRA_RAT_Type**	
Comment	specifies RAT type and frame structure (TS 36.211, clause 4)	
FDD	EUTRA_FDD_Info_Type	
TDD	EUTRA_TDD_Info_Type	
HalfDuplexFDD	EUTRA_HalfDuplexFDD_Info_Type	

CellTimingInfo_Type

TTCN-3 Record Type			
Name	**CellTimingInfo_Type**		
Comment	Cell Timing		
Tcell	integer (0..307199)		frame duration Tf = 307 200 * Ts = 10 ms; System Time Unit Ts = 1/(15 000 * 2 048)
SfnOffset	integer (0..1023)		(assuming 10 bit SFN)

DownlinkStaticCellInfo_Type

TTCN-3 Record Type			
Name	**DownlinkStaticCellInfo_Type**		
Comment	DL Static Info		
Earfcn	ARFCN_ValueEUTRA		DL-EARFCN as defined in 36.101
Bandwidth	Dl_Bandwidth_Type		N(DL, RB) = 6..110 (6, 15, 25, 50, 75, 100)
RBSize	EUTRA_RBSize_Type		may be skipped assuming normal sub-carrier spacing => N(RB, SC) = 12
CyclicPrefix	EUTRA_CyclicPrefix_Type		

UplinkStaticCellInfo_Type

TTCN-3 Record Type			
Name	**UplinkStaticCellInfo_Type**		
Comment	UL Static Info		
Earfcn	ARFCN_ValueEUTRA		UL-EARFCN as defined in 36.101
Bandwidth	Ul_Bandwidth_Type		N(DL, RB) = 6..110 (6, 15, 25, 50, 75, 100)
CyclicPrefix	EUTRA_CyclicPrefix_Type		

EUTRA_RBSize_Type

TTCN-3 Enumerated Type	
Name	**EUTRA_RBSize_Type**
Comment	Resource Block Size in freq domain; N(RB,SC) is 12 for normal sub-carrier spacing
n_RB_SC_12	
n_RB_SC_24	

EUTRA_CyclicPrefix_Type

TTCN-3 Enumerated Type	
Name	**EUTRA_CyclicPrefix_Type**
Comment	NOTE: In DL extended cyclic prefix depends on sub-carrier spacing (may cyclic prefix be different for UL/DL ??)
normal	
extended	

Modulation_Type

TTCN-3 Enumerated Type	
Name	**Modulation_Type**
Comment	'unused' e.g. for 2nd codeword when there is no spatial multiplexing
unused	
qpsk	
qam16	
qam64	

Attenuation_Type

TTCN-3 Union Type		
Name	**Attenuation_Type**	
Comment	attenuation of the reference power	
Value	integer (0..144)	-> cell power reference power reduced by the given attenuation (value is in dB)
Off	Null_Type	even though in 36.508 a value of -145dBm is given for a non suitable cell we specify an explicit "Off" value here

ToRS_EPRE_Ratios_Type

TTCN-3 Record Type			
Name	**ToRS_EPRE_Ratios_Type**		
Comment	RA and RB ratios according to see TS 36.213, clause 5.2		
RA	ToRS_EPRE_Ratio_Type	opt	
RB	ToRS_EPRE_Ratio_Type	opt	

InitialCellPower_Type

TTCN-3 Record Type			
Name	**InitialCellPower_Type**		
Comment			
MaxReferencePower	AbsoluteCellPower_Type		maximum value of cell reference power (dBm); a cell is initialised with this reference power; its value is the upper bound of the cell power during the test case
Attenuation	InitialAttenuation_Type		initial attenuation

D.1.3.2 Downlink_Physical_Layer_Configuration

Downlink physical layer configuration:

- DL antenna configuration.
- Control region (PCFICH, PHICH, PDCCH).
- Primary/secondary sync signals.
- Power control for physical channels and signals.

D.1.3.2.1 Antenna_Configuration

Antenna_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
AntennaPortId_Type	integer (0, 1, 2, 3)	

AntennaPortInfo_Type

TTCN-3 Record Type			
Name	**AntennaPortInfo_Type**		
Comment	Note: for conformance tests it may not be necessary to consider propagation pathes for different antennas; => for the first step this type may be reduced to be of Null_Type; FFS		
PowerAttenuation	Dummy_Type		even though in a real network eNb shall send with the same power on all antennas at the UE there may be different signal strength => RS will have reduced power Note: the EPRE ratios (e.g. PDSCH-to-RS ratio) are assumed to be equal for all antennas
PropagationDelay	Dummy_Type		signal from different antennas may have different propagation delay

AntennaPortConfig_Type

TTCN-3 Union Type		
Name	**AntennaPortConfig_Type**	
Comment		
AddOrReconfigure	AntennaPortInfo_Type	add / re-configure antenna port
Release	Null_Type	release antenna port

AntennaPort_Type

TTCN-3 Record Type			
Name	**AntennaPort_Type**		
Comment			
Id	AntennaPortId_Type		
Config	AntennaPortConfig_Type		

DownlinkAntennaGroupConfig_Type

TTCN-3 Record Type			
Name	**DownlinkAntennaGroupConfig_Type**		
Comment			
AntennaInfoCommon	AntennaInfoCommon_Type		acc. to TS 36.331, clause 6.3.2; contains antennaPortsCount = an1, an2, an4; static parameter; will (normally) not be modified whilst a test; Note: information is redundant since number of antenna ports may implicitly be determined by the number of ports being configured
AntennaPort	record length (1..4) of AntennaPort_Type		1, 2 or 4 antennas; from the UE's point of view each antenna may have a different power level and a different propagation delay

D.1.3.2.2 Physical_Channels

PbchConfig_Type

TTCN-3 Record Type			
Name	**PbchConfig_Type**		
Comment			
RelativeTxPower	ToRS_EPRE_Ratios_Type	opt	power ratio for PBCH's resource elements relative to the RS

PcfichConfig_Type

TTCN-3 Record Type			
Name	**PcfichConfig_Type**		
Comment			
CfiValue	CfiValue_Type	opt	control format indicator signalled on PCFICH
RelativeTxPower	ToRS_EPRE_Ratios_Type	opt	power ratio for PFCICH's resource elements relative to the RS

PhichConfig_Type

TTCN-3 Record Type			
Name	**PhichConfig_Type**		
Comment			
PhichConfig	PHICH_Config_Type	opt	parameters acc. TS 36.331, clause 6.3.2: phich-Duration, phich-Resource; may have impact on Cfi
RelativeTxPower	ToRS_EPRE_Ratios_Type	opt	power ratio for PHICH's resource elements relative to the RS

CCE_StartIndex_DL_UL_Type

TTCN-3 Record Type			
Name	**CCE_StartIndex_DL_UL_Type**		
Comment	CCE_St_Ind' or CCE_St_Ind" acc. to table 7.1.1-1 in 36.523-3		
CCE_StartIndex_DL	integer		
CCE_StartIndex_UL	integer		

CCE_StartIndexList_Type

TTCN-3 Record of Type	
Name	**CCE_StartIndexList_Type**
Comment	describes PDCCH candidates for all sub-frames
record length(10) of CCE_StartIndex_DL_UL_Type	

PdcchCandidate_Type

TTCN-3 Record Type			
Name	**PdcchCandidate_Type**		
Comment	CCE start indeces for a given RNTI value acc. to table 7.1.1-1 in 36.523-3		
RNTI	C_RNTI		RNTI value as per table 7.1.1-1
CCE_StartIndexList	CCE_StartIndexList_Type		CCE Start Indices corresponding to the RNTI

PdcchCandidateList_Type

TTCN-3 Record of Type	
Name	**PdcchCandidateList_Type**
Comment	list of RNTIs and their corresponding CCE Start Indices
record of PdcchCandidate_Type	

PdcchConfig_Type

TTCN-3 Record Type			
Name	**PdcchConfig_Type**		
Comment	UE performs blind detection for common and UE specific search spaces for different aggregation levels (PDCCH formats acc. TS 36.211, clause 6.8.1) content of the PDCCHs (DCI formats acc. TS 36.212, clause 5.3.3) shall be controlled together with scheduling and resource allocation		
CommonSearchSpaceFormat	integer (2, 3)	opt	PDCCH format for common search space; acc. to TS 36.213, clause 9.1.1 only aggregation level 4 and 8 are allowed (i.e. PDCCH format 2 and 3
UeSpecificSearchSpaceFormat	integer (0, 1, 2, 3)	opt	UE specific search space: corresponding aggregation levels 1, 2, 4, 8
PdcchCandidateList	PdcchCandidateList_Type	opt	PDCCH candidate list acc. to table 7.1.1-1 in TS 36.523-3
RelativeTxPower	ToRS_EPRE_Ratios_Type	opt	power ratio for PDCCH's resource elements relative to the RS

PdschRelativeTxPower_Type

TTCN-3 Record Type			
Name	**PdschRelativeTxPower_Type**		
Comment	NOTE 1: The power control for the PDSCH is assumed to be (semi-)static for signalling conformance tests acc. to TS 36.323; nevertheless for different channels and purposes with the PDSCH there may be different power settings. NOTE 2: Acc. to TS 36.213, clause 5.2 the EPRE ratio is different in time domain for OFDM symbols containing or not containing reference signals; this needs to be considered by SS.		
RachResponse	ToRS_EPRE_Ratios_Type	opt	
BcchOnPdsch	ToRS_EPRE_Ratios_Type	opt	
PcchOnPdsch	ToRS_EPRE_Ratios_Type	opt	
CcchDcchDtch	ToRS_EPRE_Ratios_Type	opt	

PdschConfig_Type

TTCN-3 Record Type			
Name	**PdschConfig_Type**		
Comment			
RelativeTxPower	PdschRelativeTxPower_Type	opt	

D.1.3.2.3 Physical_Signals

PrimarySyncSignal_Type

TTCN-3 Record Type			
Name	**PrimarySyncSignal_Type**		
Comment			
RelativeTxPower	ToRS_EPRE_Ratios_Type	opt	power ratio for PSS's resource elements relative to the RS

SecondarySyncSignal_Type

TTCN-3 Record Type			
Name	**SecondarySyncSignal_Type**		
Comment			
RelativeTxPower	ToRS_EPRE_Ratios_Type	opt	power ratio for PSS's resource elements relative to the RS

SRS_UL_Config_Type

TTCN-3 Record Type			
Name	**SRS_UL_Config_Type**		
Comment			
Common	SoundingRS_UL_ConfigCommon_Type		
Dedicated	SoundingRS_UL_ConfigDedicated_Type		

PhysicalLayerConfigDL_Type

TTCN-3 Record Type			
Name	**PhysicalLayerConfigDL_Type**		
Comment	all fields are declared as optional to allow single reconfigurations; in this case omit means "keep as it is"		
AntennaGroup	DownlinkAntennaGroupConfig_Type	opt	
Pbch	PbchConfig_Type	opt	
Pcfich	PcfichConfig_Type	opt	
Phich	PhichConfig_Type	opt	
Pdcch	PdcchConfig_Type	opt	
Pdsch	PdschConfig_Type	opt	
Pss	PrimarySyncSignal_Type	opt	
Sss	SecondarySyncSignal_Type	opt	

D.1.3.3 Uplink_Physical_Layer_Configuration

Uplink physical channel configuration: PRACH, PUCCH, PUSCH and UL RS

PUCCH_Configuration_Type

TTCN-3 Record Type			
Name	**PUCCH_Configuration_Type**		
Comment			
Common	PUCCH_ConfigCommon_Type	opt	
Dedicated	PUCCH_ConfigDedicated_Type	opt	

PUSCH_Configuration_Type

TTCN-3 Record Type			
Name	**PUSCH_Configuration_Type**		
Comment			
Common	PUSCH_ConfigCommon_Type	opt	
Dedicated	PUSCH_ConfigDedicated_Type	opt	

SS_TimingAdvanceConfig_Type

TTCN-3 Union Type		
Name	**SS_TimingAdvanceConfig_Type**	
Comment		
InitialValue	RACH_TimingAdvance_Type	initial value corresponding to what is sent to the UE in RACH response (range acc. 11 bit value; 0 in normal cases)
Relative	TimingAdvanceIndex_Type	timing advance command to adjust changes of timing advance acc. to TS 36.213, clause 4.2.3; (range acc. 6 bit value: -31..32)

PhysicalLayerConfigUL_Type

TTCN-3 Record Type			
Name	**PhysicalLayerConfigUL_Type**		
Comment			
Prach	PRACH_Config_Type	opt	parameters acc. TS 36.331, clause 6.3.2; in general depending on FDD/TDD (see TS 36.211, clause 5.7)
Pucch	PUCCH_Configuration_Type	opt	parameters acc. TS 36.331, clause 6.3.2
Pusch	PUSCH_Configuration_Type	opt	parameters acc. TS 36.331, clause 6.3.2 (including configuration of RS)
TimingAdvance	SS_TimingAdvanceConfig_Type	opt	to adjust timing advance; in normal test cases timing advance is configured as 0 at the beginning and never changed during the test case; in some MAC test cases timing advance may be configured to a non-zero (11 bit value) at the beginning and modified by (6 bit) timing advance commands during the test
SRS_UL_Config	SRS_UL_Config_Type	opt	sounding reference symbol (SRS); -> TS 36.213, clause 8.2, TS 36.211, clause 5.5.3
SR_Config	SchedulingRequestConfig_Type	opt	PUCCH resources for scheduling requests acc. to TS 36.213, table 10.15; as signalled to the UE acc. to TS 36.331, clause 6.3.2
CQI_ReportConfig	CQI_ReportConfig_Type	opt	

