## 1.2 Detailed specification of the radio interface technology

Detailed specifications described in this Annex are developed around a “Global Core Specification” (GCS)[[1]](#footnote-2), which is related to externally developed materials incorporated by specific references for a specific technology. The process and use of the GCS, references, and related notifications and certifications are found as Document reference to be added by ITU-R.

The IMT-2020 Satellite standards contained in this section are derived from the global core specification for 3GPP 5G-NTN-SRIT contained at reference to be added by ITU-R. The following notes apply to the sections below:

1) The identified Transposing Organizations[[2]](#footnote-3) should make their reference material available from their website.

2) This information was supplied by the Transposing Organizations and relates to their own deliverables of the transposed global core specification.

Section 1.2.1 contains titles and synopses of the Global Core Specification of IMT-2020 Satellite radio interface technology entitled 3GPP 5G-NTN-SRIT and the related hyperlinks to the transposed standards.

The specific 3GPP specifications of the Global Core Specifications (GCS) for IMT-2020 Satellite and 5G-NTN that are being transposed in § 1.2.1 are summarized in Table number to be added by ITU:

TABLE number to be added by ITU

3GPP specifications in § 1.2.1 that are to be transposed

|  |
| --- |
| PART AList of Specifications |
| 36.100 Series | 36.200 Series | 36.300 Series | 36.400 Series | 37.xxx Series | 38.100 Series | 38.200 Series | 38.300 Series | 38.400 Series |
| TS 36.102TS 36.108TS 36.111TS 36.124TS 36.133 | TS 36.201TS 36.211TS 36.212TS 36.213TS 36.214 | TS 36.300TS 36.302TS 36.304TS 36.305TS 36.306TS 36.307TS 36.314TS 36.321TS 36.322TS 36.323TS 36.331TS 36.355TS 36.360TS 36.361 | TS 36.401TS 36.410TS 36.411TS 36.412TS 36.413TS 36.414TS 36.420TS 36.421TS 36.422TS 36.423TS 36.424TS 36.425TS 36.440TS 36.441TS 36.442TS 36.443TS 36.444TS 36.445TS 36.455TS 36.461TS 36.462TS 36.463TS 36.464TS 36.465 | TS 37.320TS 37.324TS 37.340TS 37.355TS 37.460TS 37.461TS 37.462TS 37.470TS 37.471TS 37.472TS 37.473TS 37.480TS 37.481TS 37.482TS 37.483 | TS 38.101-5TS 38.108TS 38.124TS 38.133 | TS 38.201TS 38.202TS 38.211TS 38.212TS 38.213TS 38.214TS 38.215 | TS 38.300TS 38.304TS 38.305TS 38.306TS 38.307TS 38.314TS 38.321TS 38.322TS 38.323TS 38.331TS 38.355 | TS 38.401TS 38.410TS 38.411TS 38.412TS 38.413TS 38.414TS 38.415TS 38.420TS 38.421TS 38.422TS 38.423TS 38.424TS 38.425TS 38.455TS 38.460TS 38.461TS 38.462TS 38.463TS 38.470TS 38.471TS 38.472TS 38.473TS 38.474 |
| PART BSpecification versions to be used |
| The specific versions of the 3GPP specifications that are to be used for the transpositions of those specifications listed in Table number to be added by ITU are provided in the link below:link to be provided by ITU |

Editor’s note : the next Section will be updated once the list of specifications in the table above will be agreed

### 1.2.1 Titles and synopses of the global core specification and the transposed standards

#### 1.2.1.1 Introduction

The standards documents referenced below, as transposed from the relevant 3GPP specifications, are provided by the identified ***Transposing Organizations*** as the transposed sets of standards for the terrestrial radio interface of IMT-2020 identified as *5G* and includes not only the key characteristics of IMT-2020 but also the additional capabilities of *5G* both of which are continuing to be enhanced.

#### 1.2.1.2 Radio Layer 1

##### 1.2.1.2.1 TS 36.201

Evolved Universal Terrestrial Radio Access (E-UTRA); LTE physical layer; General description

This document provides a general description of the physical layer of the E-UTRA radio interface. This document also describes the document structure of the 3GPP E-UTRA physical layer specifications, i.e. TS 36.200 series. The TS 36.200 series specifies the Uu point for the LTE mobile system, and defines the minimum level of specifications required for basic connections in terms of mutual connectivity and compatibility.

##### 1.2.1.2.2 TS 36.211

Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation

This document describes the physical channels and modulation for E-UTRA.

##### 1.2.1.2.3 TS 36.212

Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding

This document specifies the coding, multiplexing and mapping to physical channels for E-UTRA.

##### 1.2.1.2.4 TS 36.213

Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures

This document specifies and establishes the characteristics of the physical layer procedures for E-UTRA.

##### 1.2.1.2.5 TS 36.214

Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements

This document contains the description and definition of the measurements done at the UE and network in order to support operation in idle mode and connected mode in E-UTRA.

##### 1.2.1.2.6 TS 36.216

Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer for relaying operation

This document describes the characteristics of eNodeB – relay node transmissions.

##### 1.2.1.2.7 TS 38.201

NR; Physical layer; General description

This document provides a general description of the physical layer of NR radio interface. This document also describes the document structure of the 3GPP physical layer specifications, i.e. TS 38.200 series.

##### 1.2.1.2.8 TS 38.202

NR; Services provided by the physical layer

This document is a technical specification of the services provided by the physical layer of 5G-NR to upper layers.

##### 1.2.1.2.9 TS 38.211

NR; Physical channels and modulation

This document describes the physical channels and signals for 5G-NR.

##### 1.2.1.2.10 TS 38.212

NR; Multiplexing and channel coding

This document specifies the coding, multiplexing and mapping to physical channels for 5G NR.

##### 1.2.1.2.11 TS 38.213

NR; Physical layer procedures for control

This document specifies and establishes the characteristics of the physical layer procedures for control operations in 5G-NR.

##### 1.2.1.2.12 TS 38.214

NR; Physical layer procedures for data

This document specifies and establishes the characteristics of the physicals layer procedures of data channels for 5G-NR.

##### 1.2.1.2.13 TS 38.215

NR; Physical layer measurements

This document describes the physical layer measurements for NR.

#### 1.2.1.3 Radio Layers 2 & 3

##### 1.2.1.3.1 TS 36.300

Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2

This document provides an overview and overall description of the E-UTRAN radio interface protocol architecture. Details of the radio interface protocols are specified in companion specifications of the 36 series.

##### 1.2.1.3.2 TS 36.302

Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer

This document is a technical specification of the services provided by the physical layer of E-UTRA to upper layers.

