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| **Recommendation ITU-R M.2012-5**  **(02/2022)** |
| **Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications-Advanced (IMT‑Advanced)** |
| **M Series**  **Mobile, radiodetermination, amateur**  **and related satellite services** |

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

# Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Resolution ITU‑R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU‑T/ITU‑R/ISO/IEC and the ITU-R patent information database can also be found.

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| **Series** | Title |
| **BO** | Satellite delivery |
| **BR** | Recording for production, archival and play-out; film for television |
| **BS** | Broadcasting service (sound) |
| **BT** | Broadcasting service (television) |
| **F** | Fixed service |
| M | Mobile, radiodetermination, amateur and related satellite services |
| **P** | Radiowave propagation |
| **RA** | Radio astronomy |
| **RS** | Remote sensing systems |
| **S** | Fixed-satellite service |
| **SA** | Space applications and meteorology |
| **SF** | Frequency sharing and coordination between fixed-satellite and fixed service systems |
| **SM** | Spectrum management |
| **SNG** | Satellite news gathering |
| **TF** | Time signals and frequency standards emissions |
| **V** | Vocabulary and related subjects |

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| ***Note***: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.* |

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RECOMMENDATION ITU-R M.2012-5

Detailed specifications of the terrestrial radio interfaces of International  
Mobile Telecommunications-Advanced (IMT-Advanced)

(2012-2014-2015-2017-2019-2022)

Scope

This Recommendation identifies the terrestrial radio interface technologies of International Mobile Telecommunications-Advanced (IMT-Advanced) and provides the detailed radio interface specifications.

These radio interface specifications detail the features and parameters of IMT-Advanced. This Recommendation includes the capability to ensure worldwide compatibility, international roaming, and access to high-speed data services.

Keywords

IMT, IMT-Advanced, LTE-Advanced, LTE-Advanced Pro, WirelessMAN-Advanced, radio interface specifications

Related ITU-R Recommendations, Reports and Resolutions[[1]](#footnote-1)

Recommendation ITU-R M.1036 Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR)

Recommendation ITU-R M.1224 Vocabulary of Terms for International Mobile Telecommunications (IMT)

Recommendation ITU-R M.1579 Global circulation of IMT terrestrial terminals

Recommendation ITU-R M.1645 Framework and overall objectives of the future development of IMT-2000 and systems beyond IMT-2000

Recommendation ITU-R M.1822 Framework for services supported by IMT

Recommendation ITU-R M.2047 Detailed specifications of the satellite radio interface of International Mobile Telecommunications-Advanced (IMT‑Advanced)

Recommendation ITU-R M.2070 Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-Advanced

Recommendation ITU-R M.2071 Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced

Recommendation ITU-R M.2090 Specific unwanted emission limit of IMT mobile stations operating in the frequency band 694-790 MHz to facilitate protection of existing services in Region 1 in the frequency band 470-694 MHz

Report ITU-R M.2072 World mobile telecommunication market forecast

Report ITU-R M.2074 Radio aspects for the terrestrial component of IMT-2000 and systems beyond IMT-2000

Report ITU-R M.2133 Requirements, evaluation criteria and submission templates for the development of IMT-Advanced

Report ITU-R M.2134 Requirements related to technical performance for IMT‑Advanced radio interface(s)

Report ITU-R M.2135 Guidelines for evaluation of radio interface technologies for IMT-Advanced

Report ITU-R M.2198 The outcome of the evaluation, consensus building and decision of the IMT-Advanced process (steps 4-7), including characteristics of IMT-Advanced radio interfaces

Report ITU-R M.2291 The use of International Mobile Telecommunications for the broadband public protection and disaster relief applications

Report ITU-R M.2320 Future technology trends of terrestrial IMT systems

Report ITU-R M.2334 Passive and active antenna systems for base stations of IMT systems

Report ITU-R M.2370 IMT traffic estimates for the years 2020 to 2030

Report ITU-R M.2373 Audio-visual capabilities and applications supported by terrestrial IMT systems

Report ITU-R M.2375 Architecture and topology of IMT networks

Resolution ITU-R 56 Naming for International Mobile Telecommunications

Resolution ITU-R 57 Principles for the process of development of IMT-Advanced

Handbook on Global Trends in International Mobile Telecommunication.

The ITU Radiocommunication Assembly,

considering

*a)* that IMT systems are mobile broadband systems including IMT-2000, IMT‑Advanced and IMT-2020;

*b)* that IMT-Advanced systems include the new capabilities of IMT that go beyond those of IMT-2000[[2]](#footnote-2);

*c)* that such systems provide access to a wide range of telecommunication services including advanced mobile services, supported by mobile and fixed networks, which are increasingly packet-based;

*d)* that IMT-Advanced systems support low to high mobility applications and a wide range of data rates in accordance with user and service demands in multiple user environments;

*e)* that IMT-Advanced also has capabilities for high-quality multimedia applications within a wide range of services and platforms providing a significant improvement in performance and quality of service;

*f)* that the key features of IMT-Advanced are:

– a high degree of commonality of functionality worldwide while retaining the flexibility to support a wide range of services and applications in a cost-efficient manner;

– compatibility of services within IMT and with fixed networks;

– capability of interworking with other radio access systems;

– high-quality mobile services;

– user equipment suitable for worldwide use;

– user-friendly applications, services and equipment;

– worldwide roaming capability;

– enhanced peak data rates to support advanced services and applications (100 Mbit/s for high and 1 Gbit/s for low mobility were established as targets for research)[[3]](#footnote-3);

*g)* that these features enable IMT-Advanced to address evolving user needs;

*h)* that the capabilities of IMT-Advanced systems are being continuously enhanced in line with technology developments;

*i)* the necessity of priority services (e.g. emergency calls shall be supported as higher priority than other commercial services);

*j)* that due to the large effective bandwidths required to support the very high data rates needed for the various services offered, allowances must be made for either much larger single carrier bandwidths (even as spectral efficiencies increase) or aggregation of RF carriers;

*k)* that the rapid development of information technology, including the Internet, has resulted in the aggregation and convergence of various networks and digital devices,

further considering

that Resolution ITU-R 57-2 on the “Principles for the process of development of IMT‑Advanced” outlines the essential criteria and principles used in the process of developing the Recommendations and Reports for IMT-Advanced, including Recommendation(s) for the radio interface specification,

noting

that Report ITU-R M.2198 contains the outcome and conclusions of Steps 4 through 7 of the IMT‑Advanced process, including the evaluation and consensus building, and provides the characteristics of the IMT-Advanced terrestrial radio interfaces for the first release of Recommendation ITU-R M.2012-0 (01-2012),

recommends

**1** that the terrestrial radio interfaces for IMT-Advanced should be:

– “LTE-Advanced”[[4]](#footnote-4); and

– “WirelessMAN-Advanced”[[5]](#footnote-5);

**2** that the information provided or referenced in Annexes 1 and 2 should be used according to the terrestrial radio interfaces referred to in *recommends* 1 above as the complete set of standards for the detailed specifications of the terrestrial radio interfaces of IMT‑Advanced.