D.1.3.4 Common_MAC_Configuration

Transport channel and MAC related procedures and configuration

Common_MAC_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
Imcs_Type	integer (0..31)	Modulation and coding scheme index coding
TimingAdvanceIndex_Type	integer (0..63)	acc. to TS 36.321, clause 6.1.3.5 "Timing Advance Command MAC Control Element" and TS 36.213, clause 4.2.3 "Transmission timing adjustments"
TimingAdvance_Period_Type	integer (400, 600, 1 020, 1 530, 2 040, 4 090, 8 190)	corresponding to 80 % of TimeAlignmentTimer (acc. to TS 36.523-3, clause 7.2) (TS 36.331, clause 6.3.2: sf500, sf750, sf1280, sf1920, sf2560, sf5120, sf10240) rounded to nearest multiple of 10

RedundancyVersionList_Type

TTCN-3 Record of Type	
Name	**RedundancyVersionList_Type**
Comment	Note: in general the list shall contain maxHARQ-Tx elements; if there are not enough elements specified SS shall raise an error; per default the list is configured to 0,2,3,1,0
record length (1..28) of RedundancyVersion_Type	

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 (-1,1..infinity)	duration of the grant period (TTI=1ms)

TransmissionRepitition_Type

TTCN-3 Union Type		
Name	**TransmissionRepitition_Type**	
Comment		
Continuous	Null_Type	
NumOfCycles	integer (1..infinity)	

PUCCH_AutoSynch_Type

TTCN-3 Record Type			
Name	**PUCCH_AutoSynch_Type**		
Comment			
TimingAdvance	TimingAdvanceIndex_Type		
TA_Period	TimingAdvance_Period_Type		time period after which TA MAC control elements need to be automatically transmitted
TA_Repitition	TransmissionRepitition_Type		number of TA MAC control element repititions to be automatically transmitted or 'Continuous'

PUCCH_Synch_Type

TTCN-3 Union Type		
Name	**PUCCH_Synch_Type**	
Comment		
None	Null_Type	no PUCCH Synchronisation applied
Auto	PUCCH_AutoSynch_Type	SS automatically maintains PUCCH synchronization at UE

FreqDomainSchedulCommon_Type

TTCN-3 Record Type			
Name	**FreqDomainSchedulCommon_Type**		
Comment	common type to specify restrictions for frequency domain scheduling by a start index and a maximum range of RBs; in general the resource allocation refers to virtual resource blocks: format 1A (localised): FirstRbIndex refers to the first physical RB; the RBs are subsequent (upto MaxRbCnt RBs); may be applied for all kind of channels format 1C (distributed): FirstRbIndex refers to the first virtual RB; the virtual RBs are subsequent (upto MaxRbCnt RBs) but mapped (distributed) to physical resource; typically applied on BCCH, PCCH and RAR format 1 (localised): FirstRbIndex refers to the first physical RB; RBs are not consecutive; SS needs to provided bitmap of RBs (see 36.523-3) to cope with mapping of virtual resource allocation (format 1C) applied on other channels; typically there are either - all channels having format 1A (localised) - BCCH, PCCH and RAR having format 1C (distributed) + DTCH/DCCH having format 1		
FirstRbIndex	integer		index of the first (vitual) resource block in frequency domain; 0 .. N(UL/DL, RB) - 1; note: DCI format 1C refers to a virtual RB allocation i.e. the resource block index differs from the physical resource allocation where the RBs are distributed over the whole frequency bandwidth (TS 36.213, clause 7.1.6.3)
MaxRbCnt	integer		max. number of resource blocks to be assigned; FirstRbIndex + MaxRbCnt <= N(UL/DL, RB); SS shall not assigned more than the given resource blocks to the respective channel (i.e. MaxRbCnt is the upper bound); if the the configuration for a channel exceeds the total bandwidth this is a TTCN error (=> SS shall raise an error)

FreqDomainSchedulExplicit_Type

TTCN-3 Record Type			
Name	**FreqDomainSchedulExplicit_Type**		
Comment	type used for explicit DL scheduling; Nprb is the exact nunber of RBs whereas in FreqDomainSchedulCommon_Type MaxRbCnt is the upper bound		
FirstRbIndex	integer		index of the first resource block in frequency domain; 0 .. N(UL/DL, RB) - 1
Nprb	integer		number of resource blocks to be assigned;

PdcchDciFormat_Type

TTCN-3 Enumerated Type	
Name	**PdcchDciFormat_Type**
Comment	DCI format acc. to TS 36.212, clause 5.3.3.1; SS shall apply physical parameters accordingly as specified in TS 36.508, clause 4.3.6
dci_0	physical layer parameters acc. TS 36.508, table 4.3.6.1.1-1
dci_1	physical layer parameters acc. TS 36.508, table 4.3.6.1.2-1
dci_1A	physical layer parameters acc. TS 36.508, table 4.3.6.1.3-1
dci_1B	
dci_1C	physical layer parameters acc. TS 36.508, table 4.3.6.1.4-1
dci_1D	
dci_2	physical layer parameters acc. TS 36.508, table 4.3.6.1.5-1
dci_2A	physical layer parameters acc. TS 36.508, table 4.3.6.1.6-1
dci_3	
dci_3A	

PdcchResourceAllocation_Type

TTCN-3 Enumerated Type	
Name	**PdcchResourceAllocation_Type**
Comment	Resource allocation acc. TS 36.213, clause 7.1.6
ra_0	
ra_1	
ra_2_Localised	=> physical and virtual RB index are identical
ra_2_Distributed	=> virtual resource allocation

DciDlInfoCommon_Type

TTCN-3 Record Type			
Name	**DciDlInfoCommon_Type**		
Comment	used for normal DL scheduling acc. to TS 36.523-3, clause 7.3		
Format	PdcchDciFormat_Type		BCCH, PCCH and RACH Response: 1A or 1C (TS 36.213, clause 7.1) CCCH: 1A since transmission mode is not (may not be) configured at the UE yet (TS 36.213, clause 7.1) DTCH/DCCH: depending on transmission mode
ResourceAllocType	PdcchResourceAllocation_Type		depends on DCI format, e.g. ra_2_Localised or ra_2_Distributed for DCI format 1A
Modulation_1stCW	Modulation_Type		max. modulation scheme for the 1st code word; depending on the amount of data a lower modulation scheme may be by SS but not a higher one; BCCH, PCCH and RACH Response: QPSK only
Modulation_2ndCW	Modulation_Type		modulation scheme for 2nd code word in case of spatial multiplexing; can be different than 1st code word (see TS 36.211, clause 6.3.2; TS 36.212, clause 5.3.3.1.5); 'unused' when there is no spatial multiplexing
FreqDomainSchedul	FreqDomainSchedulCommon_Type		index of 1st RB; max. number of RBs per TTI; note: in case of DCI format 1C the first RB index has no meaning since distributed virtual resource blocks assigned in this case (TS 36.213, clause 7.1.6.3)
RedundancyVersionList	RedundancyVersionList_Type		list of Redundancy version to be used in case of retransmission the number of elements in the list provides the maxHARQ-Tx

DciDlInfoExplicit_Type

TTCN-3 Record Type			
Name	**DciDlInfoExplicit_Type**		
Comment	used for explicit DL scheduling acc. to TS 36.523-3, clause 7.3		
Imcs	Imcs_Type		MCS index of table 8.6.1-1 of TS 36.213
Format	PdcchDciFormat_Type		
ResourceAllocType	PdcchResourceAllocation_Type		
FreqDomainSchedul	FreqDomainSchedulExplicit_Type		
RedundancyVersionList	RedundancyVersionList_Type		list of Redundancy version to be used in case of retransmission the number of elements in the list provides the maxHARQ-Tx

DciDlInfo_Type

TTCN-3 Union Type		
Name	**DciDlInfo_Type**	
Comment		
Auto	DciDlInfoCommon_Type	SS shall chose the appropriate TBS up to the maximim number of resource blocks
Explicit	DciDlInfoExplicit_Type	used in MAC or RAB tests where exact TBS needs to be specified

DciUlInfo_Type

TTCN-3 Record Type			
Name	**DciUlInfo_Type**		
Comment			
Imcs	Imcs_Type		MCS index of table 8.6.1-1 of 36.213
RedundancyVersionList	RedundancyVersionList_Type		list of Redundancy version to be used in case of retransmission the number of elements in the list provides the maxHARQ-Tx
ToggleNDI	boolean		By default it shall be TRUE meaning toggled every fresh transmission; Combination of one entry in RV List and ToggleNDI can be used in MAC tests
FreqDomainSchedul	FreqDomainSchedulExplicit_Type		

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'
NoOfRepititions	TransmissionRepitition_Type		number of UL Grant repititions to be automatically transmitted or continuous repitition

UL_GrantConfig_Type

TTCN-3 Union Type		
Name	**UL_GrantConfig_Type**	
Comment		
OnSI_Reception	Null_Type	SS tranmits UL Grant as configured by CommonDciInfoUL_Type at every reception of SI; to be used in non L2 Test
Periodic	PeriodicGrant_Type	SS tranmits UL Grant as configured by CommonDciInfoUL_Type periodically; to be used in L2 tests; MAC tests testing Grants might set the period as infinite and num grant as 1
None	Null_Type	disable any grant transmission

D.1.3.5 Random_Access_Procedure

EUTRA_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_RandomAccessResponseListSize	integer	10	FFS; maybe even greater than maximum value of PREAMBLE_TRANS_MAX: in case of RACH in idle, UE will keep on making RACH attempts until t300 expires

Random_Access_Procedure: Basic Type Definitions

TTCN-3 Basic Types		
RACH_TimingAdvance_Type	integer (0..2047)	11 bit timing advance as used in RACH response (absolute value)

UplinkGrant_Type

TTCN-3 Record Type			
Name	**UplinkGrant_Type**		
Comment	TS 36.213, clause 6.2		
HoppingFlag	B1_Type		Hopping flag
RB_Allocation	B10_Type		Fixed size resource block assignment
ModAndCodScheme	B4_Type		Truncated modulation and coding scheme
TPC_Command	B3_Type		TPC command for scheduled PUSCH
UL_Delay	B1_Type		UL delay
CQI_Req	B1_Type		CQI request

ContentionResolution_ContainedRlcPdu

TTCN-3 Union Type		
Name	**ContentionResolution_ContainedRlcPdu**	
Comment		
RlcPdu	octetstring	octetstring of an RLC PDU containing e.g. the RRC Connection Setup to be sent in the same MAC PDU as the MAC Contention Resolution Control Element
None	Null_Type	MAC PDU containing the MAC Contention Resolution Control Element does not contain an RLC PDU (i.e. RRC Connection Setup is sent in another PDU)

TCRNTI_ContentionResolutionMacPdu_Type

TTCN-3 Record Type			
Name	**TCRNTI_ContentionResolutionMacPdu_Type**		
Comment			
XorMask	ContentionResolutionId_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)
ContainedRlcPdu	ContentionResolution_ContainedRlcPdu		the MAC PDU containing the MAC Contention Resolution Control Element may contain the RRC Connection Setup; in this case the RRC PDU shall be completely encoded been contained in an RLC PDU

TCRNTI_ContentionResolutionCtrl_Type

TTCN-3 Union Type		
Name	**TCRNTI_ContentionResolutionCtrl_Type**	
Comment	when the UE responds on a Random Access Response with a RRC Connection Request on CCCH and not with a C-RNTI SS shall assume initial Random Access Procedure (see TS 36.300, clause 10.1.5.1), i.e. sends a ContentionResolutionId back to the UE	
MacPdu	TCRNTI_ContentionResolutionMacPdu_Type	MAC PDU containing the Contention Resolution ID and optionally an RRC PDU (RRC Connection Setup)
MacPdu_CRC_Error	TCRNTI_ContentionResolutionMacPdu_Type	same as MacPdu (see above), but final PDU transmitted will contain CRC bits (0-3) being toggled (causing a CRC error); no retransmissions shall be made as UE shall not send a NACK
NoContResolID	Null_Type	SS shall not include contention resolution ID (i.e. no MAC PDU shall be sent) Used for contention resolution fail case

CRNTI_ContentionResolutionCtrl_Type

TTCN-3 Union Type		
Name	**CRNTI_ContentionResolutionCtrl_Type**	
Comment	configuration for Random Access Procedure in RRC_CONNECTED (see TS 36.300, clause 10.1.5.1); when SS receives C-RNTI MAC element sent by the UE after Random Access Response, SS shall deal with the C-RNTI as specified in this structure	
Automatic	Null_Type	before expiry of the contention resolution timer SS shall automatically address PDCCH using C-RNTI as sent by the UE
None	Null_Type	Used in case of dedicated preamble transmission or to simulate failure cases; SS shall not address PDCCH using C-RNTI => expiry of contention resolution timer on UE side

ContentionResolutionCtrl_Type

TTCN-3 Union Type		
Name	**ContentionResolutionCtrl_Type**	
Comment	Note: SS only needs to consider one kind of contention resolution at one time; in the initial configuration of a cell TCRNTI_Based shall be configured and the common assuption is that in RRC_CONNECTED normally there are no RACH procedures (i.e. no CRNTI_Based configuration needed) whereas in case of handover scenarios CRNTI_Based shall be configured	
TCRNTI_Based	TCRNTI_ContentionResolutionCtrl_Type	TCRNTI based contention resolution (e.g. initial access), hence involves inclusion contention resolution identity in DL message 4 of RACH procedure
CRNTI_Based	CRNTI_ContentionResolutionCtrl_Type	CRNTI based contention resolution (e.g. in case UE is being in RRC_CONNECTED): hence uplink message in step 3 [of RACH procedure] is followed by PDCCH transmission with UE C-RNTI to end procedure