##### 1.2.1.3.3 TS 36.304

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode

This document specifies the Access Stratum (AS) part of the Idle Mode procedures applicable to a UE. This document specifies the model for the functional division between the NAS and AS in a UE. This document applies to all UEs that support at least E-UTRA, including multi-RAT UEs as described in 3GPP specifications, in the following cases: (i) When the UE is camped on an E-UTRA cell; (ii) When the UE is searching for a cell to camp on.

##### 1.2.1.3.4 TS 36.305

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Stage 2 functional specification of User Equipment (UE) positioning in E-UTRAN

This document specifies the stage 2 of the UE positioning function of E-UTRAN, which provides the mechanisms to support or assist the calculation of the geographical position of a UE. The purpose of this stage 2 specification is to define the E-UTRAN UE Positioning architecture, functional entities and operations to support positioning methods. This description is confined to the E-UTRAN Access Stratum. This stage 2 specification covers the E-UTRAN positioning methods, state descriptions, and message flows to support UE positioning.

##### 1.2.1.3.5 TS 36.306

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities

This document defines the E-UTRA UE Radio Access Capability Parameters.

##### 1.2.1.3.6 TS 36.307

Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements on User Equipments (UEs) supporting a release-independent frequency band

This document specifies requirements on UEs supporting a frequency band that is independent of release. TSG-RAN has agreed that the standardization of new frequency bands may be independent of a release. However, in order to implement a UE that conforms to a particular release but supports a band of operation that is specified in a later release, it is necessary to specify some extra requirements. All frequency bands are fully specified in this release of the specifications. This document does not contain any requirements for UEs supporting frequency bands independent of release.

##### 1.2.1.3.7 TS 36.314

Evolved Universal Terrestrial Radio Access (E-UTRA); Layer 2 – Measurements

This document contains the description and definition of the measurements performed by E‑UTRAN that are transferred over the standardized interfaces in order to support E-UTRA radio link operations, radio resource management (RRM), network operations and maintenance (OAM), and self-organizing networks (SON).

##### 1.2.1.3.8 TS 36.321

Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification

This document specifies the E-UTRA Medium Access Control (MAC) protocol.

##### 1.2.1.3.9 TS 36.322

Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification

This document specifies the E-UTRA Radio Link Control (RLC) protocol.

##### 1.2.1.3.10 TS 36.323

Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification

This document specifies the E-UTRA Packet Data Convergence Protocol (PDCP).

##### 1.2.1.3.11 TS 36.331

Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification

This document specifies the Radio Resource Control protocol for the radio interface between UE and E-UTRAN as well as for the radio interface between RN and E-UTRAN. The scope of this document also includes: (i) the radio related information transported in a transparent container between source eNodeB and target eNodeB upon inter eNodeB handover; (ii) the radio related information transported in a transparent container between a source or target eNodeB and another system upon inter RAT handover.

##### 1.2.1.3.12 TS 36.355

Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)

This document contains the definition of the LTE Positioning Protocol (LPP).

##### 1.2.1.3.13 TS 36.360

Evolved Universal Terrestrial Radio Access (E-UTRA); LTE-WLAN Aggregation Adaptation Protocol (LWAAP) specification

This document specifies the E-UTRA LTE-WLAN Aggregation Adaptation Protocol (LWAAP).

##### 1.2.1.3.14 TS 36.361

Evolved Universal Terrestrial Radio Access (E-UTRA); LTE/WLAN Radio Level Integration Using IPsec Tunnel (LWIP) encapsulation; Protocol specification

This document specifies the LWIP Encapsulation Protocol.

##### 1.2.1.3.15 TS 37.320

Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2

This document provides an overview and overall description of the minimization of drive tests functionality. The document describes functions and procedures to support collection of UE-specific measurements for MDT using Control Plane architecture, for both UTRAN and E‑UTRAN. Details of the signalling procedures for single-RAT operation are specified in the appropriate radio interface protocol specification. Network operation and overall control of MDT is described in OAM specifications.

##### 1.2.1.3.16 TS 37.324

Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Service Data Adaptation Protocol (SDAP) specification

This document specifies the Service Data Adaptation Protocol (SDAP) for a UE with connection to the 5G-CN.

##### 1.2.1.3.17 TS 37.340

NR; Multi-connectivity; Overall description; Stage-2

This document provides an overview of the multi-connectivity operation using E-UTRA and NR radio access technologies. Details of the network and radio interface protocols are specified in companion specifications of the 36 and 38 series.

##### 1.2.1.3.18 TS 37.355

LTE Positioning Protocol (LPP)

This document contains the definition of the LTE Positioning Protocol (LPP) for the radio access technologies E-UTRA/LTE and NR.

##### 1.2.1.3.19 TS 38.300

NR; NR and NG-RAN Overall description; Stage-2

This document provides an overview and overall description of the NG-RAN and focuses on the radio interface protocol architecture of NR connected to 5GC (E-UTRA connected to 5GC is covered in the 36 series). Details of the radio interface protocols are specified in companion specifications of the 38 series.

##### 1.2.1.3.20 TS 38.304

NR; User Equipment (UE) procedures in idle mode and in RRC Inactive state

This document specifies the Access Stratum (AS) part of the UE procedures in RRC\_IDLE state (also called Idle mode) and RRC\_INACTIVE state. The non-access stratum (NAS) part of Idle mode procedures and processes is specified in TS 23.122.

This document specifies the model for the functional division between the NAS and AS in a UE.

This document applies to all UEs that support at least NR Radio Access, including multi-RAT UEs as described in 3GPP specifications, in the following cases:

− When the UE is camped on a NR cell;

− When the UE is searching for a cell to camp on;

NOTE – When the UE is camped on or searching for a cell to camp on belonging to other RATs, the UE behaviour is described in the specifications of the other RATs.

##### 1.2.1.3.21 TS 38.305

NG Radio Access Network (NG-RAN); Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN

This document specifies the stage 2 of the UE Positioning function of NG-RAN which provides the mechanisms to support or assist the calculation of the geographical position of a UE. UE position knowledge can be used, for example, in support of Radio Resource Management functions, as well as location-based services for operators, subscribers, and third-party service providers. The purpose of this stage 2 specification is to define the NG-RAN UE Positioning architecture, functional entities and operations to support positioning methods. This description is confined to the NG-RAN Access Stratum. It does not define or describe how the results of the UE position calculation can be utilised in the Core Network (e.g. LCS) or in NG-RAN (e.g. RRM).

UE Positioning may be considered as a network-provided enabling technology consisting of standardised service capabilities that enable the provision of location applications. The application(s) may be service provider specific. The description of the numerous and varied possible location applications which are enabled by this technology is outside the scope of this document. However, clarifying examples of how the functionality being described may be used to provide specific location services may be included.

This stage 2 specification covers the NG-RAN positioning methods, state descriptions, and message flows to support UE Positioning.