Annex 1  
  
Specification of the LTE-Advanced radio interface technology

Background

IMT-Advanced is a system with global development activity and the IMT-Advanced terrestrial radio interface specifications identified in this Recommendation have been developed by the ITU in collaboration with the GCS[[6]](#footnote-6) Proponents and the Transposing Organizations. It is noted from Document [IMT-ADV/24(Rev.3)](https://www.itu.int/md/R07-IMT.ADV-C-0024/en), that:

– The GCS Proponent must be one of the RIT[[7]](#footnote-7)/SRIT[[8]](#footnote-8) Proponents for the relevant technology and must have legal authority to grant to ITU-R the relevant legal usage rights to the relevant specifications provided within a GCS corresponding to a technology in Recommendation ITU-R M.2012.

– A Transposing Organization must have been authorized by the relevant GCS Proponent to produce transposed standards for a particular technology and must have the relevant legal usage rights.

It is further noted that GCS Proponents and Transposing Organizations must also qualify appropriately under the auspices of Resolution ITU-R 9-5 and the ITU-R “Guidelines for the contribution of material of other organizations to the work of the Study Groups and for inviting other organizations to take part in the study of specific matters (Resolution ITU-R 9-5)”.

The ITU has provided the global and overall framework and requirements and has developed the Global Core Specification jointly with the GCS Proponent. The detailed standardization has been undertaken within the recognized Transposing Organizations which operate in concert with the GCS Proponent. This Recommendation therefore makes extensive use of references to externally developed specifications.

This approach was considered to be the most appropriate solution to enable completion of this Recommendation within the aggressive schedules set by the ITU and by the needs of administrations, operators and manufacturers.

This Recommendation has therefore been constructed to take full advantage of this method of work and to allow the global standardization time-scales to be maintained. The main body of this Recommendation has been developed by the ITU, with each Annex containing references pointing to the location of the more detailed information.

This Annex 1 contains the detailed information developed by the ITU and “ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, and TTC on behalf of 3GPP” (the GCS Proponent) and ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, and TTC (the Transposing Organizations).

Such use of referencing enables timely completion and update of the high-level elements of this Recommendation, with change control procedures, transposition, and public enquiry procedures being undertaken within the external organization. This information has generally been adopted unchanged, recognizing the need to minimize duplication of work, and the need to facilitate and support an ongoing maintenance and update process.

This general agreement, noting that the detailed information of the radio interface should to a large extent be achieved by reference to the work of external organizations, highlights not only the ITU’s significant role as a catalyst in stimulating, coordinating and facilitating the development of advanced telecommunications technologies, but also its forward-looking and flexible approach to the development of this and other telecommunications standards for the 21st century.

A more detailed understanding of the process for the development of the first release of this Recommendation may be found in Document IMT-ADV/24(Rev.3) whereas details on the process for the development of revisions of this Recommendation may be found in Document [IMT‑ADV/25(Rev.2)](https://www.itu.int/md/R07-IMT.ADV-C-0025/en).

# 1 Overview of the radio interface technology

## 1.1 Overview of the SRIT

The IMT-Advanced terrestrial radio interface specifications known as LTE-Advanced is based on LTE Release 10 and Beyond are developed by 3GPP. In 3GPP terminology, the term E-UTRA (Evolved-UTRA) is also used to indicate the LTE radio interface, and 3GPP LTE Release 13 and beyond is marked as “LTE-Advanced Pro”.

*LTE-Advanced* is a Set of RITs (Radio Interface Technologies) consisting of one FDD RIT and one TDD RIT designed for operation in paired and unpaired spectrum, respectively. The TDD RIT is also known as TD-LTE Release 10 and Beyond or *TD-LTE-Advanced*. The two RITs have been jointly developed, providing a high degree of commonality while, at the same time, allowing for optimization of each RIT with respect to its specific spectrum/duplex arrangement.

Both the FDD RIT and the TDD RIT individually, and consequently the Set of RITs (SRIT), meet all the ITU IMT-Advanced minimum requirements in all four test environments defined in all aspects of Services, Spectrum and Technical performance. Furthermore, both the FDD RIT and TDD RIT individually, and consequently the SRIT, meet the requirements of Resolution ITU‑R 57‑2, *resolves* 6 *e)* and *f)* in all four test environments.

The complete set of standards for the terrestrial radio interface of IMT-Advanced identified as *LTE‑Advanced* includes not only the key characteristics of IMT-Advanced but also the additional capabilities of *LTE-Advanced* both of which are continuing to be enhanced.

The radio aspects of *LTE-Advanced* also include the capabilities of LTE Release 8 and LTE Release 9. Furthermore, information on system and core network specifications is also provided 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. Information on the Radio specifications Release 8 and Release 9 as well as on the System and Core Network specifications is provided in § 2.2.

## 1.2 Overview of the Radio Interface Technology (RIT)

### 1.2.1 Overview of the FDD RIT

The FDD RIT is the evolution of LTE FDD. The FDD RIT uses Frequency Division Duplex operation and therefore is applicable for operation with paired spectrum. Both full-duplex and half‑duplex FDD are supported.

### 1.2.2 Overview of the TDD RIT

The TDD RIT, also known as *TD-LTE-Advanced*, is the evolution of TD-LTE. The TDD RIT uses Time-Division Duplex operation and therefore is applicable for operation with unpaired spectrum. The TDD RIT provides flexibility in terms of downlink-uplink resource allocation by supporting multiple uplink-downlink resource-allocation configurations that can be used to match different traffic scenarios. The uplink-downlink resource-allocation configuration can be adapted to the varying instantaneous traffic and interference conditions even during operation.

It is also designed to exploit the more extensive channel reciprocity inherent in case of TDD operation, e.g. for beamforming, and facilitates coexistence with TD-SCDMA as well as other TDD‑based IMT-2000 technologies.

## 1.3 Overview of the system aspects of the SRIT

The FDD and TDD RITs represent the evolution of the first releases of LTE FDD and TDD, respectively. The two RITs share many of the underlying structures to simplify implementation of dual-mode radio-access equipment. Transmission bandwidths up to 640 MHz are supported, yielding peak data rates up to roughly 32 Gbit/s in the downlink and 13.6 Gbit/s in the uplink.

The downlink transmission scheme is based on conventional OFDM to provide a high degree of robustness against channel frequency selectivity while still allowing for low-complexity receiver implementations also at very large bandwidths.