RapIdCtrl_Type

TTCN-3 Union Type		
Name	**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

TempC_RNTI_Type

TTCN-3 Union Type		
Name	**TempC_RNTI_Type**	
Comment		
SameAsC_RNTI	Null_Type	in the RA response SS shall use the same C-RNTI as configured in ActiveCellConfig_Type; this is useful for initial random access
Explicit	C_RNTI	in the RA response SS shall use different value as configured in ActiveCellConfig_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

RandomAccessResponseParameters_Type

TTCN-3 Record Type			
Name	**RandomAccessResponseParameters_Type**		
Comment	paramenters to control content of RAR sent to the UE		
RapId	RapIdCtrl_Type		to control Random Access Preamble Id to be sent back to the UE; used in RAR MAC sub-header
InitialGrant	UplinkGrant_Type		initial UL grant
TimingAdvance	RACH_TimingAdvance_Type		timing advance: granularity of 0.52 micro sec (16*Ts); see TS 36.300, clause 5.2.7.3, TS 36.321, clause 6.1.3.5; NOTE: Timing advance has impact not only on the RA procedure; SS in general needs to adjust its timing accordingly
TempC_RNTI	TempC_RNTI_Type		NOTE: For initial Random Access Procedure at network (SS) side there is no temporary C-RNTI: network assigns the C-RNTI which is used by any UE as being temporary; the UE which 'wins' the contention resolution keeps the (temporary) C-RNTI other UEs need to repeat the RACH procedure; => at the SS the 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)

RarList_Type

TTCN-3 Record of Type	
Name	**RarList_Type**
Comment	in general MAC PDU may contain one or several RARs; normally only one RAR is contained
record of RandomAccessResponseParameters_Type	

RandomAccessResponse_Type

TTCN-3 Union Type		
Name	**RandomAccessResponse_Type**	
Comment		
None	Null_Type	used for unsuccessful RA procedure
List	RarList_Type	normally one RAR to be sent to the UE; in general there can be more than one RAR

RandomAccessBackoffIndicator_Type

TTCN-3 Union Type		
Name	**RandomAccessBackoffIndicator_Type**	
Comment		
None	Null_Type	normal case, no back off indicator included
Index	integer (0..15)	Backoff Parameter values acc. TS 36.321, clause 7.2; values 0..12 are defined, 13..15 may be used in error case

RandomAccessResponseCtrl_Type

TTCN-3 Record Type			
Name	**RandomAccessResponseCtrl_Type**		
Comment	configuration for Random Access Response mapped to DL-SCH mapped to PDSCH TransmissionMode: single antenna mode when there is only one antenna configured, transmit diversit else; RNTI: RA-RNTI (TS 36.321, clause 7.1); if both RAR msg and backoff indicator are 'None' SS shall not respond on RAP		
DciInfo	DciDlInfoCommon_Type		DCI format: 1A or 1C (TS 36.213, clause 7.1) ResourceAllocType: 2 (acc. to DCI format) Modulation: QPSK Frequency domain schedule: index of 1st RB; max. number of RBs per TTI
Rar	RandomAccessResponse_Type		RAR to be sent to the UE
BackoffInd	RandomAccessBackoffIndicator_Type		possible backoff indicator; 'None' for normal cases

RandomAccessResponseConfig_Type

TTCN-3 Union Type		
Name	**RandomAccessResponseConfig_Type**	
Comment		
Ctrl	RandomAccessResponseCtrl_Type	contains information to control sending of RAR
Ctrl_CRC_Error	RandomAccessResponseCtrl_Type	same as Ctrl (see above), but final PDU transmitted will contain CRC bits (0-3) being toggled; no retransmissions shall be made as UE shall not send a NACK
None	Null_Type	to be used when there is no RAR to be sent at all

RachProcedure_Type

TTCN-3 Record Type			
Name	**RachProcedure_Type**		
Comment			
RAResponse	RandomAccessResponseConfig_Type		control of how the SS shall react on RA preamble; this may be - the RAP id as expected by the UE - a RAP id not matching to the UE's RAP - a backoff indicator - nothing at all
ContentionResolutionCtrl	ContentionResolutionCtrl_Type		

RachProcedureList_Type

TTCN-3 Record of Type	
Name	**RachProcedureList_Type**
Comment	to simulate RACH procedure with one or more than one attempt by the UE: 1. Normal cases: one single RandomAccessResponse is sent to the UE matching the UE's RACH preamble contention resolution is successful immediately => list contains only one element which is used for any RA procedure 2. Special cases: there are upto tsc_RandomAccessResponseListSize preambles sent by the UE => there are upto tsc_RandomAccessResponseListSize responses to be configured as elements of the list; SS shall start with the first element in the list and use the RAR as specified in this element; if the RAR matches at the UE side the UE will send UL data and contention resolution is performed as configured for this element; if the RAR does not match the UE sends another RAP and SS continues with the next element in the list; in this case the contention resolution of the respective element is not used; if the end of the list is reached and further RACH preambles are sent by the UE SS shall repeatively apply the last element of the list (this is necessary because there might be not enough time to reconfigure SS after the end of the list has been reached and there shall be well-defined behaviour after the list has been processed); to change from a special mode to normal mode the RachProcedureList is reconfigured by TTCN to achieve transparency and readability of the code; Note: when there are RACH_ConfigDedicated configured (see below) and the RA preamble matches with one the configured ones the contention resolution ctrl is obsolete (non contention based random access procedure)
record length(1..tsc_RandomAccessResponseListSize) of RachProcedure_Type	

RachProcedureConfig_Type

TTCN-3 Record Type			
Name	**RachProcedureConfig_Type**		
Comment	parameters to control the random access procedure; TS 36.321, clause 5.1		
RACH_ConfigCommon	RACH_ConfigCommon_Type	opt	acc. TS 36.331, clause 6.3.2; may not be necessary for SS; omit: "keep as it is"
RACH_ConfigDedicated	RACH_ConfigDedicated_Type	opt	acc. TS 36.331, clause 6.3.2; when random access preamble sent by the UE matches with the configured one SS shall assume the random access procedure being non-contention based; initial configuration: no RACH_ConfigDedicated are configured; omit means "keep as it is"
RachProcedureList	RachProcedureList_Type	opt	in normal cases there is one element which is used for any RA procedure; special cases are used in MAC test cases; omit means "keep as it is"

D.1.3.6 System_Information_Control

Primitive to configuration BCCH/BCH.

System_Information_Control: Basic Type Definitions

TTCN-3 Basic Types		
BcchToPbchConfig_Type	Null_Type	place holder for BCCH mapped to BCH mapped to PBCH: MIB using fixed scheduling (periodicity: 40 ms); transmission mode: single antenna port configuration (layer mapping acc. TS 36.211, clause 6.3.3.1) or transmit diversity (layer mapping acc. TS 36.211, clause 6.3.3.3) depending on antenna configuration

Sib1Schedul_Type

TTCN-3 Record Type			
Name	**Sib1Schedul_Type**		
Comment	SIB1: fixed scheduling in time domain acc. TS 36.331, clause 5.2.1.2 (periodicity: 80ms; repetitions every 20 ms)		
DciInfo	DciDlInfoCommon_Type	opt	DCI format: 1A or 1C (TS 36.213, clause 7.1) ResourceAllocType: 2 (acc. to DCI format) Modulation: QPSK Frequency domain schedule: index of 1st RB; max. number of RBs per TTI

SingleSiSchedul_Type

TTCN-3 Record Type			
Name	**SingleSiSchedul_Type**		
Comment	specifies scheduling for a single SI in freq and time domain		
DciInfo	DciDlInfoCommon_Type	opt	DCI format: 1A or 1C (TS 36.213, clause 7.1) ResourceAllocType: 2 (acc. to DCI format) Modulation: QPSK Frequency domain schedule: index of 1st RB; max. number of RBs per TTI
SubframeOffset	integer	opt	offset within the SI-window; NOTE: SI-window may span more than one frame

SiSchedul_Type

TTCN-3 Record Type			
Name	**SiSchedul_Type**		
Comment	specifies for a specific SI scheduling and repititions within as SI window		
Periodicity	SiPeriodicity_Type	opt	
Window	record of SingleSiSchedul_Type	opt	NOTE: acc. to TS 36.331, clause 5.2.1.2 the same SI may occur more than once in an SI-window; to allow this there is a "record of" even though acc. to TS 36.508, clause 4.4.3.3 all SIs are sent only once within the window

SiSchedulList_Type

TTCN-3 Record of Type	
Name	**SiSchedulList_Type**
Comment	
record length(1..maxSI_Message) of SiSchedul_Type	

AllSiSchedul_Type

TTCN-3 Record Type			
Name	**AllSiSchedul_Type**		
Comment			
WindowLength	SiWindowLength_Type	opt	to calculate start of each SI window acc. TS 36.331, clause 5.2.3
SiList	SiSchedulList_Type	opt	list of SIs containing one ore more SIBs

BcchToPdschConfig_Type

TTCN-3 Record Type			
Name	**BcchToPdschConfig_Type**		
Comment	configuration for BCCH mapped to DL-SCH mapped to PDSCH TransmissionMode: single antenna mode when there is only one antenna configured, transmit diversity else; RNTI: SI-RNTI (TS 36.321, clause 7.1)		
Sib1Schedul	Sib1Schedul_Type	opt	scheduling of SIB1 in frequency domain
SiSchedul	AllSiSchedul_Type	opt	scheduling of SIs in frequency and time domain

SI_List_Type

TTCN-3 Record of Type	
Name	**SI_List_Type**
Comment	TS 36.331, clause 6.2.1 BCCH-DL-SCH-Message and clause 6.2.2 SystemInformation
record of BCCH_DL_SCH_Message	

BcchInfo_Type

TTCN-3 Record Type			
Name	**BcchInfo_Type**		
Comment	all fields are declared as optional to allow modification of single field; acc. to TS 36.331, clause 9.1.1.1 "RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5."; therefore this needs to be done by the system simulator		
MIB	BCCH_BCH_Message	opt	TS 36.331, clause 6.2.1 BCCH-BCH-Message and clause 6.2.2 MasterInformationBlock; NOTE: The sequence number included in MIB needs to be handled and maintained by the system simulator; that means that the sequence number being setup by TTCN will be overwritten by SS
SIB1	BCCH_DL_SCH_Message	opt	TS 36.331, clause 6.2.1 BCCH-DL-SCH-Message and clause 6.2.2 SystemInformationBlockType1
SIs	SI_List_Type	opt	

BcchConfig_Type

TTCN-3 Record Type			
Name	**BcchConfig_Type**		
Comment	all fields are optional to allow single modifications; activation time may be applied in the common part of the ASP; NOTE 1: Acc. to TS 36.331, clause 9.1.1.1 there is no PDCP and RLC/MAC are in TM NOTE 2: Mapping/scheduling and contents of the System Information in general is done in one go (i.e. there are no separate ports for SIB data and configuration)		
Pbch	BcchToPbchConfig_Type	opt	
Pdsch	BcchToPdschConfig_Type	opt	
BcchInfo	BcchInfo_Type	opt	

D.1.3.7 Paging_Control

Primitive to configuration PCCH/PCH.

PcchConfig_Type

TTCN-3 Record Type			
Name	**PcchConfig_Type**		
Comment	configuration for PCCH mapped to PCH mapped to PDSCH TransmissionMode: single antenna mode when there is only one antenna configured, transmit diversity else; RNTI: P-RNTI (TS 36.321, clause 7.1) NOTE: acc. to TS 36.331, clause 9.1.1.3 there is no PDCP and RLC/MAC are in TM		
DciInfo	DciDlInfoCommon_Type	opt	DCI format: 1A or 1C (TS 36.213, clause 7.1) ResourceAllocType: 2 (acc. to DCI format) Modulation: QPSK Frequency domain schedule: index of 1st RB; max. number of RBs per TTI

D.1.3.8 UE_Specific_Channel_Configuration

D.1.3.8.1 UE_Specific_Channel_Configuration_DL

Scheduling and other information for CCCH/DCCH/DTCH mapped to DL-SCH mapped to PDSCH.

D.1.3.8.1.1 MIMO_Configuration

Precoding information for spatial multiplexing (DCI format 2).