##### 1.2.1.3.22 TS 38.306

NR; User Equipment (UE) radio access capabilities

This document defines the NR UE Radio Access Capability Parameters.

##### 1.2.1.3.23 TS 38.307

NR; Requirements on User Equipments (UEs) supporting a release-independent frequency band

This document specifies requirements for UEs supporting release independent features such as additional NR operating bands and power classes on top of TS 38.101 and TS 38.133.

##### 1.2.1.3.24 TS 38.314

NR; Layer 2 measurements

This document contains the description and definition of the measurements performed by NR or the UE that are transferred over the standardised interfaces in order to support NR radio link operations, radio resource management (RRM), network operations and maintenance (OAM), minimization of drive tests (MDT) and self-organising networks (SON).

Only the differences relative to TS 28.552 are specified in this specification.

##### 1.2.1.3.25 TS 38.321

NR; Medium Access Control (MAC) protocol specification

This document specifies the NR MAC protocol.

##### 1.2.1.3.26 TS 38.322

NR; Radio Link Control (RLC) protocol specification

This document specifies the NR Radio Link Control (RLC) protocol for the UE – NR radio interface.

##### 1.2.1.3.27 TS 38.323

NR; Packet Data Convergence Protocol (PDCP) specification

This document provides the description of the Packet Data Convergence Protocol (PDCP).

##### 1.2.1.3.28 TS 38.331

NR; Radio Resource Control (RRC); Protocol specification

This document specifies the Radio Resource Control protocol for the radio interface between UE and NG-RAN.

The scope of this document also includes:

− the radio related information transported in a transparent container between source gNB and target gNB upon inter gNB handover;

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

− the radio related information transported in a transparent container between a source eNB and target gNB during E-UTRA-NR Dual Connectivity.

##### 1.2.1.3.29 TS 38.340

NR; Backhaul Adaptation Protocol (BAP) specification

This document provides description of the Backhaul Adaptation Protocol (BAP).

##### 1.2.1.3.30 TS 38.351

**NR; Sidelink Relay Adaptation Protocol (SRAP) Specification**

This document provides description of the Sidelink Relay Adaptation Protocol (SRAP).

##### 1.2.1.3.31 TS 38.355

**NR; Sidelink Positioning Protocol (SLPP); Protocol Specification**

This document specifies the Sidelink Positioning Protocol (SLPP) for the interface between UEs and between UE and LMF.

#### 1.2.1.4 Architecture

##### 1.2.1.4.1 TS 36.401

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Architecture description

This document describes the overall architecture of the E-UTRAN, including internal interfaces and assumptions on the radio, S1 and X2 interfaces.

##### 1.2.1.4.2 TS 36.410

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 general aspects and principles

This document is an introduction to the 3GPP TS 36.41x series of technical specifications that define the S1 interface for the interconnection of the eNodeB component of the Evolved Universal Terrestrial Radio Access Network (E UTRAN) to the Core Network of the EPS system.

##### 1.2.1.4.3 TS 36.411

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 layer 1

This document specifies the standards allowed to implement layer 1 on the S1 interface. The specification of transmission delay requirements and O&M requirements are not in the scope of this document. In the following, “layer 1” and “physical layer” are assumed to be synonymous.

##### 1.2.1.4.4 TS 36.412

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 signalling transport

This document specifies the standards for signalling transport to be used across S1 interface. S1 interface is a logical interface between the eNodeB and the E-UTRAN core network. This document describes how the S1-AP signalling messages are transported over S1.

##### 1.2.1.4.5 TS 36.413

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)

This document specifies the E-UTRAN radio network layer signalling protocol for the S1 interface. The S1 Application Protocol (S1AP) supports the functions of S1 interface by signalling procedures defined in this document.

##### 1.2.1.4.6 TS 36.414

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 data transport

This document specifies the standards for user data transport protocols and related signalling protocols to establish user plane transport bearers over the S1 interface.

##### 1.2.1.4.7 TS 36.420

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 general aspects and principles

This document is an introduction to the TSG RAN TS 36.42x series of UMTS technical specifications that define the X2 interface. It is an interface for the interconnection of two E-UTRAN NodeB (eNodeB) components within the Evolved Universal Terrestrial Radio Access Network (E‑UTRAN) architecture.

##### 1.2.1.4.8 TS 36.421

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 layer 1

This document specifies the standards allowed to implement Layer 1 on the X2 interface. The specification of transmission delay requirements and O & M requirements are not in the scope of this document. In the following “Layer 1” and “Physical Layer” are assumed to be synonymous.

##### 1.2.1.4.9 TS 36.422

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 signalling transport

This document specifies the standards for Signalling Transport to be used across X2 interface. X2 interface is a logical interface between eNodeBs. This document describes how the X2-AP signalling messages are transported over X2.

##### 1.2.1.4.10 TS 36.423

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)

This document specifies the radio network layer signalling procedures of the control plane between eNodeBs in E-UTRAN. X2AP supports the functions of X2 interface by signalling procedures defined in this document.

##### 1.2.1.4.11 TS 36.424

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 data transport

This document specifies the standards for user data transport protocols and related signalling protocols to establish user plane transport bearers over the X2 interface.

##### 1.2.1.4.12 TS 36.425

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 interface user plane protocol

This document specifies the X2 user plane protocol being used over the X2 interface.

##### 1.2.1.4.13 TS 36.440

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); General aspects and principles for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN

This document describes the overall architecture of the interface for the provision of MBMS in the E-UTRAN. This includes also a description of the general aspects, assumptions and principles guiding the architecture and interface. The MBMS functions to be provided within that architecture are summarized. It introduces the TSG RAN TS 36.44x series of UMTS technical specifications that define the different interfaces introduced for MBMS provision in E-UTRAN.

##### 1.2.1.4.14 TS 36.441

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Layer 1 for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN

This document specifies the standards allowed to implement layer 1 on the interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN. In the following, “layer 1” and “physical layer” are assumed to be synonymous.

##### 1.2.1.4.15 TS 36.442

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Signalling Transport for interfaces supporting Multimedia Broadcast Multicast Service (MBMS) within E-UTRAN

This document specifies the standards for signalling transport to be used across M2 and M3 interfaces. M2 interface is a logical interface between the eNodeB and the MCE. M3 interface is a logical interface between the MCE and the MME. This document describes how the M2-AP signalling messages are transported over M2, and how the M3-AP signalling messages are transported over M3.

##### 1.2.1.4.16 TS 36.443

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M2 Application Protocol (M2AP)

This document specifies the E-UTRAN radio network layer signalling protocol for the M2 interface. The M2 Application Protocol (M2AP) supports the functions of M2 interface by signalling procedures defined in this document.