The uplink transmission scheme is based on Discrete Fourier Transform-spread OFDM (DFTS‑OFDM). The use of DFTS-OFDM transmission for the uplink is motivated by the lower Peak‑to-Average Power Ratio (PAPR) of the transmitted signal compared to conventional OFDM. This allows for more efficient usage of the power amplifier at the terminal, which translates into an increased coverage and/or reduced terminal power consumption. The uplink numerology is aligned with the downlink numerology. The Narrow-band Internet of Things (NB-IoT) UL allows allocating a single-tone in addition to multi-tone DFTS-OFDM with the possibility of a lower subcarrier spacing in addition to the normal subcarrier spacing.

Channel coding is based on rate-1/3 Turbo coding (Tail Biting Convolutional Code for NB-IoT DL) and is complemented by Hybrid-ARQ with soft combining to handle decoding errors at the receiver side. Data modulation supports QPSK, 16-QAM, 64-QAM, and 256-QAM for both the downlink and the uplink. For NB-IoT, additionally pi/2-BPSK and pi/4-QPSK are supported in uplink when a single-tone is allocated.

The FDD and TDD RITs support bandwidths from approximately 1.4 MHz to 640 MHz. NB‑IoT supports 200 kHz bandwidth. Carrier aggregation, i.e. the simultaneous transmission of multiple component carriers in parallel to/from the same terminal/eNB, is used to support bandwidths larger than 20 MHz. Component carriers do not have to be contiguous in frequency and can even be located in different frequency bands in order to enable exploitation of fragmented spectrum allocations by means of spectrum aggregation. Licensed-Assisted Access (LAA) allows secondary component carriers to operate in the unlicensed 5 GHz band. In order to fairly coexist, LAA uses a Listen-Before-Talk (LBT) medium access in the unlicensed frequency bands. Carrier Aggregation supports the functionality to aggregate TDD bands with different uplink and downlink allocations as well as the functionality to support multiple timing advancements. Carrier Aggregation also supports to aggregate FDD and TDD component carriers. Dual Connectivity allows aggregating component carriers of different eNBs that are connected via a non-ideal backhaul over the X2 interface.

The RITs allow co-existence with NR and the operation of the RITs and NR on the same frequency is possible. NR is not part of this Recommendation, and its description is contained in Recommendation ITU-R M.2150-0, Annex 1, § 1.1.

Channel-dependent scheduling in both the time and frequency domains is supported for both downlink and uplink with the base-station scheduler being responsible for (dynamically) selecting the transmission resource as well as the data rate. The basic operation is dynamic scheduling, where the base-station scheduler takes a decision for each 1 ms Transmission Time Interval (TTI), but there is also a possibility for semi-persistent scheduling. Semi-persistent scheduling (SPS) enables transmission resources and data rates to be semi-statically allocated to a given User Equipment (UE) for a longer time period than one TTI to reduce the control-signalling overhead. For low latency UL transmissions, the SPS periodicity can be as low as 1 ms and UEs are allowed to skip the UL grant. For better uplink coverage, TTI bundling allows UEs to transmit in four consecutive TTIs. NB-IoT and enhanced Machine-type Communication (eMTC) allows for widespread coverage extension by means of scheduling multiple TTIs (up to several thousands).

For low latency communication there is support for reduced processing time as well as TTI shorter than 1 ms in the form of subslot or slot transmission, also referred to as short TTI (sTTI). The TTI for subslot transmission is two or three symbols and the TTI for slot transmission is half a subframe.

For increased reliability and lower latency, the SRIT provides functionality for transmission repetition and for packet duplication whereby packets can be transmitted over two paths using carrier aggregation or dual connectivity. The SRIT also supports provisioning of granular time reference.

To increase robustness and minimize interruption time during mobility, the SRIT supports techniques such as Dual Active Protocol Stack, where the UE maintains connectivity with the source eNB until successful completion of handover (HO) to the target eNB, and Conditional HO, where the UE maintains the connectivity with the source eNB until one or more HO execution conditions are met.

Multi-antenna transmission schemes are an integral part of both RITs. Multi-antenna precoding with dynamic rank adaptation supports both spatial multiplexing (single-user MIMO) and beam‑forming. Beam-forming by means of two-dimensional antenna arrays can exploit the horizontal as well as the vertical domain. Spatial multiplexing with up to eight layers in the downlink and four layers in the uplink is supported. Multi-user MIMO, where multiple users (up to eight) are assigned the same time-frequency resources, is also supported. Coordinated MultiPoint (CoMP) operation is also supported, where multiple transmission points or reception points are coordinated in their transmission or reception respectively. The coordinated transmission points can belong to the same cell, to different cells of the same eNB or to different cells of different eNBs. A discovery reference signal can be used to identify transmission points or cells for CoMP and/or Carrier aggregation operation. In addition, non-coherent joint transmission is supported, where the transmission of the multiple MIMO layers is performed from two transmission points (TPs) without joint precoding across the TPs. Finally, transmit diversity based on Space-Frequency Block Coding (SFBC) or a combination of SFBC and Frequency Switched Transmit Diversity (FSTD) is supported. Large antenna arrays are efficiently supported, e.g. through codebook based channel state information (CSI) feedback for up to 32 eNB antenna ports or beamformed CSI reference signals.

Inter-cell interference coordination (ICIC), where neighbour cells exchange information aiding the scheduling in order to reduce interference, is supported for the RITs. ICIC can be used for homogenous deployments with non-overlapping cells of similar transmission power, as well as for heterogeneous deployments where a higher-power cell overlays one or several lower-power nodes. In order to increase the potential of cell range expansion, functionality for terminal‑side interference mitigation of reference and synchronization signals as well as the broadcast channel exists. A terminal-side mitigation of inter-cell interference caused by the data channel is supported with network assistance. A network-side interference mitigation technique is supported, which is based on the ability to turn on and off secondary cells. Another network-based interference mitigation technique is also supported, in which the bandwidth of Cell Specific Reference Symbol (CRS) can be reduced when UEs do not perform any DL or UL operation requiring CRS.

Relaying functionality is included in both the FDD and TDD RITs. The relay node appears as a conventional eNB to terminals but is wirelessly backhauled to the remaining part of the radio-access network using the LTE Release 10 radio-interface technology.

Both RITs support various types of machine-type communication. In order to better address the low-cost segment, a low-complexity terminal (Category 0) is supported, which approximately 50% has reduced modem complexity as compared to the least complex ‘normal’ UE (Category 1), e.g. by a single receive antenna, half-duplex operation and greatly reduced peak data rate support.

With the introduction of LTE-M, complexity is further reduced, e.g. by reducing the UE bandwidth down to 1.4 or 5 MHz and lower UE power classes (20 dBm/14 dBm). Two coverage extension modes have been added to LTE/LTE-M, one for moderate and another for large coverage extension basically using repetitions.