PrecodingInfoForOneCodeWord_Type

TTCN-3 Union Type		
Name	**PrecodingInfoForOneCodeWord_Type**	
Comment	NOTE: Not all index values may make sense (e.g. the indices refering to the values reported by the UE)	
TwoAntennasClosedLoop	integer (0..6)	index acc. to TS 36.212, table 5.3.3.1.5-2; RI = 1; transmit diversity or code book index 0..3 acc. TS 36.211, table 6.3.4.2.3-1
FourAntennasClosedLoop	integer (0..34)	index acc. to TS 36.212, table 5.3.3.1.5-3; RI = 1..2; transmit diversity or code book index 0..15 acc. TS 36.211, table 6.3.4.2.3-2
TwoAntennasOpenLoop	Null_Type	no precoding info; RI=1 when only codeword 1 is enabled
FourAntennasOpenLoop	integer (0..1)	index acc. to TS 36.212, table 5.3.3.1.5-4 RI = 1..2; RI=1 => transmit diversity; RI=2 => large delay CDD

PrecodingInfoForTwoCodeWords_Type

TTCN-3 Union Type		
Name	**PrecodingInfoForTwoCodeWords_Type**	
Comment	NOTE: Not all index values may make sense (e.g. the indices refering to the values reported by the UE)	
TwoAntennasClosedLoop	integer (0..2)	index acc. to TS 36.212, table 5.3.3.1.5-2; RI = 2; code book index 1, 2 acc. TS 36.211, table 6.3.4.2.3-1
FourAntennasClosedLoop	integer (0..50)	index acc. to 36.212 Table 5.3.3.1.5-3; RI = 2..4; code book index 0..15 acc. TS 36.211, table 6.3.4.2.3-2
TwoAntennasOpenLoop	Null_Type	no precoding info; RI=2 when both codewords are enabled
FourAntennasOpenLoop	integer (0..2)	index acc. to TS 36.212, table 5.3.3.1.5-4 RI = 2..4; large delay CDD

PrecodingInfoIndex_Type

TTCN-3 Union Type		
Name	**PrecodingInfoIndex_Type**	
Comment		
OneCodeWord	PrecodingInfoForOneCodeWord_Type	only codeword 1 shall be enabled in the DCI
TwoCodeWords	PrecodingInfoForTwoCodeWords_Type	both codewords shall be enabled in the DCI

PrecodingOperationMode_Type

TTCN-3 Enumerated Type	
Name	**PrecodingOperationMode_Type**
Comment	how to determine precoding information for spatial multiplexing is signalled on PDCCH with DCI format 2 (TS 36.212, clause 5.3.3.1.5)
hardcoded	SS shall apply configured precoding info as configured regardless RI and PMI reported by the UE
automatic	SS shall apply configured precoding info as long as there are no RI and PMI reported by the UE; when there are RI and PMI reported by the UE these shall be used

SpatialMultiplexingInfo_Type

TTCN-3 Record Type			
Name	**SpatialMultiplexingInfo_Type**		
Comment	NOTE: There may be codebookSubsetRestriction as signalled to the UE (TS 36.331, clause 6.3.2 AntennaInfoDedicated) to be considered		
OperationMode	PrecodingOperationMode_Type		
PrecodingIndex	PrecodingInfoIndex_Type		NOTE: Contains information about number of code words to be used in DCI format 2

MimoInfo_Type

TTCN-3 Union Type		
Name	**MimoInfo_Type**	
Comment		
NoMimo	Null_Type	
Spatial	SpatialMultiplexingInfo_Type	

CcchDcchDtchConfigDL_Type

TTCN-3 Record Type			
Name	**CcchDcchDtchConfigDL_Type**		
Comment	configuration for CCCH/DCCH/DTCH mapped to DL-SCH mapped to PDSCH TransmissionMode: as signalled to the UE (AntennaInfoDedicated in RRCConnectionSetup); RNTI: C-RNTI (TS 36.321, clause 7.1); all fields optional (omit = "keep as it is") since DCI format and modulation may be changed during a test; for initial configuration all fields are mandatory		
DciInfo	DciDlInfo_Type	opt	DCI format: 1A per default since for CCCH mimo cannot be applied in general ResourceAllocType: (depending on DCI format) Modulation: QPSK for signalling Frequency domain schedule: index of 1st RB; max. number of RBs per TTI; in case of spatial multiplexing if there are 2 code words FreqDomainSchedul shall be applied to both
AntennaInfo	AntennaInfoDedicated_Type	opt	as signalled to the UE (TS 36.331, clause 6.3.2): transmissionMode, codebookSubsetRestriction
MimoInfo	MimoInfo_Type	opt	when spatial multiplexing is applied (transmissionMode 3, 4): precoding information, number of code words

D.1.3.8.2 UE_Specific_Channel_Configuration_UL

Scheduling information for CCCH/DCCH/DTCH mapped to UL-SCH mapped to PUSCH

UplinkHoppingResourceParameters_Type

TTCN-3 Record Type	
Name	**UplinkHoppingResourceParameters_Type**
Comment	it is FFS whether/which parameters are needed to control hopping resource allocation as signalled in DCI format 0 (TS 36.212, clause 5.3.3.1.1)

UplinkHoppingControl_Type

TTCN-3 Union Type		
Name	**UplinkHoppingControl_Type**	
Comment	shall be considered by SS to fill in the information needed for DCI format 0 (TS 36.213, clause 7.1)	
Deactivated	Null_Type	
Activated	UplinkHoppingResourceParameters_Type	

CcchDcchDtchConfigUL_Type

TTCN-3 Record Type			
Name	**CcchDcchDtchConfigUL_Type**		
Comment	scheduling for CCCH/DCCH/DTCH mapped to UL-SCH mapped to PUSCH NOTE 1: For definition of the possible UL grants the location of the PUCCH (TS 36.211, clause 5.4.3) and the PRACH (TS 36.211, clause 5.7.3) need to be taken into account. NOTE 2: In contrast to the DL where the scheduling can be done (with consideration of some restrictions) by SS on a per need basis in the uplink the scheduling depends on information provided by the UE: A) when the UE has UL resources granted it sends BSRs (buffer status report) together with UL data => SS can evaluate the next grant(s) to be assigned to the UE (taking an upper bound into account); B) when the UE has nothing to be sent, SS will not assign any UL grants => SS shall not assign grants permanently and the UE needs to send an SR before it can sent data again; C) assuming the PUCCH being configured, the UE will send an SR when it needs to send data but has no grants assigned => upon the SR SS shall assign an appropriate grant to the UE; this may be a minimum grant (FFS). NOTE 3: There may be additional information to be controlled for special testcases, e.g. CQI request, it is FFS whether this shall be done in the common configuration ASP or needs "special-mode" implementation		
DciInfo	DciUlInfo_Type	opt	DCI format: 0 (TS 36.213, clause 7.1) ResourceAllocType: 2 (acc. to DCI format) Modulation: QPSK per default Frequency domain schedule: index of 1st RB; max. number of RBs per TTI (upper bound up to which SS may assign grants to the UE)
Hopping	UplinkHoppingControl_Type	opt	when Hopping = 'Activated' SS shall set hopping flag in DCI format 0
PUCCH_Synch	PUCCH_Synch_Type	opt	parameters to control automatic control of timing advance
UL_GrantConfig	UL_GrantConfig_Type	opt	UL grant allocation to be applied

DrxConfig_Type

TTCN-3 Record Type			
Name	**DrxConfig_Type**		
Comment	parameters acc. to TS 36.331, clause 6.3.2 MAC-MainConfiguration; Note: there is not own type definition in the core spec (yet)		
drx_StartOffset	integer		
onDurationTimer	integer		
drx_InactivityTimer	integer		
drx_RetransmissionTimer	integer		
longDRX_Cycle	integer		
shortDRX	record { integer shortDRX_Cycle, integer drxShortCycleTimer }		

DrxCtrl_Type

TTCN-3 Union Type		
Name	**DrxCtrl_Type**	
Comment	DRX configuration for connected mode (TS 36.321, clause 5.7) NOTE 1: In is not clear whether DRX needs to be considered in normal (test) cases; furthermore as long as DRX has no impact on e.g. RRC test cases it might be that DRX needs not to be configured at SS since for test cases testing DRX the timing can also be calculated in TTCN (i.e. not 'automatic mode' in SS is necessary); FFS. NOTE 2: In connected mode DRX can also be controlled/triggered by MAC by sending DRX Command MAC Control Element (TS 36.321, clauses 5.7 and 6.1.3.3); this may be triggered from a test case by sending a special purpose primitive; FFS.	
None	Null_Type	DRX not configured
Config	DrxConfig_Type	DRX is configured as signalled to the UE

TimeDomainRestriction_Type

TTCN-3 Record Type			
Name	**TimeDomainRestriction_Type**		
Comment			
MeasGapConfig	MeasGapConfig_Type		measurement gap configuration acc. to TS 36.331, clause 6.3.5 and gap pattern acc. TS 36.133, table 8.1.2.1-1

CcchDcchDtchConfig_Type

TTCN-3 Record Type			
Name	**CcchDcchDtchConfig_Type**		
Comment			
TimeDomainRestriction	TimeDomainRestriction_Type	opt	to tell the SS when no assignments/grants shall be assigned to the UE
DL	CcchDcchDtchConfigDL_Type	opt	Scheduling, parameters related to CCCH, DCCH and DTCH in DL
UL	CcchDcchDtchConfigUL_Type	opt	Scheduling, parameters related to CCCH, DCCH and DTCH in UL
DrxCtrl	DrxCtrl_Type	opt	since it is not clear whether DRX is used e.g. for RRC test cases, DRX may be switched of in the beginning; FFS

D.1.4 Cell_Power_Attenuation

CellAttenuationConfig_Type

TTCN-3 Record Type			
Name	**CellAttenuationConfig_Type**		
Comment			
CellId	CellId_Type		
Attenuation	Attenuation_Type		

CellAttenuationList_Type

TTCN-3 Record of Type	
Name	**CellAttenuationList_Type**
Comment	
record length(1..tsc_MaxNumberOfCells) of CellAttenuationConfig_Type	

D.1.5 Radio_Bearer_Configuration

Radio Bearer Configuration: SRBs/DRBs.

D.1.5.1 PDCP_Configuration

PDCP_ROHC_Mode_Type

TTCN-3 Enumerated Type	
Name	**PDCP_ROHC_Mode_Type**
Comment	
Start	cause SS to handle PDCP incl. ROHC as transparent

PDCP_NonROHC_Mode_Type

TTCN-3 Enumerated Type	
Name	**PDCP_NonROHC_Mode_Type**
Comment	
Start	cause SS to handle PDCP without ROHC as transparent

PDCP_TestModeInfo_Type

TTCN-3 Union Type		
Name	**PDCP_TestModeInfo_Type**	
Comment		
PDCP_ROHC_Mode	PDCP_ROHC_Mode_Type	
PDCP_NonROHC_Mode	PDCP_NonROHC_Mode_Type	

PDCP_TestModeConfig_Type

TTCN-3 Union Type		
Name	**PDCP_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	PDCP_TestModeInfo_Type	

PDCP_RbConfig_Type

TTCN-3 Union Type		
Name	**PDCP_RbConfig_Type**	
Comment		
Srb	Null_Type	for SRB1/2 there are no PDCP_Parameters; SN is always 5 bits
Drb	PDCP_Config_Type	PDCP-Configuration acc. to TS 36.331, clause 6.3.2; among others for UM here pdcp-SN-Size is configured to be either len7bits or len12bits; for AM it always is 12bit

PDCP_ConfigInfo_Type

TTCN-3 Record Type			
Name	**PDCP_ConfigInfo_Type**		
Comment			
Rb	PDCP_RbConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	PDCP_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"

PDCP_Configuration_Type

TTCN-3 Union Type		
Name	**PDCP_Configuration_Type**	
Comment		
None	Null_Type	for SRB0 no PDCP is configured
Config	PDCP_ConfigInfo_Type	

D.1.5.2 RLC_Configuration

RLC configuration: radio bearer specific

RLC_Configuration: Basic Type Definitions

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

RLC_ACK_Prohibit_Type

TTCN-3 Enumerated Type	
Name	**RLC_ACK_Prohibit_Type**
Comment	
Prohibit	cause SS RLC layer to stop any ACK transmission for UL PDU's received from UE
Continue	bring back the SS RLC in normal mode, where ACK/NACK are transmitted at polling

RLC_NotACK_NextRLC_PDU_Type

TTCN-3 Enumerated Type	
Name	**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

RLC_TestModeInfo_Type

TTCN-3 Union Type		
Name	**RLC_TestModeInfo_Type**	
Comment		
AckProhibit	RLC_ACK_Prohibit_Type	
NotACK_NextRLC_PDU	RLC_NotACK_NextRLC_PDU_Type	

RLC_TestModeConfig_Type

TTCN-3 Union Type		
Name	**RLC_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	RLC_TestModeInfo_Type	

SS_RLC_AM_Type

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

SS_RLC_UM_Bi_Directional_Type

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

SS_RLC_UM_Uni_Directional_UL_Type

TTCN-3 Record Type			
Name	**SS_RLC_UM_Uni_Directional_UL_Type**		
Comment			
Rx	DL_UM_RLC_Type	opt	the UE's DL setting to be used in SS's rx direction

SS_RLC_UM_Uni_Directional_DL_Type

TTCN-3 Record Type			
Name	**SS_RLC_UM_Uni_Directional_DL_Type**		
Comment			
Tx	UL_UM_RLC_Type	opt	the UE's UL setting to be used in SS's tx direction

RLC_RbConfig_Type

TTCN-3 Union Type		
Name	**RLC_RbConfig_Type**	
Comment		
AM	SS_RLC_AM_Type	
UM	SS_RLC_UM_Bi_Directional_Type	
UM_OnlyUL	SS_RLC_UM_Uni_Directional_UL_Type	
UM_OnlyDL	SS_RLC_UM_Uni_Directional_DL_Type	
TM	SS_RLC_TM_Type	normally SRB0 only; may be used for test purposes also

RLC_Configuration_Type

TTCN-3 Record Type			
Name	**RLC_Configuration_Type**		
Comment			
Rb	RLC_RbConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"
TestMode	RLC_TestModeConfig_Type	opt	mandatory for initial configuration; omit means "keep as it is"

D.1.5.3 MAC_Configuration

MAC configuration: radio bearer specific configuration

EUTRA_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_MaxHarqRetransmission	integer	28	maximum value for maxHARQ-Msg3Tx as being signalled to the UE

MAC_Test_DLLogChID_Type

TTCN-3 Union Type		
Name	**MAC_Test_DLLogChID_Type**	
Comment		
LogChId	TestLogicalChannelId_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.