##### 1.2.1.4.17 TS 36.444

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M3 Application Protocol (M3AP)

This document specifies the E-UTRAN radio network layer signalling protocol for the M3 interface. The M3 Application Protocol (M3AP) supports the functions of M3 interface by signalling procedures defined in this document.

##### 1.2.1.4.18 TS 36.445

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M1 data transport

This document specifies the standards for user data transport protocols over the E-UTRAN M1 interface.

##### 1.2.1.4.19 TS 36.455

Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol A (LPPa)

This document specifies the control plane radio network layer signalling procedures between eNodeB and E-SMLC. LPPa supports the concerned functions by signalling procedures defined in this document.

##### 1.2.1.4.20 TS 36.456

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); SLm interface general aspects and principles

This document is an introduction to the 3GPP TS 36.45x series of technical specifications that define the SLm interface for the interconnection of the Evolved Serving Mobile Location Centre (E-SMLC) to the Location Measurement Unit (LMU) components of the Evolved Universal Terrestrial Radio Access Network (E-UTRAN).

##### 1.2.1.4.21 TS 36.457

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); SLm interface layer 1

This document specifies the standards allowed to implement layer 1 on the SLm interface.

##### 1.2.1.4.22 TS 36.458

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); SLm interface signalling transport

This document specifies the standards for signalling transport to be used across the SLm interface. The SLm interface is a logical interface between the LMU and the E-SMLC in the E-UTRAN core network. This document describes how the SLmAP signalling messages are transported over SLm.

##### 1.2.1.4.23 TS 36.459

Evolved Universal Terrestrial Radio Access Network (E-UTRAN); SLm interface Application Protocol (SLmAP)

This document specifies the E-UTRAN radio network layer signalling protocol for the SLm interface. The SLm Application Protocol (SLmAP) supports the functions of the SLm interface by signalling procedures defined in this document.

##### 1.2.1.4.24 TS 36.461

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless LAN (WLAN); Xw layer 1

This document specifies the standards allowed to implement Layer 1 on the Xw interface. The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

##### 1.2.1.4.25 TS 36.462

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless LAN (WLAN); Xw signalling transport

This document specifies the standards for Signalling Transport to be used across the Xw interface. The Xw interface is a logical interface between the eNB and the WLAN Termination (WT). This document describes how the Xw-AP signalling messages are transported over Xw.

##### 1.2.1.4.26 TS 36.463

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless Local Area Network (WLAN); Xw application protocol (XwAP)

This document specifies the signalling procedures of the control plane between an eNB and WLAN Termination (WT). The Xw Application Protocol (XwAP) supports the functions of Xw interface by signalling procedures defined in this document.

##### 1.2.1.4.27 TS 36.464

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless Local Area Network (WLAN); Xw data transport

This document specifies the standards for user data transport protocols and related signalling protocols to establish user plane transport bearers over the Xw interface for LTE/WLAN Aggregation (LWA).

##### 1.2.1.4.28 TS 36.465

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless Local Area Network (WLAN); Xw interface user plane protocol

This document specifies the Xw user plane protocol being used over the Xw interface for LTE/WLAN Aggregation (LWA).

##### 1.2.1.4.29 TS 37.460

Iuant interface: General aspects and principles

This document is an introduction to the 3GPP TS 37.46x series of Technical Specifications that define the Iuant Interface. The Iuant interface is applicable for UTRAN, E-UTRAN and NG-RAN. In this specification UTRAN, E-UTRAN and NG-RAN are denoted as “RAN”, whereas the corresponding network entities Node B, eNB, en-gNB and NG-RAN node are denoted as “RAN Node”. The logical Iuant interface is an interface internal to the RAN Node and defined to reside between the implementation specific O&M function and the RET antennas and between the implementation specific O&M function and the TMA control unit function.

##### 1.2.1.4.30 TS 37.461

Iuant interface: Layer 1

This document specifies the standards allowed to implement layer 1 on the Iuant interface for UTRA, E-UTRA and NR.

The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

##### 1.2.1.4.31 TS 37.462

Iuant interface: Signalling transport

This document specifies the signalling transport related to RETAP and TMAAP signalling to be used across the Iuant interface for UTRAN, E-UTRAN and NG‑RAN. In this specification UTRAN, E-UTRAN and NG-RAN are denoted as “RAN”, whereas the corresponding network entities Node B, eNB, en-gNB and NG-RAN node are denoted as “RAN Node”. The logical Iuant interface is an interface internal to the RAN Node and defined to reside between the implementation specific O&M function and the RET antennas and between the implementation specific O&M function and the TMA control unit function.

##### 1.2.1.4.32 TS 37.466

Iuant interface: Application part

This document is an introduction to the 3GPP TS 37.46x series of Technical Specifications that define the Iuant Interface. The Iuant interface is applicable for UTRAN, E-UTRAN and NG-RAN. In this specification UTRAN, E-UTRAN and NG-RAN are denoted as “RAN”, whereas the corresponding network entities Node B, eNB, en-gNB and NG-RAN node are denoted as “RAN Node”. The logical Iuant interface is an interface internal to the RAN Node and defined to reside between the implementation specific O&M function and the RET antennas together with the TMAs control unit function of the RAN Node.

This document is applicable for UTRAN, E-UTRAN and NG-RAN and specifies the *Remote Electrical Tilting Application Part (RETAP)* and the *Tower Mounted Amplifier Application Part (TMAAP).* In this specification UTRAN, E-UTRAN and NG-RAN are denoted as “RAN”, whereas the corresponding network entities Node B, eNB, en-gNB and NG-RAN node are denoted as “RAN Node”. RETAP supports the functions of the Iuant interface between the implementation specific O&M transport function and the RET Antenna Control unit function, TMAAP supports the functions of the Iuant interface between the implementation specific O&M transport function and the TMA control function.

##### 1.2.1.4.33 TS 37.470

W1 interface; General aspects and principles

This document is an introduction to the 3GPP TS 37.4xx series of technical specifications that define the W1 interface. The W1 interface provides means for interconnecting a ng-eNB-CU and a ng-eNB-DU of a ng-eNB within a NG-RAN.

##### 1.2.1.4.34 TS 37.471

W1 interface; Layer 1

This document specifies the standards allowed to implement Layer 1 on the W1 interface. The W1 interface provides means for interconnecting a ng-eNB-CU and a ng-eNB-DU of a ng-eNB within a NG-RAN.

The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

In the following ‘Layer 1’ and ‘Physical Layer’ are assumed to be synonymous.

##### 1.2.1.4.35 TS 37.472

W1 interface; Signalling transport

This document specifies the standards for Signalling Transport to be used across the W1 interface. The W1 interface provides means for interconnecting a ng-eNB-CU and a ng-eNB-DU of a ng-eNB within a NG-RAN. This document describes how the W1AP signalling messages are transported over W1.