NB-IoT is introduced aiming at extreme low complexity, e.g. by reducing the UE bandwidth down to 200 kHz, by even further limiting the UE peak data rate, and by introducing low UE power classes (20 dBm/14 dBm). Coverage extension of ~20 dB is enabled also basically through repetitions. NB‑IoT can operate inband in LTE, in the LTE guardband, or standalone.

In order to improve UE power consumption, a Power Saving mode was introduced and extended Discontinuous Reception (eDRX) cycles range up to 10.24 s in connected mode, 43.69 min in idle mode for LTE-M and 2.91 h in idle mode for NB-IoT. For NB-IoT and LTE-M, further reduced UE power consumption has been enabled with support for: Wake-Up Signals (WUS) allowing the UE to reduce control channel processing before a WUS is detected; Early Data Transmission (EDT) and Transmission using Pre-configured UL Resource (PUR) which enable UEs to transmit and receive small data with minimal signaling; and relaxed monitoring for cell reselection when mobility is low. For LTE-M and NB-IoT, it is possible to configure an additional uplink and an additional downlink carrier for traffic which is dedicated to a particular User Equipment, whilst common transmissions such as synchronization signals, and uplink transmissions during cell access, occur on the same carrier for all User Equipments.

In order to enhance data offloading, both RITs support LTE/Wi-Fi interworking functionality via RAN-assisted and RAN-controlled WLAN interworking. Based on configurable rules or eNB command, the UE steers its data traffic to the most appropriate radio access. Additionally, from Release 13 onwards, both RITs support LTE-WLAN aggregation (LWA) and LTE-WLAN Radio Level Integration with IPSec Tunnel (LWIP). LWA allows utilizing both LTE and WLAN in the unlicensed 2.4 GHz and 5 GHz bands simultaneously under the control of eNB.

From Release 12 onwards, sidelink transmissions are defined for Proximity based Services (ProSe) Direct Discovery and ProSe Direct Communication between terminals. ProSe Direct Communication is targeting only Public Safety applications and allows terminals to communicate with each other directly without routing the data via the eNB. ProSe Direct Discovery allows discovering other terminals in close proximity. Direct communication is also supported when a terminal is out of LTE coverage. The sidelink has been further enhanced in order to address direct vehicle-to-vehicle (V2V) communication. The sidelink supports carrier aggregation and transmit diversity.

### 1.3.1 Network architecture

The *LTE-Advanced* radio-access network has a flat architecture with a single type of node, the *eNodeB*, which is responsible for all radio-related functions in one or several cells. The eNodeB is connected to the core network by means of the S1 interface, more specifically to the *serving gateway* (S-GW) by means of the user-plane part, S1-u, and to the *Mobility Management Entity* (MME) by means of the control-plane part, S1-c. One eNodeB can interface to multiple MMEs/S‑GWs for the purpose of load sharing and redundancy. MMEs/S-GWs can be (re)selected for support of separate dedicated core networks that are designed to meet the requirements of a certain group of devices/customers.

The X2 interface, connecting eNodeBs to each other, is mainly used to support active-mode mobility. This interface may also be used for multi-cell *Radio Resource Management* (RRM) functions such as ICIC or CoMP. The X2 interface is also used to support lossless mobility between neighbouring cells by means of packet forwarding.

Figure 1

Radio-access network interfaces

Diagram

Description automatically generated

E-UTRA also supports other architectures. These other architectures are not part of this Recommendation and their description is contained in Recommendation ITU-R M.2150-0, Annex 1, § 1.1.

### 1.3.2 Layer 2 protocol architecture

Layer 2 (L2) consists of several sub-layers: *Packet Data Convergence Protocol* (PDCP), *Radio Link Control* (RLC) and *Medium Access Control* (MAC). The downlink and uplink protocol structures are illustrated in Fig. 2 and Fig. 3, respectively. Layer 2 provides one or more Radio Bearers to higher layers to which IP packets are mapped according to their Quality-of-Service (QoS) requirements. L2/MAC PDUs, also referred to as transport blocks, are created according to instantaneous scheduling decisions and delivered to the physical layer on one or several transport channels (one transport channel of the same type per component carrier).

Figure 2

Downlink L2 protocol structure

Diagram

Description automatically generated

Figure 3

Uplink L2 protocol structure

Diagram

Description automatically generated

In Dual Connectivity, a data radio bearer can be configured as Master Cell Group (MCG) bearer, Secondary Cell Group (SCG) bearer or a split bearer. The MCG bearer is served by the Master eNB (MeNB), SCG bearer by the Secondary eNB (SeNB) and the split bearer is served by both eNBs. For a split bearer, a common PDCP entity is located in the MeNB, but there are two RLC entities, one terminating in the MeNB and one in the SeNB.

#### 1.3.2.1 Packet Data Convergence Protocol (PDCP)

Except for NB-IoT, the main services and functions of the PDCP sublayer for the user plane include:

– Header compression and decompression of IP data flows using ROHC.

– Header compression and decompression of Ethernet packet streams.

– Compression and decompression of uplink PDCP SDUs: DEFLATE based UDC only.

– Transfer of user data.

– In-sequence delivery of upper layer PDUs at PDCP re-establishment procedure for RLC AM.

– For split bearers in Dual Connectivity (only support for RLC AM) and LWA bearers (only support for RLC AM and RLC UM): PDCP PDU routing for transmission and PDCP PDU reordering for reception.

– Duplicate detection of lower layer SDUs at PDCP re-establishment procedure for RLC AM.

– Retransmission of PDCP SDUs at handover and, for split bearers in DC and LWA bearers, of PDCP PDUs at PDCP data-recovery procedure, for RLC AM.

– Ciphering and deciphering.

– Timer-based SDU discard in uplink.

– Duplication of PDCP PDUs.

– For PDCP duplication, reordering and duplicate detection at the receiver.

For NB-IoT UE when AS security is activated, the main services and functions of the PDCP sublayer for the user plane include:

– Header compression and decompression: ROHC only;

– Transfer of user data;

– In-sequence delivery of upper layer PDUs at PDCP re-establishment procedure for RLC AM;

– Duplicate detection of lower layer SDUs at PDCP re-establishment procedure for RLC AM;

– Ciphering and deciphering;

– Timer-based SDU discard in uplink.

The main services and functions of the PDCP for the control plane include:

– Ciphering and Integrity Protection and Verification.

– Transfer of control plane data.

Except for NB-IoT, the main services and functions of the PDCP sublayer for the control plane also include:

– Duplication of PDCP PDUs.

– For PDCP duplication, reordering and duplicate detection at the receiver.

For a NB-IoT UE that supports Control Plane CIoT EPS optimizations only, PDCP is bypassed. For a NB-IoT UE that supports both Control Plane CIoT EPS optimizations and User Plane CIoT EPS optimizations PDCP is not used until AS security is activated.