MAC_Test_DL_SCH_CRC_Mode_Type

TTCN-3 Enumerated Type	
Name	**MAC_Test_DL_SCH_CRC_Mode_Type**
Comment	
Normal	default mode, the CRC generation is correct
Erroneous	The CRC is generated and few CRC bits [bits 0 to 3] are toggled, resulting in CRC error at UE
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

MAC_Test_SCH_NoHeaderManipulation_Type

TTCN-3 Enumerated Type	
Name	**MAC_Test_SCH_NoHeaderManipulation_Type**
Comment	
NormalMode	MAC header is fully controlled by the SS
DL_SCH_Only	No header to be added for DL SCH transport channel. TTCN will submit a final MAC PDU including header and payloads. It is possible that data belonging to multiple DRBs is sent in one MAC PDU and from one special RB configured.
UL_SCH_Only	No header to be removed for any transmission received on UL_SCH and complete MAC PDU received 0n UL-SCH needs to be directed to the special RB configured with this MAC manipulation. I.e. when the special RB with this special header manipulation is configured there is no data routed in UL on any other logical channel except the special RB.
DL_UL_SCH	the DL shall be as for DL_SCH_Only and UL as for UL_SCH_Only

HARQ_ModeList_Type

TTCN-3 Record of Type	
Name	**HARQ_ModeList_Type**
Comment	
record length (1..tsc_MaxHarqRetransmission) of HARQ_Type	

PhichTestMode_Type

TTCN-3 Union Type		
Name	**PhichTestMode_Type**	
Comment		
NormalMode	Null_Type	PHICH is configured to operate in normal mode
ExplicitMode	HARQ_ModeList_Type	the numer of elements in explicit list shall match the value configured for UL retransmissions

MAC_TestModeInfo_Type

TTCN-3 Record Type			
Name	**MAC_TestModeInfo_Type**		
Comment	Parameters/Configuration for MAC tests		
DiffLogChId	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-heaader on DL-SCH channel
No_HeaderManipulation	MAC_Test_SCH_NoHeaderManipulation_Type		to configure mode for no header manipulation in SS MAC layer for DL/UL SCH

MAC_TestModeConfig_Type

TTCN-3 Union Type		
Name	**MAC_TestModeConfig_Type**	
Comment		
None	Null_Type	
Info	MAC_TestModeInfo_Type	

MAC_LogicalChannelConfig_Type

TTCN-3 Record Type			
Name	**MAC_LogicalChannelConfig_Type**		
Comment			
Priority	integer		logical channel priority for the DL as described in TS 36.321, clause 5.4.3.1 for the UL
PrioritizedBitRate	PrioritizedBitRate_Type		PBR as described for the UL; probably not needed at SS

MAC_Configuration_Type

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

Radio_Bearer_Configuration: Basic Type Definitions

TTCN-3 Basic Types		
LogicalChannelId_Type	integer (0..10)	acc. TS 36.331, clause 6.3.2 for DRBs DTCH-LogicalChannelIdentity is INTEGER (3..10); additionally we have 0..2 for the SRBs
TestLogicalChannelId_Type	integer (0..31)	To be used in MAC test mode for reserved values of Logicall channels;

RadioBearerConfigInfo_Type

TTCN-3 Record Type			
Name	**RadioBearerConfigInfo_Type**		
Comment	semantics of omit: "keep as it is"		
Pdcp	PDCP_Configuration_Type	opt	for SRB0: "Pdcp.None:=true" mandatory for initial configuration; omit means "keep as it is"
Rlc	RLC_Configuration_Type	opt	mandatory for initial configuration; omit means "keep as it is"
LogicalChannelId	LogicalChannelId_Type	opt	DRBs: DTCH-LogicalChannelIdentity as for rb-MappingInfo in DRB-ToAddModifyList; SRBs: for SRBs specified configurations acc. to TS 36.331, clause 9.1.2 shall be applied: SRB1: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 1 SRB2: ul-LogicalChannel-Identity = dl-LogicalChannel-Identity = 2 for SRB0 being mapped to CCCH the LCID is '00000'B acc. to TS 36.321, clause 6.2.1; mandatory for initial configuration; omit means "keep as it is"
Mac	MAC_Configuration_Type	opt	

RadioBearerConfig_Type

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

RadioBearer_Type

TTCN-3 Record Type			
Name	**RadioBearer_Type**		
Comment			
Id	RadioBearerId_Type		either for SRB or DRB
Config	RadioBearerConfig_Type		

RadioBearerList_Type

TTCN-3 Record of Type	
Name	**RadioBearerList_Type**
Comment	array of SRBs and/or DRBs (DRBs + 3 SRBs)
record length (1..tsc_MaxRB) of RadioBearer_Type	

D.1.6 AS_Security

Primitive for control of AS security.

PdcpSQN_Type

TTCN-3 Record Type			
Name	**PdcpSQN_Type**		
Comment			
Format	PdcpCountFormat_Type		5 bit, 7 bit or 12 bit SQN
Value	integer		SQN value (5 bit, 7 bit or 12 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)

PDCP_ActTime_Type

TTCN-3 Union Type		
Name	**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	PdcpSQN_Type	PDCP sequence number

SecurityActTime_Type

TTCN-3 Record Type			
Name	**SecurityActTime_Type**		
Comment			
RadioBearerId	RadioBearerId_Type		
UL	PDCP_ActTime_Type		
DL	PDCP_ActTime_Type		

SecurityActTimeList_Type

TTCN-3 Record of Type	
Name	**SecurityActTimeList_Type**
Comment	
record length (1..tsc_MaxRB) of SecurityActTime_Type	

AS_IntegrityInfo_Type

TTCN-3 Record Type			
Name	**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_Type		IntegrityProtAlgorithm_Type being defined in RRC ASN.1
KRRCint	B128_Key_Type		
ActTimeList	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

AS_CipheringInfo_Type

TTCN-3 Record Type			
Name	**AS_CipheringInfo_Type**		
Comment			
Algorithm	CipheringAlgorithm_Type		CipheringAlgorithm_Type being defined in RRC ASN.1
KRRCenc	B128_Key_Type		
KUPenc	B128_Key_Type		Two possibilities: 1. KUPenc is mandatory; and SS uses it when DRB are configured 2. KUPenc is optional and provided only if DRBs are configured => FFS
ActTimeList	SecurityActTimeList_Type		

AS_SecStartRestart_Type

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

AS_Security_Type

TTCN-3 Union Type		
Name	**AS_Security_Type**	
Comment	Security mode command procedure (TS 36.331, clause 5.3.4): both SMC and SMComp are integrity protected (nevertheless SS shall be able to cope with unprotected SM reject); ciphering is started just after SMComp (acc. to TS 36.331, clauses 5.3.4.3 and 5.3.1.1)	
StartRestart	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 Semi_Persistant_Scheduling

Semi-persistant scheduling (SPS).

NOTE 1: Configuration of SPS cannot be done completely in advance but needs to be activated by PDCCH signalling => SPS is configured/activated in an own primitive which may be sent to SS during RBs are being configured.

NOTE 2: Semi-persisitent (configured) scheduling is per UE (as well as 'normal' scheduling; see e.g. TS 36.300, clause 11.1).

SpsAssignmentUL_Type

TTCN-3 Record Type			
Name	**SpsAssignmentUL_Type**		
Comment	information to assign semi-persistent scheduls in UL		
DciInfo	DciUlInfo_Type	opt	to apply a grant
SchedulInterval	SpsConfigurationUL_Type	opt	as in TS 36.331, clause 6.3.2 SPS-ConfigUL

SpsAssignmentDL_Type

TTCN-3 Record Type			
Name	**SpsAssignmentDL_Type**		
Comment	information to assign semi-persistent scheduls in DL		
DciInfo	DciDlInfo_Type	opt	to apply a assignment
SchedulInterval	SpsConfigurationDL_Type	opt	as in TS 36.331, clause 6.3.2 SPS-ConfigDL

SpsInfo_Type

TTCN-3 Record Type			
Name	**SpsInfo_Type**		
Comment	Semi-persistant scheduling (SPS): Even though SPS is pre-configured at the UE (e.g. RRCConnectionSetup->RadioResourceConfiguration->MAC_MainConfig) it needs to be activated by RRC signalling => SS shall 'activate' SPS by sending appropriate assignments/grants to the UE; this should be done with an activation time		
SPS_C_RNTI	C_RNTI		SPS C-RNTI as signalled to UE
UplinkGrant	SpsAssignmentUL_Type	opt	
DownlinkAssignment	SpsAssignmentDL_Type	opt	

SpsConfig_Type

TTCN-3 Union Type		
Name	**SpsConfig_Type**	
Comment		
Activate	SpsInfo_Type	CellId identifier of the cell where the UE is active RoutingInfo None TimingInfo activation time for SPS; FFS ControlInfo CnfFlag:=false ???; FollowOnFlag:=false
Deactivate	Null_Type	CellId identifier of the cell where the UE is active RoutingInfo None TimingInfo none ControlInfo CnfFlag:=false ???; FollowOnFlag:=false

D.1.8 Paging_Trigger

PagingTrigger_Type

TTCN-3 Record Type			
Name	**PagingTrigger_Type**		
Comment	CellId identifier of the cell where the UE is active RoutingInfo None TimingInfo Calculated paging occassion ControlInfo CnfFlag:=false; FollowOnFlag:=false primitive to trigger transmission of a paging on the PCCH at a calculated paging occasion (TS 36.304, clause 7); The paging occasion is calculated by TTCN and activation time is applied; as for BCCH Infor acc. to TS 36.331, clause 9.1.1.3 "RRC will perform padding, if required due to the granularity of the TF signalling, as defined in 8.5."; therefore this needs to be done by the system simulator		
Paging	PCCH_Message		paging to be send out at paging occasion and being announced on PDCCH using P-RNTI

D.1.9 L1_MAC_Indication_Control

Primitive for control of L1/MAC indication for special purposes.

L1Mac_IndicationMode_Type

TTCN-3 Enumerated Type	
Name	**L1Mac_IndicationMode_Type**
Comment	
enable	
disable	

L1Mac_IndicationControl_Type

TTCN-3 Record Type			
Name	**L1Mac_IndicationControl_Type**		
Comment	Note: Initially all indications are disabled in SS (i.e. it shall not be nacessary in 'normal' test cases to use this primitive but only if a specific indication is needed); omit means indication mode is not changed		
RachPreamble	L1Mac_IndicationMode_Type	opt	To enable/disable reporting of PRACH preamble received.
SchedReq	L1Mac_IndicationMode_Type	opt	To enable/disable reporting of reception of Scheduling Request on PUCCH.
BSR	L1Mac_IndicationMode_Type	opt	To enable/disable reporting of Buffer Status Report. Note this is applicable only when MAC is configured in normal mode in UL. MAC configured in test mode, results in over writing the report.
UL_HARQ	L1Mac_IndicationMode_Type	opt	To enable/disable reporting of reception of HARQ ACK/NACK.
C_RNTI	L1Mac_IndicationMode_Type	opt	To enable/disable reporting of C-RNTI sent by the UE within MAC PDU
PHR	L1Mac_IndicationMode_Type	opt	To enable/disable reporting of Power Headroom Report. Note this is applicable only when MAC is configured in normal mode in UL. MAC configured in test mode, results in over writing the report.

D.1.10 PDCP_Count

Primitives to enquire PDCP COUNT.

PDCP_Count: Basic Type Definitions

TTCN-3 Basic Types		
PdcpCountValue_Type	B32_Type	

PdcpCountFormat_Type

TTCN-3 Enumerated Type	
Name	**PdcpCountFormat_Type**
Comment	
PdcpCount_Srb	27 bit HFN; 5 bit SQF
PdcpCount_DrbLongSQN	20 bit HFN; 12 bit SQF
PdcpCount_DrbShortSQN	25 bit HFN; 7 bit SQF

PdcpCount_Type

TTCN-3 Record Type			
Name	**PdcpCount_Type**		
Comment			
Format	PdcpCountFormat_Type		
Value	PdcpCountValue_Type		

PdcpCountInfo_Type

TTCN-3 Record Type			
Name	**PdcpCountInfo_Type**		
Comment			
RadioBearerId	RadioBearerId_Type		
UL	PdcpCount_Type	opt	omit: keep as it is
DL	PdcpCount_Type	opt	omit: keep as it is

PdcpCountInfoList_Type

TTCN-3 Record of Type	
Name	**PdcpCountInfoList_Type**
Comment	
record length (1..tsc_MaxRB) of PdcpCountInfo_Type	

PdcpCountGetReq_Type

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

PDCP_CountReq_Type

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

PDCP_CountCnf_Type

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

D.1.11 L1_MAC_Test_Mode

Primitive for control of L1/MAC Test Modes.

L1_TestMode_Type

TTCN-3 Record Type			
Name	**L1_TestMode_Type**		
Comment	L1 test mode; in general RACH is handled separately		
DL_SCH_CRC	DL_SCH_CRC_Type		Manipulation of CRC bit generation for DL-SCH
Phich	PhichTestMode_Type		HARQ feedback mode on the PHICH

DL_SCH_CRC_Type

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

D.1.12 PDCCH_Order

Primitive to trigger SS to send PDCCH order to initiate RA procedure (TS 36.321, clause 5.1.1).