##### 1.2.1.4.36 TS 37.473

W1 interface; Application Protocol (W1AP)

This document specifies the 5G radio network layer signalling protocol for the W1 interface. The W1 interface provides means for interconnecting a ng-eNB-CU and a ng-eNB-DU of a ng-eNB within an NG-RAN. The W1 Application Protocol (W1AP) supports the functions of W1 interface by signalling procedures defined in this document. W1AP is developed in accordance with the general principles stated in TS 38.401 and TS 37.470.

##### 1.2.1.4.37 TS 37.480

**E1 general aspects and principles**

This document is an introduction to the 3GPP TS 37.48x series of technical specifications that define the E1 interface. The E1 interface provides means for interconnecting a gNB-CU-CP and a gNB-CU-UP of a gNB-CU within an NG-RAN, or for interconnecting a gNB-CU-CP and a gNB-CU-UP of an en-gNB within an E-UTRAN, or for interconnecting an eNB-CP and an eNB-UP of an eNB within an E-UTRAN, or for interconnecting an ng-eNB-CU-CP and an ng-eNB-CU-UP of an ng-eNB-CU within an NG-RAN.

##### 1.2.1.4.38 TS 37.481

**E1 layer 1**

This document specifies the standards allowed to implement layer 1 on the E1 interface.

##### The specification of transmission delay requirements and O&M requirements are not in the scope of this document.1.2.1.4.39 TS 37.482

**E1 signalling transport**

This document specifies the standards for Signalling Transport to be used across the E1 interface. The E1 interface provides means for the interconnection of gNB-CU-CP and gNB-CU-UP within the NG-RAN architecture (TS 38.401), or for the interconnection of ng-eNB-CU-CP and ng-eNB-CU-UP within the NG-RAN architecture (TS 38.401), or for the interconnection of eNB-CP and eNB-UP within the E-UTRAN architecture (TS 36.401).

##### 1.2.1.4.40 TS 37.483

**E1 Application Protocol (E1AP)**

This document specifies the 5G radio network layer signalling protocol for the E1 interface. The E1 interface provides means for interconnecting a gNB-CU-CP and a gNB-CU-UP of a gNB within an NG-RAN, or for interconnecting a gNB-CU-CP and a gNB-CU-UP of an en-gNB within an E-UTRAN, or for interconnecting an eNB-CP and an eNB-UP of an eNB within an E-UTRAN, or for interconnecting an ng-eNB-CU-CP and an ng-eNB-CU-UP of an ng-eNB within an NG-RAN. The E1 Application Protocol (E1AP) supports the functions of E1 interface by signalling procedures defined in this document. E1AP is developed in accordance to the general principles stated in TS 38.401 and TS 37.480.

##### 1.2.1.4.41 TS 38.401

NG-RAN; Architecture description

This document describes the overall architecture of the NG-RAN, including interfaces NG, Xn and F1 interfaces and their interaction with the radio interface.

##### 1.2.1.4.42 TS 38.410

NG-RAN; NG general aspects and principles

This document is an introduction to the 3GPP TS 38.41x series of technical specifications that define the NG interface for the interconnection of an NG-RAN node to the 5GC (5G Core Network).

##### 1.2.1.4.43 TS 38.411

NG-RAN; NG layer 1

This document specifies the standards allowed to implement layer 1 on the NG interface.

The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

##### 1.2.1.4.44 TS 38.412

NG-RAN; NG signalling transport

This document specifies the standards for signalling transport to be used across NG interface. NG interface is a logical interface between the NG-RAN and the 5GC. This document describes how the NGAP signalling messages are transported over NG.

##### 1.2.1.4.45 TS 38.413

NG-RAN; NG Application Protocol (NGAP)

This document specifies the radio network layer signalling protocol for the NG interface. The NG Application Protocol (NGAP) supports the functions of the NG interface by signalling procedures defined in this document. NGAP is developed in accordance with the general principles stated in TS 38.401 and TS 38.410.

##### 1.2.1.4.46 TS 38.414

NG-RAN; NG data transport

This document specifies the standards for user data transport protocols and related signalling protocols to establish user plane transport bearers over the NG interface.

##### 1.2.1.4.47 TS 38.415

NG-RAN; PDU session user plane protocol

This document specifies the PDU Session user plane protocol being used over the NG-U, Xn-U and N9 interfaces. Applicability to other interfaces is not precluded.

##### 1.2.1.4.48 TS 38.420

NG-RAN; Xn general aspects and principles

This document is an introduction to the TSG RAN TS 38.42x series of Technical Specifications that define the Xn interface. It is an interface for the interconnection of two NG-RAN nodes within the NG-RAN architecture (TS 38.401).

##### 1.2.1.4.49 TS 38.421

NG-RAN; Xn layer 1

This document specifies the standards allowed to implement layer 1 on the Xn interface.

The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

##### 1.2.1.4.50 TS 38.422

NG-RAN; Xn signalling transport

This document specifies the standards for signalling transport to be used across Xn interface. The Xn interface provides means for interconnecting two NG-RAN nodes. The Xn interface is a logical interface between two nodes of the NG-RAN. This document describes how the XnAP signalling messages are transported over Xn.

##### 1.2.1.4.51 TS 38.423

NG-RAN; Xn Application Protocol (XnAP)

This document specifies the radio network layer signalling procedures of the control plane between NG-RAN nodes in NG-RAN. XnAP supports the functions of the Xn interface by signalling procedures defined in this document. XnAP is developed in accordance with the general principles stated in TS 38.401 and TS 38.420.

##### 1.2.1.4.52 TS 38.424

NG-RAN; Xn data transport

This document specifies the standards for user data transport protocols and related signalling protocols to establish user plane transport bearers over the Xn interface.

##### 1.2.1.4.53 TS 38.425

NG-RAN; NR user plane protocol

This document specifies the NR user plane protocol functions used within NG-RAN and, for EN-DC, within E-UTRAN. NR user plane protocol functions may reside in nodes terminating either the X2-U (for EN-DC) or the Xn-U or the F1-U interface.

##### 1.2.1.4.54 TS 38.455

NG-RAN; NR Positioning Protocol A (NRPPa)

This document specifies the control plane radio network layer signalling procedures between a NG-RAN node and the LMF. NRPPa supports the concerned functions by signalling procedures defined in this document.

##### 1.2.1.4.55 TS 38.460

NG-RAN; E1 general aspects and principles

This document is an introduction to the 3GPP TS 38.46x series of technical specifications that define the E1 interface. The E1 interface provides means for interconnecting a gNB-CU-CP and a gNB-CU-UP of a gNB-CU within an NG-RAN, or for interconnecting a gNB-CU-CP and a gNB-CU-UP of an en-gNB within an E-UTRAN.