PDCP uses the services provided by the RLC sub-layer. There is one PDCP entity per radio bearer configured for a UE.

#### 1.3.2.2 Radio Link Control (RLC)

*Radio Link Control* (RLC) is responsible for:

– Transfer of upper layer PDUs.

– Error correction through ARQ (only for AM data transfer).

– Concatenation, segmentation and reassembly of RLC SDUs (only for UM and AM data transfer).

– Resegmentation of RLC data PDUs (only for AM data transfer).

– Reordering of RLC data PDUs (only for UM and AM data transfer).

– Duplicate detection (only for UM and AM data transfer).

– Protocol error detection (only for AM data transfer).

– RLC SDU discard (only for UM and AM data transfer).

– RLC re-establishment.

Depending on the mode-of-operation, an RLC entity may provide all, a subset of, or none of the services above. The RLC can operate in three different modes:

– *Transparent mode* (TM), where the RLC is completely transparent and is in essence bypassed. This configuration is used for control-plane broadcast channels such as Broadcast Control Channel (BCCH), Common Control Channel (CCCH) and Paging Control Channel (PCCH) only where the information should reach multiple users.

– *Unacknowledged mode* (UM), where the RLC provides all the functionality above except error correction, is used when error-free delivery is not required, for example for Multicast Control Channel (MCCH) and Multicast Traffic Channel (MTCH) using Multimedia Broadcast over a Single Frequency Network (MBSFN) and for Voice-over-IP (VoIP).

– *Acknowledged mode* (AM), where the RLC provides all the services above, is the main mode-of-operation for TCP/IP packet data transmission on the Downlink Shared Channel (DL‑SCH). Segmentation/reassembly, in-sequence delivery and retransmissions of erroneous data are all supported.

The RLC offers services to the PDCP in the form of *radio bearers* and uses services from the MAC layer in the form of *logical channels*. There is one RLC entity per radio bearer configured for a terminal, except for radio bearers configured with PDCP duplication and for DAPS bearers, for which there are two for UL and DL, respectively.

#### 1.3.2.3 Medium access control (MAC)

The MAC layer is responsible for:

– Mapping between logical channels and transport channels.

– Multiplexing/demultiplexing of MAC SDUs belonging to one or different logical channels into/from transport blocks delivered to/from the physical layer on transport channels.

– Scheduling information reporting.

– Error correction through N-process stop-and-wait hybrid-ARQ (HARQ) with synchronous (for the uplink) and asynchronous (for the downlink and optionally for the uplink) retransmissions.

– Priority handling between logical channels of one UE.

– Priority handling between UEs by means of dynamic scheduling.

– Multimedia Broadcast/Multicast Service (MBMS) identification.

– Transport format selection.

– Padding.

The ProSe specific services and functions of the MAC sublayer include:

– Radio resource selection.

– Packet filtering for Prose Direct Communication.

In case of Dual Connectivity, the UE is configured with two independent MAC entities, one for MCG and one for SCG.

The MAC offers services to the RLC in the form of *logical channels*. A logical channel is defined by the *type* of information it carries and is generally classified as a *control channel*, used for transmission of control and configuration information necessary for operating an *LTE-Advanced* system, or as a *traffic channel*, used for the user data. The set of logical-channel types specified for *LTE-Advanced* includes:

– *Broadcast Control Channel* (BCCH), used for broadcasting system control information.

– *Bandwidth Reduced Broadcast Control Channel* (BR-BCCH), used for broadcasting system control information to bandwidth limited eMTC UEs.

– *Paging Control Channel* (PCCH), a downlink channel used for paging when the network is not aware of the location of the UE and for system information change notifications.

– *Common Control Channel* (CCCH), used for transmission of control information between UEs and network when the UE has no RRC connection.

– *Dedicated Control Channel* (DCCH), used for transmission of control information to/from a mobile terminal when the UE has a RRC connection.

– *Multicast Control Channel* (MCCH), used for transmission of control information required for reception of the MTCH.

– *Single-Cell Multicast Control Channel* (SC-MCCH), used for transmission of control information required for reception of MBMS using single-cell point-to-multipoint (SC‑PTM).

– *Sidelink Broadcast Control Channel* (SBCCH) used for broadcasting sidelink system information from one UE to other UE(s). This channel is used only by ProSe Direct Communication capable UEs and V2X sidelink communication capable UEs.

– *Dedicated Traffic Channel* (DTCH), used for transmission of user data to/from a mobile terminal. This is the logical channel type used for transmission of all uplink and non‑MBSFN downlink user data. DTCH is not supported for a NB-IoT UE that only uses Control Plane CIoT EPS optimizations.

– *Multicast Traffic Channel* (MTCH), used for downlink transmission of MBMS services.

– *Single-Cell Multicast Traffic Channel* (SC-MTCH), used for downlink transmission of MBMS services using SC-PTM.

– *Sidelink Traffic Channel* (STCH) is a point-to-multipoint channel, for transfer of user information from one UE to other UEs. This channel is used only by Prose Direct Communication capable UEs and V2X sidelink communication capable UEs.

For a NB-IoT UE that only uses Control Plane CIoT EPS optimizations there is only one dedicated logical channel per UE.

From the physical layer, the MAC layer uses services in the form of *Transport Channels*. A transport channel is defined by *how* and *with what characteristics* the information is transmitted over the radio interface. Data on a transport channel is organized into *transport blocks*. In each *Transmission Time Interval* (TTI), at most one or two (in case of spatial multiplexing) transport blocks are transmitted per component carrier.

Associated with each transport block is a *Transport Format* (TF), specifying *how* the transport block is to be transmitted over the radio interface. The transport format includes information about the transport-block size, the modulation scheme, and the antenna mapping. The scheduler is responsible for (dynamically) determining the uplink as well as downlink transport format in each TTI.

The following transport-channel types are defined:

– *Broadcast Channel* (BCH) has a fixed transport format, provided by the specifications. It is used for transmission of parts of the BCCH system information, more specifically the so‑called *Master Information Block* (MIB).

– *Paging Channel* (PCH) is used for transmission of paging information from the PCCH logical channel. The PCH supports *discontinuous reception* (DRX) to allow the mobile terminal to save battery power by waking up to receive the PCH only at predefined time instants.

– *Downlink Shared Channel* (DL-SCH) is the main transport-channel type used for transmission of downlink data in *LTE-Advanced*. It supports dynamic rate adaptation and channel-dependent scheduling, hybrid-ARQ with soft combining, and spatial multiplexing. It also supports DRX to reduce mobile-terminal power consumption while still providing an always-on experience.

The DL-SCH is also used for transmission of the parts of the BCCH system information not mapped to the BCH. In case of transmission to a terminal using multiple component carriers the UE receives one DL-SCH per component carrier.