PDCCH_Order: Basic Type Definitions

TTCN-3 Basic Types		
PrachPreambleIndex_Type	integer (0..63)	
PrachMaskIndex_Type	integer (0..15)	TS 36.321, clause 7.3

RA_PDCCH_Order_Type

TTCN-3 Record Type			
Name	**RA_PDCCH_Order_Type**		
Comment	see also TS 36.212, clause 5.3.3.1.3		
PreambleIndex	PrachPreambleIndex_Type		naming acc. TS 36.212, clause 5.3.3.1.3
PrachMaskIndex	PrachMaskIndex_Type		naming acc. TS 36.212, clause 5.3.3.1.3

D.1.13 System_Indications

Primitives for System indications

System_Indications: Basic Type Definitions

TTCN-3 Basic Types		
PRTPower_Type	Dummy_Type	needs to define appropriately the power level report of PREAMBLE_RECEIVED_TARGET_POWER; FFS
LogicalChannelGroup_Type	integer (0..3)	
BSR_Value_Type	integer (0..63)	
PHR_Type	integer (0..63)	

RachPreamble_Type

TTCN-3 Record Type			
Name	**RachPreamble_Type**		
Comment			
RAPID	PrachPreambleIndex_Type		indicates the RAPID of the preamble used (integer (0..63))
PRTPower	PRTPower_Type		represents the PREAMBLE_RECEIVED_TARGET_POWER

Short_BSR_Type

TTCN-3 Record Type			
Name	**Short_BSR_Type**		
Comment			
LCG	LogicalChannelGroup_Type		Logical channel Group
Value	BSR_Value_Type		BSR value

Long_BSR_Type

TTCN-3 Record Type			
Name	**Long_BSR_Type**		
Comment			
Value_LCG1	BSR_Value_Type		BSR value for LCG 1
Value_LCG2	BSR_Value_Type		BSR value for LCG 2
Value_LCG3	BSR_Value_Type		BSR value for LCG 3
Value_LCG4	BSR_Value_Type		BSR value for LCG 4

BSR_Type

TTCN-3 Union Type		
Name	**BSR_Type**	
Comment		
Short	Short_BSR_Type	
Long	Long_BSR_Type	

HARQ_Type

TTCN-3 Enumerated Type	
Name	**HARQ_Type**
Comment	ack represents HARQ ACK; nack represents HARQ_NACK
ack	
nack	

D.1.14 System_Interface

SYSTEM_CTRL_REQ

TTCN-3 Record Type			
Name	**SYSTEM_CTRL_REQ**		
Comment			
Common	ReqAspCommonPart_Type		TimingInfo depends on respective primitive:
Request	SystemRequest_Type		Cell TimingInfo: 'now' (in general) CellAttenuationList TimingInfo: 'now' (in general, but activation time may be used also) RadioBearerList TimingInfo: 'now' (in general) EnquireTiming TimingInfo: 'now' AS_Security TimingInfo: 'now'; note: "activation time" may be specified in the primitive based on PDCP SQN Sps TimingInfo: activation time when SPS shall start (FFS) Paging TimingInfo: Calculated paging occassion L1MacIndCtrl TimingInfo: 'now' (in general) PdcpCount TimingInfo: 'now' L1_TestMode TimingInfo: depends on the test mode; activation time is used e.g. for manipulation of the CRC PdcchOrder TimingInfo: 'now' (in general)

SYSTEM_CTRL_CNF

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

SYSTEM_IND

TTCN-3 Record Type			
Name	**SYSTEM_IND**		
Comment			
Common	IndAspCommonPart_Type		The SS shall always provide TimingInfo (SFN + subframe number)
Indication	SystemIndication_Type		Error TimingInfo: related to the error (if available) RachPreamble TimingInfo: shall indicate start of the RACH preamble SchedReq TimingInfo: subframe containing the SR BSR TimingInfo: subframe in which the MAC PDU contains the BSR UL_HARQ TimingInfo: subframe containing the UL HARQ C_RNTI TimingInfo: subframe in which the MAC PDU contains the C_RNTI PHR TimingInfo: subframe in which the MAC PDU contains the PHR

EUTRA_SYSTEM_PORT

TTCN-3 Port Type		
Name	**EUTRA_SYSTEM_PORT**	
Comment	EUTRA PTC: Port for system configuration	
out	SYSTEM_CTRL_REQ	
in	SYSTEM_CTRL_CNF	

EUTRA_SYSIND_PORT

TTCN-3 Port Type		
Name	**EUTRA_SYSIND_PORT**	
Comment	EUTRA PTC: Port for system indications	
in	SYSTEM_IND	

D.2 EUTRA_ASP_DrbDefs

ASP interface for DRBs.

D.2.1 Common_Constants

EUTRA_ASP_DrbDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_DRB_MaxNoOfPDUs	integer	1024	arbitrarily selected
tsc_DRB_MaxNoOfSDUs	integer	1024	arbitrarily selected
tsc_DRB_MaxNoOfSubframes	integer	256	arbitrarily selected

D.2.2 PDU_TypeDefs

D.2.2.1 MAC_PDU

MAC_PDU: Basic Type Definitions

TTCN-3 Basic Types		
MAC_CTRL_C_RNTI_Type	C_RNTI	TS 36.321, clause 6.1.3.2
MAC_CTRL_ContentionResolutionId_Type	ContentionResolutionId_Type	TS 36.321, clause 6.1.3.4 fix 48-bit size; consists of a single field defined UE Contention Resolution Identity (uplink CCCH SDU transmitted by MAC)
MAC_CTRL_TimingAdvance_Type	B8_Type	TS 36.321, clause 6.1.3.5 indicates the amount of timing adjustment in 0.5 ms that the UE has to apply; the length of the field is [8] bits
MAC_SDU_Type	octetstring	

MAC_PDU_Length_Type

TTCN-3 Record Type			
Name	**MAC_PDU_Length_Type**		
Comment	Notes: since F and L field are either both present or both omitted they are put into this record; to allow homogeneous (direct) encoding the PDU length is not defined as union; TTCN-3 does allow length restrictions to one lenght or a range of length but not to two specific lengthes; further restriction may be achieved by appropriate templates (parameter either 7 or 15 bit)		
Format	B1_Type		F: The Format field indicates the size of the Length field as indicated in table 6.2.1-3. There is one F field per MAC PDU subheader except for the last subheader and sub-headers corresponding to fixed-sized MAC control elements. The size of the F field is 1 bit. If the size of the MAC SDU or MAC control element is less than 128 bytes, the UE shall set the value of the F field to 0, otherwise the UE shall set it to 1
Value	B7_15_Type		L: The Length field indicates the length of the corresponding MAC SDU or MAC control element in bytes. There is one L field per MAC PDU subheader except for the last subheader and sub-headers corresponding to fixed-sized MAC control elements. The size of the L field is indicated by the F field

MAC_PDU_SubHeader_Type

TTCN-3 Record Type			
Name	**MAC_PDU_SubHeader_Type**		
Comment			
Reserved	B2_Type		Reserved bits
Extension	B1_Type		E: The Extension field is a flag indicating if more fields are present in the MAC header or not. The E field is set to "1" to indicate another set of at least R/R/E/LCID fields. The E field is set to "0" to indicate that either a MAC SDU, a MAC control element or padding starts at the next byte
LCID	B5_Type		LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC control element or padding as described in tables 6.2.1-1 and 6.2.1-2 for the DL and UL-SCH respectively. There is one LCID field for each MAC SDU, MAC control element or padding included in the MAC PDU. The LCID field size is 5 bits; FFS: Should this be of integer type ??
Length	MAC_PDU_Length_Type	opt	

MAC_Header_Type

TTCN-3 Record of Type	
Name	**MAC_Header_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of MAC_PDU_SubHeader_Type	

MAC_CTRL_ShortBSR_Type

TTCN-3 Record Type			
Name	**MAC_CTRL_ShortBSR_Type**		
Comment	TS 36.321, clause 6.1.3.1		
LCG	B2_Type		
Value	B6_Type		

MAC_CTRL_LongBSR_Type

TTCN-3 Record Type			
Name	**MAC_CTRL_LongBSR_Type**		
Comment	TS 36.321, clause 6.1.3.1		
Value_LCG1	B6_Type		
Value_LCG2	B6_Type		
Value_LCG3	B6_Type		
Value_LCG4	B6_Type		

MAC_CTRL_PowerHeadRoom_Type

TTCN-3 Record Type			
Name	**MAC_CTRL_PowerHeadRoom_Type**		
Comment	TS 36.321, clause 6.1.3.6		
Reserved	B2_Type		
Value	B6_Type		

MAC_CTRL_ElementList_Type

TTCN-3 Set Type			
Name	**MAC_CTRL_ElementList_Type**		
Comment	Note: - for simplicication UL and DL are not distiguished even though the control elements are either UL or DL - type is defined as set: the ordering is not signifficant; nevertheless the ordering is well-defined by the sub-headers; for codec implementations it is in any case necessary to evaluate the sub-header information in order to encode/decode the payload		
ShortBSR	MAC_CTRL_ShortBSR_Type	opt	UL only
LongBSR	MAC_CTRL_LongBSR_Type	opt	UL only
C_RNTI	MAC_CTRL_C_RNTI_Type	opt	UL only
ContentionResolutionID	MAC_CTRL_ContentionResolutionId_Type	opt	DL only
TimingAdvance	MAC_CTRL_TimingAdvance_Type	opt	DL only
PowerHeadRoom	MAC_CTRL_PowerHeadRoom_Type	opt	UL only

MAC_SDUList_Type

TTCN-3 Record of Type	
Name	**MAC_SDUList_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of MAC_SDU_Type	

MAC_PDU_Type

TTCN-3 Record Type			
Name	**MAC_PDU_Type**		
Comment			
Header	MAC_Header_Type		list of MAC PDU SubHeaders corresponding to MAC control elements and MAC SDUs
CtrlElementList	MAC_CTRL_ElementList_Type	opt	Mac control elements; acc. to TS 36.321, clause 6.1.2 "MAC control elements, are always placed before any MAC SDU."
SduList	MAC_SDUList_Type	opt	MAC SDUs, which can typically be RLC PDUs
Padding	octetstring	opt	Octet aligned Padding if more than or equal to 2 bytes

MAC_PDUList_Type

TTCN-3 Record of Type	
Name	**MAC_PDUList_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of MAC_PDU_Type	

D.2.2.2 RLC_PDU

D.2.2.2.1 Common

RLC PDU definition: common AM/UM field definitions.

Common: Basic Type Definitions

TTCN-3 Basic Types		
RLC_FramingInfo_Type	B2_Type	00 .. First byte of the Data field corresponds to the first byte of a RLC SDU. Last byte of the Data field corresponds to the last byte of a RLC SDU. 01 .. First byte of the Data field corresponds to the first byte of a RLC SDU. Last byte of the Data field does not correspond to the last byte of a RLC SDU. 10 .. First byte of the Data field does not correspond to the first byte of a RLC SDU. Last byte of the Data field corresponds to the last byte of a RLC SDU. 11 .. First byte of the Data field does not correspond to the first byte of a RLC SDU. Last byte of the Data field does not correspond to the last byte of a RLC SDU.

RLC_LengthIndicator_Type

TTCN-3 Record Type			
Name	**RLC_LengthIndicator_Type**		
Comment			
Extension	B1_Type		0 ... Data field follows from the octet following the LI field following this E field 1 ... A set of E field and LI field follows from the bit following the LI field following this E field
LengthIndicator	B11_Type		Length Indicator

RLC_LI_List_Type

TTCN-3 Record of Type	
Name	**RLC_LI_List_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of RLC_LengthIndicator_Type	

RLC_PDU_Header_FlexPart_Type

TTCN-3 Record Type			
Name	**RLC_PDU_Header_FlexPart_Type**		
Comment	Flexible part of the header with a number of K LIs		
LengthIndicator	RLC_LI_List_Type		List of E, LI fields
Padding	B4_Type	opt	optional 4 bit padding present in case of odd number of LI's

D.2.2.2.2 TM_Data

RLC PDU definition: UM (TS 36.322, clause 6.2.1.2).

TM_Data: Basic Type Definitions

TTCN-3 Basic Types		
RLC_TMD_PDU_Type	octetstring	TS 36.322, clause 6.2.1.2

D.2.2.2.3 UM_Data

RLC PDU definition: UM (TS 36.322, clause 6.2.1.3).

NOTE: To allow direct encoding the definition for RLC UM Data PDU is split into data PDU with 5/10 bit sequence number.