##### 1.2.1.4.56 TS 38.461

NG-RAN; E1 layer 1

This document specifies the standards allowed to implement layer 1 on the E1 interface.

The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

##### 1.2.1.4.57 TS 38.462

NG-RAN; E1 signalling transport

This document specifies the standards for Signalling Transport to be used across the E1 interface. The E1 interface provides means for the interconnection of gNB-CU-CP and gNB-CU-UP within the NG-RAN architecture (TS 38.401).

##### 1.2.1.4.58 TS 38.463

NG-RAN; E1 Application Protocol (E1AP)

This document specifies the 5G radio network layer signalling protocol for the E1 interface. The E1 interface provides means for interconnecting a gNB-CU-CP and a gNB-CU-UP of a gNB within an NG-RAN, or for interconnecting a gNB-CU-CP and a gNB-CU-UP of an en-gNB within an E-UTRAN. The E1 Application Protocol (E1AP) supports the functions of E1 interface by signalling procedures defined in this document. E1AP is developed in accordance to the general principles stated in TS 38.401 and TS 38.460.

##### 1.2.1.4.59 TS 38.470

NG-RAN; F1 general aspects and principles

This document is an introduction to the 3GPP TS 38.47x series of technical specifications that define the F1 interface. The F1 interface provides means for interconnecting a gNB-CU and a gNB-DU of a gNB within an NG-RAN, or for interconnecting a gNB-CU and a gNB-DU of an en-gNB within an E-UTRAN.

##### 1.2.1.4.60 TS 38.471

NG-RAN; F1 layer 1

This document specifies the standards allowed to implement Layer 1 on the F1 interface. The F1 interface provides means for interconnecting a gNB-CU and a gNB-DU of a gNB within an NG-RAN, or for interconnecting a gNB-CU and a gNB-DU of an en-gNB within an E-UTRAN.

The specification of transmission delay requirements and O&M requirements are not in the scope of this document.

##### 1.2.1.4.61 TS 38.472

NG-RAN; F1 signalling transport

This document specifies the standards for Signalling Transport to be used across the F1 interface. The F1 interface provides means for interconnecting a gNB-CU and a gNB-DU of a gNB within an NG-RAN, or for interconnecting a gNB-CU and a gNB-DU of an en-gNB within an E-UTRAN. This document describes how the F1AP signalling messages are transported over F1.

##### 1.2.1.4.62 TS 38.473

NG-RAN; F1 Application Protocol (F1AP)

This document specifies the 5G radio network layer signalling protocol for the F1 interface. The F1 interface provides means for interconnecting a gNB-CU and a gNB-DU of a gNB within an NG-RAN, or for interconnecting a gNB-CU and a gNB-DU of an en-gNB within an E-UTRAN. The F1 Application Protocol (F1AP) supports the functions of F1 interface by signalling procedures defined in this document. F1AP is developed in accordance with the general principles stated in TS 38.401 and TS 38.470.

##### 1.2.1.4.63 TS 38.474

NG-RAN; F1 data transport

This document specifies the standards for user data transport protocols and related signalling protocols to establish user plane transport bearers over the F1 interface. The F1 interface provides means for interconnecting a gNB-CU and a gNB-DU of a gNB within an NG-RAN, or for interconnection a gNB-CU and a gNB-DU of an en-gNB within an E-UTRAN.

#### 1.2.1.5 Radio-frequency aspects

##### 1.2.1.5.1 TS 36.101

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception

This document establishes the minimum RF characteristics and minimum performance requirements for E-UTRA User Equipment (UE).

##### 1.2.1.5.2 TS 36.102

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception for satellite access

This document establishes the minimum RF characteristics and minimum performance requirements for E-UTRA User Equipment (UE) operating satellite access.

##### 1.2.1.5.3 TS 36.104

Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception

This document establishes the minimum RF characteristics and minimum performance requirements of E-UTRA Base Station (BS).

##### 1.2.1.5.4 TS 36.106

Evolved Universal Terrestrial Radio Access (E-UTRA); FDD repeater radio transmission and reception

This document establishes the minimum RF characteristics of E-UTRA FDD Repeater.

##### 1.2.1.5.5 TS 36.108

**Evolved Universal Terrestrial Radio Access (E-UTRA); Satellite Access Node radio transmission and reception**

This document establishes the minimum RF characteristics and minimum performance requirements of Satellite Access Node (SAN) supporting standalone NB-IoT operation or E-UTRA.

##### 1.2.1.5.6 TS 36.111

Location Measurement Unit (LMU) performance specification; Network based positioning systems in Evolved Universal Terrestrial Radio Access Network (E-UTRAN)

This document establishes the Location Measurement Unit (LMU) minimum UTDOA positioning requirement for the FDD and TDD mode of E-UTRAN.

##### 1.2.1.5.7 TS 36.113

Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) and repeater ElectroMagnetic Compatibility (EMC)

This document covers the assessment of E-UTRA base stations, repeaters and associated ancillary equipment in respect of Electromagnetic Compatibility (EMC). This document specifies the applicable test conditions, performance assessment and performance criteria for E-UTRA base stations, repeaters and associated ancillary equipment in one of the following categories: (i) base stations of E-UTRA meeting the requirements of TS 36.104, with conformance demonstrated by compliance to TS 36.141; (ii) repeaters of FDD E-UTRA meeting the requirements of TS 36.106, with conformance demonstrated by compliance to TS 36.143. The environment classification used in this document refers to the environment classification used in IEC 61000-6-1 and IEC 61000‑6-3. The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

##### 1.2.1.5.8 TS 36.116

Evolved Universal Terrestrial Radio Access (E-UTRA); Relay radio transmission and reception

This document establishes the minimum RF characteristics and minimum performance requirements of E-UTRA Relay.

##### 1.2.1.5.9 TS 36.124

Evolved Universal Terrestrial Radio Access (E-UTRA); Electromagnetic compatibility (EMC) requirements for mobile terminals and ancillary equipment

This document establishes the essential EMC requirements for “3rd generation” digital cellular mobile terminal equipment and ancillary accessories in combination with a 3GPP E-UTRA user equipment (UE). This document specifies the applicable EMC tests, the methods of measurement, the frequency range, the limits and the minimum performance criteria for all types of E-UTRA UEs and their accessories. Requirements for the radiated emission from the enclosure port of integral antenna equipment and ancillaries have been included. The immunity requirements have been selected to ensure an adequate level of compatibility for apparatus in residential, commercial, light industrial and vehicular environments. The levels, however, do not cover extreme cases, which may occur in any location but with low probability of occurrence. Compliance of radio equipment to the requirements of this document does not signify compliance to any requirement related to the use of the equipment (i.e. licensing requirements). Compliance to the requirements of this document does not signify compliance to any safety requirement. However, any temporary or permanent unsafe condition caused by EMC is considered as non-compliance.