– *Multicast Channel* (MCH) is used to support MBMS. It is characterized by a semi-static transport format and semi-persistent scheduling. In case of multi-cell transmission using MBSFN, the scheduling and transport format configuration is coordinated among the cells involved in the MBSFN transmission.

– *Uplink Shared Channel* (UL-SCH) is the uplink counterpart to the DL-SCH, i.e. it is the uplink transport channel used for transmission of uplink data.

– *Random Access Channel* (RACH) is also defined as an uplink transport channel although it does not carry transport blocks. The RACH is used in the uplink to respond to the paging message or to initiate the move to the RRC\_CONNECTED state according to terminal data transmission needs.

– *Sidelink broadcast channel* (SL-BCH) uses a pre-defined transport format.

– *Sidelink discovery channel* (SL-DCH) supports both UE autonomous resource selection and scheduled resource allocation by eNodeB; it uses a fixed size, pre-defined format periodic broadcast transmission.

– *Sidelink shared channel* (SL-SCH) supports both UE autonomous resource selection and scheduled resource allocation by eNodeB; it supports HARQ combining and dynamic link adaptation by varying the transmit power, modulation and coding.

The mapping between logical channels, transport channels and physical channels (described in § 1.1.3.3) is illustrated in Fig. 4 for the downlink, Fig. 5 for the uplink, Fig. 6 for the sidelink, Fig. 7 for the NB-IoT downlink and Fig. 8 for the NB-IoT uplink.

Figure 4

Downlink channel mapping

Diagram

Description automatically generated

Figure 5

Uplink channel mapping

Diagram

Description automatically generated

Figure 6

Sidelink channel mapping

Diagram

Description automatically generated

Figure 7

NB-IoT DL channel mapping

Diagram

Description automatically generated

Figure 8

NB-IoT UL channel mapping

Diagram

Description automatically generated

### 1.3.3 Physical layer

The physical layer is responsible for:

– Modulation and demodulation of physical channels.

– Error detection on the transport channel and indication to higher layers.

– Forward Error Correction (FEC) encoding and decoding of transport channels.

– Rate matching of the coded transport channel to physical channels.

– Mapping of the coded transport channel onto physical channels according to Fig. 4 (downlink) and Fig. 5 (uplink).

– Hybrid ARQ soft-combining.

– Frequency and time synchronization.

– Power weighting of physical channels.

– Multi-antenna processing and beamforming.

– Characteristic measurements and indication to higher layers.

– RF processing.

A simplified overview of the processing for the DL-SCH is given in Fig. 9.

Figure 9

Simplified physical-layer processing for DL-SCH on one component carrier

Diagram

Description automatically generated

#### 1.3.3.1 Physical channels

The following different types of physical channels are defined for the downlink:

– Physical Downlink Shared Channel (PDSCH): Used for transmission of user and control plane data services.

– Physical Multicast Channel (PMCH): Used for transmission of control and user-plane broadcast services during MBSFN subframes.

– Physical Downlink Control Channel (PDCCH): Used for transmission of control information such as resource allocation, transport format and H-ARQ related information.

– Enhanced Physical Downlink Control Channel (EPDCCH): Used for transmission of control information such as resource allocation, transport format and HARQ related information.

– MTC physical downlink control channel (MPDCCH): Used for transmission of control information in bandwidth-reduced operation and/or using coverage extension mode.

– Short physical downlink control channel (SPDCCH): Used for transmission of control information such as resource allocation, transport format and HARQ related information.

– Physical Broadcast Channel (PBCH): Used for conveying cell and/or system specific information.

– Physical Control Format Indicator Channel (PCFICH): It indicates to the UE the control format (number of symbols comprising PDCCH, PHICH) of the current subframe.

– Physical Hybrid ARQ Indicator Channel (PHICH): It conveys the ACK/NAK information for UL (PUSCH) transmissions received at the eNodeB.

Three different types of physical channels are defined for the uplink:

– Physical Random Access Channel (PRACH): It conveys a preamble which is used to trigger a random-access procedure in the eNodeB.

– Physical Uplink Shared Channel (PUSCH): It conveys both user data and upper layer control information.

– Physical Uplink Control Channel (PUCCH): It conveys control information (scheduling requests, CQI, PMI, RI, HARQ ACK/NAK for PDSCH, etc.).

– Short physical uplink control channel (SPUCCH): It conveys control information (scheduling requests, HARQ ACK/NAK for PDSCH, etc.).

The following types of physical channels are defined for the sidelink:

– Physical sidelink broadcast channel (PSBCH): Carries system and synchronization related information, transmitted from the UE.

– Physical sidelink discovery channel (PSDCH): Carries ProSe Direct Discovery message from the UE.

– Physical sidelink control channel (PSCCH): Carries control from a UE for ProSe Direct Communication.

– Physical sidelink shared channel (PSSCH): Carries data from a UE for ProSe Direct Communication.

The following types of physical channels are defined for NB-IoT:

– Narrowband Physical broadcast channel (NPBCH): Carries the BCH for NB-IoT UEs. Used for conveying cell and/or system specific information using a transport block mapped to sixty-four subframes within a 640 ms interval.

– Narrowband Physical downlink shared channel (NPDSCH): Carries the DL-SCH and PCH for NB-IoT UEs.

– Narrowband Physical downlink control channel (NPDCCH): Informs the NB-IoT UE about the resource allocation of PCH and DL-SCH. Carries the uplink scheduling grant for the NB‑IoT UE. Carries the direct indication information.

– Narrowband Physical uplink shared channel (NPUSCH): Carries the UL-SCH and Hybrid ARQ ACK/NAKs in response to downlink transmission for the NB-IoT UE.

– Narrowband Physical random access channel (NPRACH): Carries the random access preamble for the NB-IoT UE.

#### 1.3.3.2 Time-domain structure and duplex schemes

Figure 10 illustrates the high-level time-domain structure for transmission, with each (*radio*) *frame* of length 10 ms consisting of ten equally sized *subframes* of length 1 ms. Each subframe consists of two equally sized *slots* of length *T*slot = 0.5 ms with each slot consisting of a number of OFDM symbols including cyclic prefix.

Figure 10

*LTE-Advanced* time-domain structure

Timeline

Description automatically generated

*LTE-Advanced* can operate in both FDD and TDD as illustrated in Fig. 11. Although the time‑domain structure is, in most respects, the same for FDD and TDD there are some differences between the two duplex modes, most notably the presence of a *special* *subframe* in case of TDD. The special subframe is used to provide the necessary guard time for downlink-to-uplink switching.

Figure 11

Uplink/downlink time/frequency structure in case of FDD and TDD

Timeline

Description automatically generated

In case of FDD operation (upper part of Fig. 11), there are two carrier frequencies for each component carrier, one for uplink transmission (*f*UL) and one for downlink transmission (*f*DL). During each frame, there are thus ten uplink subframes and ten downlink subframes and uplink and downlink transmission can occur simultaneously within a cell. Half-duplex operation at the UE side is supported by the scheduler ensuring non-simultaneous reception and transmission at the UE.