UM_Data: Basic Type Definitions

TTCN-3 Basic Types		
RLC_DataField_Type	octetstring	restrictions imposed from LI size of 11 bits is not applicable when the LI's are not present

RLC_UMD_Header_FixPartShortSN_Type

TTCN-3 Record Type			
Name	**RLC_UMD_Header_FixPartShortSN_Type**		
Comment	TS 36.322, clause 6.2.1.3, figures 6.2.1.3-1, 6.2.1.3-3 and 6.2.1.3-4); one octet		
FramingInfo	RLC_FramingInfo_Type		2 bits FI
Extension	B1_Type		1 bit E
SequenceNumber	B5_Type		5 bits SN

RLC_UMD_Header_FixPartLongSN_Type

TTCN-3 Record Type			
Name	**RLC_UMD_Header_FixPartLongSN_Type**		
Comment	TS 36.322, clause 6.2.1.3, figures 6.2.1.3-2, 6.2.1.3-5 and 6.2.1.3-6); two octets		
Reserved	B3_Type		3 bits reserved
FramingInfo	RLC_FramingInfo_Type		2 bits FI
Extension	B1_Type		1 bit E
SequenceNumber	B10_Type		10 bits SN

RLC_UMD_HeaderShortSN_Type

TTCN-3 Record Type			
Name	**RLC_UMD_HeaderShortSN_Type**		
Comment			
FixPart	RLC_UMD_Header_FixPartShortSN_Type		
FlexPart	RLC_PDU_Header_FlexPart_Type	opt	

RLC_UMD_HeaderLongSN_Type

TTCN-3 Record Type			
Name	**RLC_UMD_HeaderLongSN_Type**		
Comment			
FixPart	RLC_UMD_Header_FixPartLongSN_Type		
FlexPart	RLC_PDU_Header_FlexPart_Type	opt	

RLC_DataFieldList_Type

TTCN-3 Record of Type	
Name	**RLC_DataFieldList_Type**
Comment	One to one correspondence with sub headers (LengthIndicatorList_Type)
record length (1..tsc_DRB_MaxNoOfPDUs) of RLC_DataField_Type	

RLC_UMD_PDU_ShortSN_Type

TTCN-3 Record Type			
Name	**RLC_UMD_PDU_ShortSN_Type**		
Comment			
Header	RLC_UMD_HeaderShortSN_Type		
Data	RLC_DataFieldList_Type		

RLC_UMD_PDU_LongSN_Type

TTCN-3 Record Type			
Name	**RLC_UMD_PDU_LongSN_Type**		
Comment			
Header	RLC_UMD_HeaderLongSN_Type		
Data	RLC_DataFieldList_Type		

RLC_UMD_PDU_Type

TTCN-3 Union Type		
Name	**RLC_UMD_PDU_Type**	
Comment		
ShortSN	RLC_UMD_PDU_ShortSN_Type	
LongSN	RLC_UMD_PDU_LongSN_Type	

D.2.2.2.4 AM_Data

RLC PDU definition: AM (TS 36.322, clause 6.2.1.4 and 6.2.1.5).

RLC_AMD_Header_FixPart_Type

TTCN-3 Record Type			
Name	**RLC_AMD_Header_FixPart_Type**		
Comment	TS 36.322, clause 6.2.1.4, figures 6.2.1.4-1, 6.2.1.4-2 and 6.2.1.4-3); 2 or 4 octets		
D_C	B1_Type		0 ... Control PDU 1 ... Data PDU
ReSeg	B1_Type		0 ... AMD PDU 1 ... AMD PDU segment
Poll	B1_Type		0 ... Status report not requested 1 ... Status report is requested
FramingInfo	RLC_FramingInfo_Type		2 bit FI
Extension	B1_Type		1 bit E
SN	B10_Type		Sequence numbers

RLC_AMD_Header_SegmentPart_Type

TTCN-3 Record Type			
Name	**RLC_AMD_Header_SegmentPart_Type**		
Comment	AMD PDU segment related info in PDU header acc. TS 36.322, clause 6.2.1.5		
LastSegmentFlag	B1_Type		0 ... Last byte of the AMD PDU segment does not correspond to the last byte of an AMD PDU 1 ... Last byte of the AMD PDU segment corresponds to the last byte of an AMD PDU
SegOffset	B15_Type		The SO field indicates the position of the AMD PDU segment in bytes within the original AMD PDU. Specifically, the SO field indicates the position within the Data field of the original AMD PDU to which the first byte of the Data field of the AMD PDU segment corresponds to.

RLC_AMD_Header_Type

TTCN-3 Record Type			
Name	**RLC_AMD_Header_Type**		
Comment			
FixPart	RLC_AMD_Header_FixPart_Type		
SegmentPart	RLC_AMD_Header_SegmentPart_Type	opt	present in case of AMD Seg PDU only
FlexPart	RLC_PDU_Header_FlexPart_Type	opt	

RLC_AMD_PDU_Type

TTCN-3 Record Type			
Name	**RLC_AMD_PDU_Type**		
Comment			
Header	RLC_AMD_Header_Type		
Data	RLC_DataFieldList_Type		

D.2.2.2.5 AM_Status

AM Status PDU (TS 36.322, clause 6.2.1.6).

AM_Status: Basic Type Definitions

TTCN-3 Basic Types			
RLC_Status_Padding_Type	bitstring length (1..7)	NOTE:	In TTCN-3 length restriction cannot be done inline in record definition => explicit type definition necessary

RLC_Status_ACK_Type

TTCN-3 Record Type			
Name	**RLC_Status_ACK_Type**		
Comment			
ACK_SN	B10_Type		Acknowledgement SN (TS 36.322, clause 6.2.2.14)
Extn1	B1_Type		0 ... a set of NACK_SN, E1 and E2 does not follow. 1 ... a set of NACK_SN, E1 and E2 follows.

RLC_Status_SegOffset_Type

TTCN-3 Record Type			
Name	**RLC_Status_SegOffset_Type**		
Comment			
Start	B15_Type		SOstart field indicates the position of the first byte of the portion of the AMD PDU in bytes within the Data field of the AMD PDU
End	B15_Type		SOend field indicates the position of the last byte of the portion of the AMD PDU in bytes within the Data field of the AMD PDU. The special SOend value '111111111111111'B is used to indicate that the missing portion of the AMD PDU includes all bytes to the last byte of the AMD PDU

RLC_Status_NACK_Type

TTCN-3 Record Type			
Name	**RLC_Status_NACK_Type**		
Comment			
NACK_SN	B10_Type		
Extn1	B1_Type		0 A set of NACK_SN, E1 and E2 does not follow. 1 A set of NACK_SN, E1 and E2 follows.
Extn2	B1_Type		0 A set of SOstart and SOend does not follow for this NACK_SN. 1 A set of SOstart and SOend follows for this NACK_SN.
SO	RLC_Status_SegOffset_Type	opt	

RLC_Status_NACK_List_Type

TTCN-3 Record of Type	
Name	**RLC_Status_NACK_List_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of RLC_Status_NACK_Type	

RLC_AM_StatusPDU_Type

TTCN-3 Record Type			
Name	**RLC_AM_StatusPDU_Type**		
Comment			
D_C	B1_Type		0 ..... Control PDU 1 ..... Data PDU
Type	B3_Type		000 ..... STATUS PDU 001-111 .... Reserved (=> PDU to be discarded by the receiving entity for this release of the protocol)
Ack	RLC_Status_ACK_Type		ACK_SN and E1 bit
NackList	RLC_Status_NACK_List_Type	opt	presence depends on Extn1 bit of Ack filed (RLC_Status_ACK_Type)
Padding	RLC_Status_Padding_Type	opt	1..7 bit padding if needed for octet alignment

RLC_PDU_Type

TTCN-3 Union Type		
Name	**RLC_PDU_Type**	
Comment		
TMD	RLC_TMD_PDU_Type	
UMD	RLC_UMD_PDU_Type	
AMD	RLC_AMD_PDU_Type	
Status	RLC_AM_StatusPDU_Type	

RLC_PDUList_Type

TTCN-3 Record of Type	
Name	**RLC_PDUList_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of RLC_PDU_Type	

D.2.2.3 PDCP

PDCP user plane SDU definitions.

PDCP: Basic Type Definitions

TTCN-3 Basic Types		
PDCP_SDU_Type	octetstring	

PDCP_SDUList_Type

TTCN-3 Record of Type	
Name	**PDCP_SDUList_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfSDUs) of PDCP_SDU_Type	

PDCP_DataPdu_LongSN_Type

TTCN-3 Record Type			
Name	**PDCP_DataPdu_LongSN_Type**		
Comment	User plane PDCP Data PDU with long sequence number (TS 36.323, clause 6.2.3)		
D_C	B1_Type		0 ..... Control PDU 1 ..... Data PDU
Reserved	B3_Type		
SequenceNumber	B12_Type		12 bit sequence number
SDU	PDCP_SDU_Type		content (octetstring)

PDCP_DataPdu_ShortSN_Type

TTCN-3 Record Type			
Name	**PDCP_DataPdu_ShortSN_Type**		
Comment	User plane PDCP Data PDU with short sequence number (TS 36.323, clause 6.2.4)		
D_C	B1_Type		0 ..... Control PDU 1 ..... Data PDU
SequenceNumber	B7_Type		7 bit sequence number
SDU	PDCP_SDU_Type		content (octetstring)

PDCP_Ctrl_ROHC_FB_PDU_Type

TTCN-3 Record Type			
Name	**PDCP_Ctrl_ROHC_FB_PDU_Type**		
Comment	PDCP Control PDU for interspersed ROHC feedback packet (TS 36.323, clause 6.2.5)		
D_C	B1_Type		0 ..... Control PDU 1 ..... Data PDU
Type	B3_Type		000 ..... PDCP status report 001 ..... Header Compression Feedback Information 010-111 .... reserved
Reserved	B4_Type		
ROHC_FB	octetstring		Contains one ROHC packet with only feedback, i.e. a ROHC packet that is not associated with a PDCP

PDCP_Ctrl_StatusReport_Type

TTCN-3 Record Type			
Name	**PDCP_Ctrl_StatusReport_Type**		
Comment	PDCP Control PDU for PDCP status report (TS 36.323, clause 6.2.6)		
D_C	B1_Type		0 ..... Control PDU 1 ..... Data PDU
Type	B3_Type		000 ..... PDCP status report 001 ..... Header Compression Feedback Information 010-111 .... reserved
FMS	B12_Type		PDCP SN of the first missing PDCP SDU.
Bitmap	octetstring	opt	The MSB of the first octet of the type "Bitmap" indicates whether or not the PDCP SDU with the SN (FMS + 1) modulo 4096 has been received and, optionally decompressed correctly. 0 ..... PDCP SDU with PDCP SN = (FMS + bit position) modulo 4 096 is missing in the receiver. The bit position of Nth bit in the Bitmap is N, i.e. the bit position of the first bit in the Bitmap is 1. 1 ..... PDCP PSU with PDCP SN = (FMS + bit position) modulo 4 096 does not need to be retransmitted. The bit position of Nth bit in the Bitmap is N, i.e. the bit position of the first bit in the Bitmap is 1.

PDCP_PDU_Type

TTCN-3 Union Type		
Name	**PDCP_PDU_Type**	
Comment		
DataLongSN	PDCP_DataPdu_LongSN_Type	user plane PDCP data PDU with 12 Bit Seq Number
DataShortSN	PDCP_DataPdu_ShortSN_Type	user plane PDCP data PDU with 7 Bit Seq Number
RohcFeedback	PDCP_Ctrl_ROHC_FB_PDU_Type	PDCP Control PDU for interspersed ROHC feedback packet
StatusReport	PDCP_Ctrl_StatusReport_Type	PDCP Control PDU for PDCP status report

PDCP_PDUList_Type

TTCN-3 Record of Type	
Name	**PDCP_PDUList_Type**
Comment	
record length (1..tsc_DRB_MaxNoOfPDUs) of PDCP_PDU_Type	

D.2.3 DRB_Primitive_Definitions

Primitive definitions to send/receive data PDUs over DRB's.

D.2.3.1 Common

Common: Basic Type Definitions

TTCN-3 Basic Types		
HarqProcessId_Type	integer (0..7)	The values 0..7 represent the ID of HARQ process ID

U_PlaneDataList_Type

TTCN-3 Union Type		
Name	**U_PlaneDataList_Type**	
Comment	MAC: acc. to rel-8 protocols there is not more than one MAC PDU per TTI; any MAC PDU is completely included in one subframe RLC: one or more RLC PDUs per 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 subframe PDCP: one or more PDUs per TTI; one PDCP PDU may be included in more than one subframe	
MacPdu	MAC_PDUList_Type	SS configuration: RLC TM mode, MAC no header removal (PDCP is not configured)
RlcPdu	RLC_PDUList_Type	SS configuration: RLC TM mode, MAC header removal (PDCP is not configured)
PdcpPdu	PDCP_PDUList_Type	SS configuration: RLC AM/UM mode, PDCP no header removal
PdcpSdu	PDCP_SDUList_Type	SS configuration: RLC AM/UM mode, PDCP header removal

HarqProcessAssignment_Type

TTCN-3 Union Type		
Name	**HarqProcessAssignment_Type**	
Comment	in DL the HARQ process id may be specified by the test case or automatically assigned by SS	
Id	HarqProcessId_Type	HARQ process id as specified by the test case Note: the scope of this type is only for data being sent in one TTI; if data needs more than one 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
Automatic	Null_Type	HARQ process id automatically assigned by SS

D.2.3.2 Downlink

DRB_DataPerSubframe_DL_Type

TTCN-3 Record Type			
Name	**DRB_DataPerSubframe_DL_Type**		
Comment	common definition for one or several PDUs/SDUs to be sent in the subframe given by the subframe offset; Notes: - For MAC and RLC PDUs a single PDU is always sent in one subframe; SS shall raise an error indication (using SYSTEM_IND) when taht is not possible - For PDCP the data may be spread over more than one subframe (segmented by the RLC); the TTCN implemetation 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		
SubframeOffset	integer		subframe offset relative to the absolute timing information given in the common part of the ASP; Notes: - Acc. to TS 36.523-3, clause 7.3.3 in case of TDD or half-duplex configuration only subframes available for DL are taken into consideration - if a PDCP PDU or SDU takes more than one subframe, SubframeOffset specifies the first TTI
HarqProcess	HarqProcessAssignment_Type		HARQ process to be used: specific value (0..7) or automatically assigned by SS Note: for PDCP SDUs or PDUs automatic mode shall be used
PduSduList	U_PlaneDataList_Type		list of PDUs/SDUs to be sent in one TTI

DRB_DataPerSubframeList_DL_Type

TTCN-3 Record of Type	
Name	**DRB_DataPerSubframeList_DL_Type**
Comment	list of user plane data to be sent in sub-frames given by the SubframeOffset 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 SubframeOffset relative to the common timing info; design consideration: repetitions of this sequence are not foreseen (in which case the subframe offset could not be related to the timing info of the ASP)
record length (1..tsc_DRB_MaxNoOfSubframes) of DRB_DataPerSubframe_DL_Type	