##### 1.2.1.5.10 TS 36.133

Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management

This document specifies requirements for support of Radio Resource Management for the FDD and TDD modes of E-UTRA. These requirements include requirements on measurements in UTRAN and the UE as well as requirements on node dynamical behaviour and interaction, in terms of delay and response characteristics.

##### 1.2.1.5.11 TS 37.104

NE, E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception

This document establishes the minimum RF characteristics of E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS). Requirements for multi-RAT and single-RAT operation of MSR BS are covered in this document. The requirements in this document for E-UTRA and UTRA single-RAT operation of MSR BS are also applicable to E-UTRA and UTRA multi-carrier capable single-RAT BS. Requirements for GSM BS that are only single-RAT capable are not covered.

##### 1.2.1.5.12 TS 37.105

Active Antenna System (AAS) Base Station (BS) transmission and reception

This document establishes the RF characteristics, the RF minimum requirements and minimum performance requirements for E-UTRA AAS Base Station (BS), the FDD mode of UTRA AAS Base Station (BS), the 1,28 Mchip/s TDD mode of UTRA AAS Base Station (BS) in single RAT and any MSR AAS Base Station (BS) implementation of these RATs.

##### 1.2.1.5.13 TS 37.113

NR, E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) Electromagnetic Compatibility (EMC)

This document covers the assessment of E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Stations and associated ancillary equipment in respect of Electromagnetic Compatibility (EMC). This document specifies the applicable test conditions, performance assessment and performance criteria for E-UTRA, UTRA and GSM/EDGE Base Stations and associated ancillary equipment in one of the following categories: (i) Multi-Standard Radio (MSR) Base Stations for E-UTRA, UTRA and GSM/EDGE meeting the requirements of TS 37.104, with conformance demonstrated by compliance to TS 37.141; (ii) Base Stations for E-UTRA meeting the requirements of TS 36.104, with conformance demonstrated by compliance to TS 36.141; (iii) Base Stations for UTRA FDD meeting the requirements of TS 25.104, with conformance demonstrated by compliance to TS 25.141; (iv) Base Stations for UTRA TDD meeting the requirements of TS 25.105, with conformance demonstrated by compliance to TS 25.142; (v) Base Stations for GSM/EDGE meeting the requirements of TS 45.005, with conformance demonstrated by compliance to TS 51.021. The environment classification used in this document refers to the environment classification used in IEC 61000-6-1 and IEC 61000-6-3.

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

##### 1.2.1.5.14 TS 37.114

Active Antenna System (AAS) Base Station (BS) Electromagnetic Compatibility (EMC)

This document covers the assessment of E-UTRA, UTRA and Multi-Standard Radio (MSR) Active Antenna Systems Base Stations in respect of Electromagnetic Compatibility (EMC).

This document specifies the applicable test conditions, performance assessment and performance criteria for E‑UTRA and UTRA Base Stations and associated ancillary equipment in one of the following categories:

– Active Antenna System Base Station for E-UTRA, UTRA and MSR meeting the requirements of 3GPP TS 37.105, with conformance demonstrated by compliance to 3GPP TS 37.145.

The scope of this document is AAS BS with TAB connectors for every transceiver unit at the Transceiver Array Boundary. Requirement, procedures and values of an AAS Base Station without TAB connectors are not included in this document and are FFS.

The environment classification used in this document refers to the residential, commercial and light industrial environment classification used in IEC 61000‑6-1 and IEC 61000-6-3.

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

##### 1.2.1.5.15 TS 38.101-1

NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone

This document establishes the minimum RF requirements for NR User Equipment (UE) operating on frequency Range 1.

##### 1.2.1.5.16 TS 38.101-2

NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone

This document establishes the minimum RF requirements for NR User Equipment (UE) operating on frequency Range 2.

##### 1.2.1.5.17 TS 38.101-3

NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios

This document establishes the minimum RF requirements for NR User Equipment (UE) Interworking operation with other radios. This includes but is not limited to additional requirements for carrier aggregation or NR dual connectivity between Range 1 and Range 2 and additional requirements due to NR non-standalone (NSA) operation mode with E-UTRA.

##### 1.2.1.5.18 TS 38.101-5

**NR; User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements**

This document establishes the minimum RF and performance requirements for NR User Equipment (UE) supporting satellite access operation.

The Mobile VSAT communicating with non-GSO is not considered in this release.

##### 1.2.1.5.19 TS 38.104

NR; Base Station (BS) radio transmission and reception

This document establishes the minimum RF characteristics and minimum performance requirements of NR and NB-IoT operation in NR in-band Base Station (BS).

##### 1.2.1.5.20 TS 38.106

**NR repeater radio transmission and reception**

This document establishes the minimum RF characteristics of NR Repeater.

##### 1.2.1.5.21 TS 38.108

**NR; Satellite Access Node radio transmission and reception**

This document establishes the minimum RF characteristics and minimum performance requirements of NR Satellite Access Node (SAN).

##### 1.2.1.5.22 TS 38.113

NR; Base Station (BS) ElectroMagnetic Compatibility (EMC)

This document covers the assessment of NR Base Station (BS) and ancillary equipment in respect of Electromagnetic Compatibility (EMC).

This document specifies the applicable test conditions, performance assessment and performance criteria for base stations and associated ancillary equipment in the following categories:

− BS equipped with antenna connectors or *TAB connectors* which are possible to be terminated during EMC testing, meeting the *BS type 1-C* and *BS type* *1-H* RF requirements of TS 38.104, with conformance demonstrated by compliance to TS 38.141-1.

− BS not equipped with antenna connectors nor *TAB connectors*, i.e. with antenna elements radiating during the EMC testing, meeting the *BS type 1-O* and *BS type* *2-O* RF requirements of TS 38.104, with conformance demonstrated by compliance to TS 38.141-2.

The scope of this document is twofold:

− Requirements, procedures and values of a BS with antenna connectors or *TAB connectors*,

− Requirements, procedures and values of a BS without antenna connectors, nor *TAB connectors*.

The environment classification used in this document refers to the residential, commercial and light industrial environment classification used in IEC 61000‑6-1 and IEC 61000-6-3.

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

##### 1.2.1.5.23 TS 38.114

**NR; Repeaters ElectroMagnetic Compatibility (EMC)**

This document covers the assessment of NR repeater and ancillary equipment in respect of Electromagnetic Compatibility (EMC).

This document specifies the applicable requirements, procedures, test conditions, performance assessment and performance criteria for NR repeater and associated ancillary equipment in the following categories:

- NR repeater equipped with antenna connectors which are possible to be terminated during EMC testing, meeting the repeater type 1-C RF requirements of TS 38.106, with conformance demonstrated by compliance to TS 38.115-1.