In case of TDD operation (lower part of Fig. 11), there is only a single carrier frequency per component carrier and uplink and downlink transmissions are always separated in time also on a cell basis. As seen in the Figure, some subframes are allocated for uplink transmissions and some subframes for downlink transmission with the switch between downlink and uplink occurring in the *special subframe*. The special subframe is split into three parts: a downlink part (DwPTS), a guard period (GP) where the switch occurs, and an uplink part (UpPTS). The DwPTS is in essence treated as a normal downlink subframe, although the amount of data that it is possible to transmit is smaller due to the reduced length of the DwPTS. The UpPTS can be used for UL data transmission, channel sounding or random access. The DwPTS, GP, and UpPTS have configurable individual lengths to support different deployment scenarios, and a total length of 1 ms.

Different asymmetries in terms of the amount of resources allocated for uplink and downlink transmission, respectively, are provided through seven different downlink/uplink configurations as shown in Fig. 12. In case of carrier aggregation, the downlink/uplink configuration is identical across component carriers in the same band and may be the same or different across component carriers in different bands.

Coexistence between the TDD RIT and other (IMT-2000) TDD systems such as TD-SCDMA is catered for by aligning the switch points between the two systems and selecting the appropriate special subframe configuration and uplink-downlink asymmetry.

Figure 12

Uplink-downlink asymmetries supported by the TDD RIT

Timeline

Description automatically generated

Sidelink transmissions use the same frame structure as the frame structure that is defined for uplink and downlink when UEs are in network coverage. However, the sidelink transmissions are restricted to a sub-set of the uplink resources in time and frequency domain.

The physical channel structure is similar to uplink transmissions and the same basic transmission scheme as the UL transmission scheme is used. However, sidelink is limited to single cluster transmissions and it uses a 1 symbol gap at the end of each sidelink subframe.

#### 1.3.3.3 Physical layer processing

To the transport block(s) to be transmitted on a DL-SCH or UL-SCH, a CRC is attached, followed by rate-1/3 Turbo coding for error correction (Tail Biting Convolutional Code for NPDSCH). Rate matching is used not only to match the number of coded bits to the amount of resources allocated for the DL-SCH/UL-SCH transmission, but also to generate the different redundancy versions as controlled by the hybrid-ARQ protocol. In case of spatial multiplexing, the processing is duplicated for the two transport blocks. After rate matching, the coded bits are modulated (QPSK, 16-QAM, 64‑QAM, 256-QAM, 1024-QAM). In case of multi-antenna transmission, the modulation symbols are mapped to multiple layers and precoded before being mapped to the different antenna ports. Alternatively, transmit diversity can be applied. Finally, the (precoded) modulation symbols are mapped to the time-frequency resources allocated for the transmission.

Downlink transmission is based on conventional OFDM with a cyclic prefix. The subcarrier spacing is Δ*f* = 15 kHz and two cyclic prefix lengths are supported: normal cyclic prefix ≈4.7 µs and extended cyclic prefix ≈16.7 µs. In the frequency domain, the number of resource blocks can range from 6 to 100 per component carrier (for channel bandwidths ranging from 1.4 to 20 MHz respectively), where a resource block is 180 kHz in the frequency domain. There can be up to 32 component carriers transmitted in parallel implying an overall bandwidth up to 640 MHz. In inband mode, NB-IoT allocates a single resource block. In standalone mode, NB-IoT uses a channel bandwidth of 200 kHz. MBSFN subframes can use subcarrier spacings of Δ*f* = 7.5 kHz or Δ*f* = 1.25 kHz with an extended cyclic prefix of ≈33.4 µs and ≈200 µs, respectively. PMCH additionally supports 100 µs cyclic prefix and Δ*f* = 2.5 kHz subcarrier spacing for support of high mobility scenarios (up to 250 km/h) and 300 µs cyclic prefix and approximately Δ*f* ≈ 0.37 kHz subcarrier spacing for support of rooftop reception.

Uplink transmission is based on DFT-spread OFDM (DFTS-OFDM). DFTS-OFDM can be seen as a DFT precoder, followed by conventional OFDM with the same numerology as in the downlink. The NB-IoT UL allows allocating a single-tone with Δ*f* = 3.75 kHz or Δ*f* = 15 kHz subcarrier spacing. Multiple DFT precoding sizes, corresponding to transmission with different scheduled bandwidths, can be used.

The remaining downlink transport channels (PCH, BCH, MCH) are based on the same general physical-layer processing as DL-SCH, although with some restrictions in the set of features used.

#### 1.3.3.4 Multi-antenna transmission

A wide range of multi-antenna transmission schemes are supported in the downlink:

– Single-antenna transmission using a single cell-specific reference signal.

– Closed-loop spatial multiplexing, also known as codebook-based beam-forming or precoding, of up to four layers using cell-specific reference signals. Feedback reports from the terminal are used to assist the eNodeB in selecting a suitable precoding matrix.

– Open-loop spatial multiplexing, also known as large-delay cyclic delay diversity, of up to four layers using cell-specific reference signals.

– Spatial multiplexing of up to eight layers using UE-specific reference signals. The eNodeB may use feedback reports or exploit channel reciprocity to set the beam-forming weights.

– Transmit diversity based on space-frequency block coding (SFBC) or a combination of SFBC and Frequency Switched Transmit Diversity (FSTD).

– Multi-user MIMO where multiple terminals are assigned overlapping time-frequency resources.

– Non-precoded CSI-RS operation is supported, which comprises schemes where different CSI-RS ports have the same wide beam width and direction and hence generally cell wide coverage.

– Beamformed CSI-RS operation is supported, which comprises schemes where (at least at a given time/frequency) CSI-RS ports have narrow beam widths and hence not cell wide coverage, and (at least from the eNB perspective) at least some CSI-RS port‑resource combinations have different beam directions.

– Downlink Coordinated MultiPoint (DL-CoMP) operation where multiple transmission points are coordinated.

The following multi-antenna transmission schemes are supported in the uplink:

– Single-antenna transmission.

– Precoding supporting rank-adaptive spatial multiplexing with one up to four layers.

– Uplink Coordinated MultiPoint (UL-CoMP) operation where multiple reception points are coordinated.

#### 1.3.3.5 Link adaptation and power control

According to the radio channel conditions, the Modulation and Coding Scheme (MCS) can be adapted flexibly. The same modulation and coding is applied to all resource units assigned to the same transport block within a TTI. Uplink power control determines the average power over a DFTS‑OFDM symbol in which the physical channel is transmitted.