U_Plane_Request_Type

TTCN-3 Record Type			
Name	**U_Plane_Request_Type**		
Comment	Note: formal type definition to allow later enhancements; U_Plane_Request_Type defines a sequence of subframes in which data shall be sent		
SubframeDataList	DRB_DataPerSubframeList_DL_Type		

D.2.3.3 Uplink

DRB_DataPerSubframe_UL_Type

TTCN-3 Record Type			
Name	**DRB_DataPerSubframe_UL_Type**		
Comment	common definition for one or several PDUs/SDUs being received in one subframe or to receive one PDCP PDU or SDU being spread over more than one TTI; Note: There is a fix relation between HARQ process id and subframe in UL => it is not necessary to include HARQ process id for UL data		
PduSduList	U_PlaneDataList_Type		list of PDUs/SDUs being received in one TTI; 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: no of TTIs the SDU or PDU has taken Notes: - the timing info in common part of the ASP always refers to the first TTI - when NoOfTTIs > 1 => PduSduList shall only contain one PDCP PDU or SDU - in case of MAC or RLC PDUs NoOfTTIs shall always be 1 (acc. to TS 36.321 MAC is not doing segmentation of RLC PDUs and acc. to TS 36.322, clause 6.2.2.2 the maximum RLC data is calculated to fit into a MAC PDU and RLC does segmentation accordingly
RedundancyVersion	RedundancyVersion_Type	opt	to be included for MAC PDUs, omit else

U_Plane_Indication_Type

TTCN-3 Record Type			
Name	**U_Plane_Indication_Type**		
Comment	NOTE: Formal type definition to allow later enhancements; U_Plane_Indication_Type defines data being received in a single subframe i.e. PDUs of subsequent TTIs are indicated in separated ASPs		
SubframeData	DRB_DataPerSubframe_UL_Type		

D.2.4 System_Interface

DRB_COMMON_REQ

TTCN-3 Record Type			
Name	**DRB_COMMON_REQ**		
Comment	common ASP to send PDUs to DRBs		
Common	ReqAspCommonPart_Type		CellId identifier of the cell RoutingInfo DRB id TimingInfo starting point when to start sending sequence of data PDUs e.g. SFN = X, subframe number = x; U_Plane.SubframeDataList[i].SubframeOffset := offset_i; => U_Plane.SubframeDataList[i].PduSduList shall be sent out at SFN = X + ((x + offset_i) / 10); subframe number = (x + offset_i) % 10 ControlInfo CnfFlag:=false; FollowOnFlag:=false
U_Plane	U_Plane_Request_Type		

DRB_COMMON_IND

TTCN-3 Record Type			
Name	**DRB_COMMON_IND**		
Comment	common ASP to receive PDUs from DRBs		
Common	IndAspCommonPart_Type		CellId identifier of the cell RoutingInfo DRB id TimingInfo time when message has been received Note: - For MAC and RCL PDUs per definition U_Plane_Indication_Type corresponse to exactly one subframe => TimingInfo refers to this subframe - For PDCP a single PDU or SDU may take more than one TTI => TimingInfo refers to the beginning of the PDU/SDU and the length is given by NoOfTTIs in U_Plane_Indication_Type
U_Plane	U_Plane_Indication_Type		

EUTRA_DRB_PORT

TTCN-3 Port Type		
Name	**EUTRA_DRB_PORT**	
Comment		
out	DRB_COMMON_REQ	
in	DRB_COMMON_IND	

D.3 NasEmu_AspTypes

System interface between NAS emulation and system adaptor.

D.3.1 System_Interface

RRC_PDU_REQ

TTCN-3 Record Type			
Name	**RRC_PDU_REQ**		
Comment			
Common	ReqAspCommonPart_Type		CellId identifier of the cell RoutingInfo SRB0, SRB1, SRB2 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 Notes: - if the RRC PDU is too long to be sent in one TTI the TimingInfo corresponds to the first TTI - the TimingInfo is changed by the NAS Emu (i.e. the timing info as coming from the test case (SRB_COMMON_REQ) is handed throug by the NAS Emu) ControlInfo CnfFlag:=false; FollowOnFlag true: Indicates that the message(s) to be sent on the same TTI will follow NOTE: If the same TimingInfo is not used in the messages to be sent on the same TTI, the SS shall produce an error false: Indicates that no more message(s) will follow
RrcPdu	RRC_MSG_Request_Type		

RRC_PDU_IND

TTCN-3 Record Type			
Name	**RRC_PDU_IND**		
Comment	common ASP to receive PDUs from SRB0, SRB1 or SRB2		
Common	IndAspCommonPart_Type		CellId identifier of the cell RoutingInfo SRB0, SRB1, SRB2 TimingInfo time when message has been received (frame and sub-frame number) this is handed through to the test case by the NAS emulation NOTE: Normally an RRC PDU is expected in one TTI; nevertheless if it is spread over more than one TTIs TimingInfo shall reflect the start of the PDU Status OK or RRC integrity error
RrcPdu	RRC_MSG_Indication_Type		

NASEMU_SYSTEM_PORT

TTCN-3 Port Type		
Name	**NASEMU_SYSTEM_PORT**	
Comment	NASEMU PTC: Port for Sending/Receiving data to/from the SYSTEM Interface	
out	RRC_PDU_REQ	
in	RRC_PDU_IND	

D.4 EUTRA_CommonDefs

D.4.1 Common_Types

Common_Types: Basic Type Definitions

TTCN-3 Basic Types		
RedundancyVersion_Type	integer (0..3)	used in EUTRA_ASP_DrbDefs and EUTRA_ASP_Typedefs
ContentionResolutionId_Type	bitstring length(48)	used in EUTRA_ASP_DrbDefs and EUTRA_ASP_Typedefs

CellId_Type

TTCN-3 Enumerated Type	
Name	**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_CellA	
eutra_CellB	
eutra_CellC	
eutra_CellD	
eutra_CellE	
eutra_CellF	
eutra_CellG	
eutra_CellH	
eutra_CellI	
eutra_CellJ	
eutra_CellK	
eutra_CellL	
eutra_CellM	

RRC_MSG_Request_Type

TTCN-3 Union Type		
Name	**RRC_MSG_Request_Type**	
Comment	DL RRC PDU on CCCH or DCCH	
Ccch	DL_CCCH_Message	
Dcch	DL_DCCH_Message	

RRC_MSG_Indication_Type

TTCN-3 Union Type		
Name	**RRC_MSG_Indication_Type**	
Comment	UL RRC PDU on CCCH or DCCH	
Ccch	UL_CCCH_Message	
Dcch	UL_DCCH_Message	

D.4.2 Common_Constants

EUTRA_CommonDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_MaxNumberOfCells	integer	10	Maximum number of cells as defined in TS 36.508

D.4.3 RRC_Nested_Types

RRC_Nested_Types: Basic Type Definitions

TTCN-3 Basic Types		
SiWindowLength_Type	SystemInformationBlockType1.si_WindowLength	
SiPeriodicity_Type	SchedulingInfoList[0].si_Periodicity	
SpsConfigurationDL_Type	SPS_ConfigDL.setup	
SpsConfigurationUL_Type	SPS_ConfigUL.setup	
M_TMSI_Type	S_TMSI.m_TMSI	
MME_GroupId_Type	RegisteredMME.mmegi	
PrioritizedBitRate_Type	LogicalChannelConfig.ul_SpecificParameters.prioritisedBitRate	
Dl_Bandwidth_Type	CarrierBandwidthEUTRA.dl_Bandwidth	
Ul_Bandwidth_Type	CarrierBandwidthEUTRA.ul_Bandwidth	
CipheringAlgorithm_Type	SecurityAlgorithmConfig.cipheringAlgorithm	
IntegrityProtAlgorithm_Type	SecurityAlgorithmConfig.integrityProtAlgorithm	

D.4.4 ASP_CommonPart

Definition of ASP common parts for REQ-, CNF- and IND-ASPs.

D.4.4.1 ASP_CommonPart_Definitions

D.4.4.1.1 Routing_Info

EUTRA_CommonDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_MaxRB	integer	maxDRB + 3	DRBs + 3 SRBs
tsc_SRB0	integer	0	
tsc_SRB1	integer	1	
tsc_SRB2	integer	2	
tsc_DRB1	DRB_Identity	1	
tsc_DRB2	DRB_Identity	2	
tsc_DRB3	DRB_Identity	3	

Routing_Info: Basic Type Definitions

TTCN-3 Basic Types		
SRB_Identity_Type	integer (tsc_SRB0, tsc_SRB1, tsc_SRB2)	SRB0 to be covered as well

RadioBearerId_Type

TTCN-3 Union Type		
Name	**RadioBearerId_Type**	
Comment		
Srb	SRB_Identity_Type	
Drb	DRB_Identity	

RoutingInfo_Type

TTCN-3 Union Type		
Name	**RoutingInfo_Type**	
Comment		
None	Null_Type	
RadioBearerId	RadioBearerId_Type	

D.4.4.1.2 Timing_Info

Timing_Info: Basic Type Definitions

TTCN-3 Basic Types		
SystemFrameNumber_Type	integer (0..1023)	
SubFrameNumber_Type	integer (0..9)	

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)

SubFrameTiming_Type

TTCN-3 Record Type			
Name	**SubFrameTiming_Type**		
Comment			
SFN	SystemFrameNumber_Type		
Subframe	SubFrameInfo_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 but not for EnquireTiming

D.4.4.2 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 follow 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)

ReqAspCommonPart_Type

TTCN-3 Record Type			
Name	**ReqAspCommonPart_Type**		
Comment			
CellId	CellId_Type		
RoutingInfo	RoutingInfo_Type		
TimingInfo	TimingInfo_Type		
ControlInfo	ReqAspControlInfo_Type		

D.4.4.3 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

CnfAspCommonPart_Type

TTCN-3 Record Type			
Name	**CnfAspCommonPart_Type**		
Comment			
CellId	CellId_Type		
RoutingInfo	RoutingInfo_Type		
TimingInfo	TimingInfo_Type		
Result	ConfirmationResult_Type		

D.4.4.4 IND_ASP_CommonPart

IntegrityErrorIndication_Type

TTCN-3 Record Type			
Name	**IntegrityErrorIndication_Type**		
Comment			
Nas	boolean		NAS Integrity: received MAC does not match calculated MAC
Pdcp	boolean		PDCP Integrity: 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	

IndAspCommonPart_Type

TTCN-3 Record Type			
Name	**IndAspCommonPart_Type**		
Comment			
CellId	CellId_Type		
RoutingInfo	RoutingInfo_Type		
TimingInfo	TimingInfo_Type		
Status	IndicationStatus_Type		

D.5 CommonDefs

CommonDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_UInt8Max	integer	255	
tsc_UInt16Max	integer	65535	
tsc_UInt32Max	integer	4294967295	
tsc_UndefinedB32	B32_Type	oct2bit ('FFFFFFFF'O)	
tsc_UndefinedB128	B128_Type	tsc_UndefinedB32 & tsc_UndefinedB32 & tsc_UndefinedB32 & tsc_UndefinedB32	

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)	
B7_15_Type	bitstring length(7..15)	NOTE: Length restriction can only be a range but not two destinct lengths
B8_Type	bitstring length(8)	
B10_Type	bitstring length(10)	
B11_Type	bitstring length(11)	
B12_Type	bitstring length(12)	
B15_Type	bitstring length(15)	
B32_Type	bitstring length(32)	
B64_Type	bitstring length(64)	
B128_Type	bitstring length(128)	
B256_Type	bitstring length(256)	
B32_128_Type	bitstring length(32..128)	
B128_Key_Type	B128_Type	128 bit security key
Null_Type	boolean (true)	dummy type for 'typeless' fields in unions
Dummy_Type	boolean (true)	dummy type for temporary purposes only
Char1_Type	charstring length (1)	

D.5 References to TTCN-3

References to TTCN-3		
EUTRA_ASP_TypeDefs	CommonEUTRA_Defs/EUTRA_ASP_TypeDefs.ttcn	Rev 1516
EUTRA_ASP_DrbDefs	CommonEUTRA_Defs/EUTRA_ASP_DrbDefs.ttcn	Rev 1516
NasEmu_AspTypes	NasEmulation/NasEmu_AspTypes.ttcn	Rev 1516
EUTRA_CommonDefs	CommonEUTRA_Defs/EUTRA_CommonDefs.ttcn	Rev 1515
CommonDefs	Common/CommonDefs.ttcn	Rev 1537

Annex E (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2008-05					Creatiion of draft TS		0.0.2
2008-08					Add test models	0.0.2	0.1.0
2008-10					Add ASPs and state model	0.1.1	0.3.0
2008-12					Add details of UL/DL scheduling and cell configurations	0.4.0	0.5.0
2009-02					Change naming conventions, add more design considerations	0.5.0	1.0.0
2009-03	43	RP-090271			Presentation for Information	1.0.0	1.0.2
2009-03					Add Upper tester interface	1.0.2	1.1.0
2009-04					Improved DL scheduling	1.1.0	1.2.0
2009-06					Add normative annex D for ASP definitions	1.2.0	1.3.0
2009-08					General update	1.3.0	1.4.0
2009-09					Style /format check from ETSI EditHelp	1.4.0	1.4.1
2009-09	45	RP-090753			Presentation of v2.0.0 for approval	1.4.1	2.0.0
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History

Document history		
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