- NR repeater not equipped with antenna connectors, i.e. with antenna elements radiating during the EMC testing, meeting the repeater type 2-O RF requirements of TS 38.106, with conformance demonstrated by compliance to TS 38.115-2.

The environment classification used in this document refers to the residential, commercial and light industrial environment classification used in IEC 61000‑6-1 and IEC 61000-6-3.

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

##### 1.2.1.5.24 TS 38.124

NR; Electromagnetic compatibility (EMC) requirements for mobile terminals and ancillary equipment

This document establishes the essential EMC requirements for “3rd generation” digital cellular mobile terminal equipment and ancillary accessories in combination with a 3GPP NR user equipment (UE).

The equipment conforming to the requirements laid out in this document and used in its intended electromagnetic environment in accordance with the manufacturer’s instructions

− shall not generate electromagnetic disturbances at a level which may interfere with the intended operation of other equipment;

− has an adequate level of intrinsic immunity to electromagnetic disturbances to operate as intended;

This document specifies the applicable EMC tests, methods of measurement, frequency ranges, applicable limits and minimum performance criteria for all types of NR UE(s) and their accessories. NR base station equipment operating within network infrastructure is outside the scope of this document. However, this document does cover mobile and portable equipment that is intended to be operated in a fixed location while connected to the AC mains. NR base station equipment operating within network infrastructure is covered by the technical specification TS 38.113.

Requirements for the radiated emission from the enclosure port of integral antenna equipment and ancillaries are included in this document. Technical specifications for conducted emissions from the antenna connector are found in the 3GPP specifications for the radio interface, e.g. TS 38.xyz, for the effective use of the radio spectrum.

Requirements for the radiated emissions from the enclosure port and ancillaries cover two cases:

− UE equipment supporting operations in a frequency range for which antenna connectors are available (i.e. for operations in Frequency Range 1 as defined in e.g. TS 38.101-1 for the radio interface)

− UE equipment supporting operations in a frequency range for which only integral antennas may be available (i.e. for operations in Frequency Range 2 as defined in e.g. TS 38.101-2 for the radio interface)

The immunity requirements are selected to ensure an adequate level of compatibility for apparatus in residential, commercial, light industrial and vehicular environments. The levels, however, do not cover extreme cases, which may occur in any location but with low probability of occurrence.

Compliance of radio equipment to the requirements of this document does not signify compliance to any requirement related to the use of the equipment (i.e. licensing requirements).

Compliance to the requirements of this document does not signify compliance to any safety requirement. However, any temporary or permanent unsafe condition caused by EMC is considered as non-compliance.

##### 1.2.1.5.25 TS 38.133

NR; Requirements for support of radio resource management

This document specifies requirements for support of Radio Resource Management for the FDD and TDD modes of New Radio (NR). These requirements include requirements on measurements in NR and the UE as well as requirements on node dynamical behaviour and interaction, in terms of delay and response characteristics.

##### 1.2.1.5.26 TS 38.174

**NR; Integrated Access and Backhaul (IAB) radio transmission and reception**

This document establishes the minimum RF characteristics, minimum radio resource management (RRM) requirements, RRM test cases and minimum performance requirements of NR Integrated access and backhaul (IAB).

##### 1.2.1.5.27 TS 38.175

**NR; Integrated Access and Backhaul (IAB) Electromagnetic Compatibility (EMC)**

This document covers the assessment for NR Integrated access and backhaul (IAB) node and associated ancillary equipment in respect of Electromagnetic Compatibility (EMC).

This document specifies the applicable test conditions, performance assessment and performance criteria for NR Integrated access and backhaul (IAB) node and associated ancillary equipment.

The environment classification used in this document refers to the residential, commercial and light industrial environment classification used in IEC 61000-6-1 and IEC 61000-6-3.

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

### 1.2.2 Other specifications

Other specifications addressing 5G-NTN-SRIT radio and device testing, but not part of the GCS, are listed in this Section.

Information on other specifications addressing 3GPP 5G radio and device testing (but not part of the GCS), system and core network specifications can be found in the 3GPP web site for a complete system perspective. These system and core network specifications address the network, terminal, and service aspects required to provide an integrated mobility solution including aspects such as user services, connectivity, interoperability, mobility and roaming, security, codecs and media, operations and maintenance, charging, etc.

All the 3GPP specifications can be found at the following link: <https://www.3gpp.org/specifications/specification-numbering>. 3GPP specifications are reviewed and updated after each Technical Specification Group Plenary meeting (held every year in March, June, September and December).

#### 1.2.2.1 TS 36.181

Evolved Universal Terrestrial Radio Access (E-UTRA); Satellite Access Node conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for Satellite Access Node (SAN) type 1-H and SAN type 1-O, supporting standalone NB-IoT operation or E-UTRA. These have been derived from and are consistent with the conducted requirements for SAN type 1-H, and radiated requirement for SAN type 1-H and SAN type 1-O in SAN specification defined in TS 36.108.

#### 1.2.2.2 TS 36.521-4

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 4: Satellite access Radio Frequency (RF) and performance Conformance Testing

This document specifies the measurement procedures for the conformance test of E-UTRA User Equipment (UE) supporting satellite access operation that contains RF and Performance requirements. Conformance test for the support of RRM (Radio Resource Management) are specified in TS 36.521-3.

The requirements are listed in different clauses only if the corresponding parameters deviate. More generally, tests are only applicable to those UEs that are intended to support the appropriate functionality. To indicate the circumstances in which tests apply, this is noted in the "definition" and "applicability" part of the test.

#### 1.2.2.3 TS 38.181

NR; Satellite Access Node conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for NR Satellite Access Node (SAN) type 1-H, SAN type 1-O and SAN type 2-O. These have been derived from and are consistent with the conducted requirements for SAN type 1-H and radiated requirement for SAN type 1-H, SAN type 1-O and SAN type 2-O in NR SAN specification defined in TS 38.108.

#### 1.2.2.4 TS 38.521-5

NR; User Equipment (UE) conformance specification; Radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance

This document specifies the measurement procedures for the conformance test of the NR User Equipment (UE) supporting satellite access operation that contains RF and Performance requirements.

1. A “GCS” (Global Core Specification) is the set of specifications that defines a single RIT, an SRIT, or a component RIT within an SRIT. [↑](#footnote-ref-2)
2. The following identified Transposing Organizations have provided their transposed sets of standards information contained in this section:

 – Association of Radio Industries and Businesses (ARIB)
– Alliance for Telecommunications Industry Solutions (ATIS)
– China Communications Standards Association (CCSA)
– European Telecommunications Standards Institute (ETSI)
– Telecommunications Standards Development Society, India (TSDSI)
– Telecommunications Technology Association (TTA)
– Telecommunication Technology Committee (TTC). [↑](#footnote-ref-3)