#### 1.3.3.6 L1/L2 control signalling

Downlink control information (DCI) is transmitted on either a PDCCH, an EPDCCH or an SPDCCH. In bandwidth-reduced operation and/or when using coverage extension mode, a DCI is transmitted on an MPDCCH. For NB-IoT, a DCI is transmitted on NPDCCH.

The PDCCH is transmitted in the first one to three OFDM symbols of each downlink subframe in each component carrier with the number of OFDM symbols being indicated on the PCFICH. Downlink and uplink scheduling grants (consisting of UE identity, time-frequency resources and transport format) and hybrid-ARQ acknowledgements are transmitted on the PDCCH and PHICH, respectively. Each grant is transmitted on a separate PDCCH using QPSK modulation and cell‑specific reference signals.

The EPDCCH/MPDCCH is transmitted in pairs of Physical Resource Blocks (PRBs) multiplexed in frequency with the PDSCH; it carries downlink and uplink scheduling grants (consisting of UE identity, time‑frequency resources and transport format). The EPDCCH/MPDCCH uses QPSK modulation and demodulation reference signals, and it may use either frequency-localized or frequency-distributed transmission.

The SPDCCH is transmitted in UE-specifically configured physical resource blocks and carries downlink and uplink scheduling grants.

For NB-IoT, the NPDCCH is transmitted in all available OFDM symbols of pairs of PRBs, with no multiplexing with NPDSCH; it carries downlink and uplink scheduling grants (consisting of UE identity, time‑frequency resources and transport format). The NPDCCH uses QPSK modulation and narrowband reference signals.

Sidelink resource allocation can be transmitted on the PDCCH/EPDCCH.

Uplink control information (UCI), consisting of channel-state information (CSI), scheduling requests and hybrid-ARQ acknowledgements, is transmitted at the band edges of the primary uplink component carrier. Alternatively, parts of the control signalling can be multiplexed with data on PUSCH. To support downlink CoMP transmission, a UE may be configured with multiple CSI processes.

#### 1.3.3.7 MBSFN operation

Multicast/Broadcast over Single Frequency Network (MBSFN) transmission, where the same signal is transmitted from multiple, time-synchronized cells, is supported by the MCH transport channel. One component carrier can support simultaneous unicast and broadcast support through time-domain multiplexing of MCH and DL-SCH transmissions, where the MCH can be configured on up to 80% of the DL resources.

# 2 Detailed specification of the radio interface technology

Detailed specifications described in this Annex are developed around a Global Core Specification (GCS), 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 IMT-ADV/24(Rev.3).

The IMT-Advanced standards contained in this section are derived from the global core specification for LTE-Advanced contained at <http://ties.itu.int/u/itu-r/ede/rsg5/IMT-Advanced/GCS/M.2012-4/LTE-Advanced/>. For information, additional specifications are contained in Recommendation ITU‑R M.2150-0, Annex 1, section 1.2. The following notes apply to the sections below:

1) The identified Transposing Organizations[[9]](#footnote-9) 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 2.1 contains titles and synopses of the Global Core Specification of IMT-Advanced radio interface technology entitled LTE-Advanced and the related hyperlinks to the transposed standards. Specifications listed in § 2.2 are not part of the LTE-Advanced GCS.

The specific 3GPP specifications of the GCS for LTE-Advanced that are being transposed in § 2.1 are summarized in Table 1:

TABLE 1

3GPP specifications in § 2.1 that are to be transposed

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 36.100 Series | 36.200 Series | 36.300 Series | 36.400 Series | 36.500 series | 37.xxx Series | 25.400 Series |
| TS 36.101 TS 36.104 TS 36.106 TS 36.111 TS 36.112 TS 36.113 TS 36.116 TS 36.117 TS 36.124 TS 36.133 TS 36.141 TS 36.143 TS 36.171 | TS 36.201 TS 36.211 TS 36.212 TS 36.213 TS 36.214 TS 36.216 | TS 36.300 TS 36.302 TS 36.304 TS 36.305 TS 36.306 TS 36.307 TS 36.314 TS 36.321 TS 36.322 TS 36.323 TS 36.331 TS 36.360 TS 36.361 | TS 36.401 TS 36.410 TS 36.411 TS 36.412 TS 36.413 TS 36.414 TS 36.420 TS 36.421 TS 36.422 TS 36.423 TS 36.424 TS 36.425 TS 36.440 TS 36.441 TS 36.442 TS 36.443 TS 36.444 TS 36.445 TS 36.455 TS 36.456 TS 36.457 TS 36.458 TS 36.459 TS 36.461 TS 36.462 TS 36.463 TS 36.464 TS 36.465 | TS 36.508 TS 36.509 TS 36.521-1 TS 36.521-2 TS 36.521-3 TS 36.523-1 TS 36.523-2 TS 36.523-3  TS 36.579-1 TS 36.579-2 TS 36.579-3 TS 36.579-4 TS 36.579-5 TS 36.579-6 TS 36.579-7 | TS 37.104 TS 37.105 TS 37.113 TS 37.114 TS 37.141 TS 37.144 TS 37.145-1 TS 37.145-2 TS 37.171 TS 37.320 TS 37.355 TS 37.460 TS 37.461 TS 37.462 TS 37.466 TS 37.544 TS 37.571-1 TS 37.571-2 TS 37.571-3 TS 37.571-4 TS 37.571-5 | TS 25.446 |

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

### 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-Advanced identified as *LTE-Advanced* and includes not only the key characteristics of IMT‑Advanced but also the additional capabilities of *LTE-Advanced* both of which are continuing to be enhanced.

### 2.1.2 Radio Layer 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.

**SDO** **Document No.** **Version** **Issued date** **Location**

**Release 10**

ARIB ARIB STD-T120-36.201 10.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36201-a00.pdf>

ATIS ATIS.3GPP.36.201V1000 10.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.201V1000 10.0.0 01.12.2010 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.201%20V10.0.0.doc>

ETSI ETSI TS 136 201 10.0.0 14.01.2011 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136201/10.00.00_60/ts_136201v100000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.201-10.0.0 V1.0.0 10.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/CHXbJzapAmAcHJ2>

TTA TTAT.3G-36.201V10.0.0 10.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V10.0.0>

**Release 11**

ARIB ARIB STD-T120-36.201 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36201-b10.pdf>

ATIS ATIS.3GPP.36.201V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ETSI ETSI TS 136 201 11.1.0 06.02.2013 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136201/11.01.00_60/ts_136201v110100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.201-11.1.0 V1.0.0 11.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/mrNtac65YwHtTAn>

TTA TTAT.3G-36.201V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V11.1.0>

**Release 12**

ARIB ARIB STD-T120-36.201 12.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36201-c20.pdf>

ATIS ATIS.3GPP.36.201V1220 12.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.201V1220 12.2.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.201%20V12.2.0.doc>

ETSI ETSI TS 136 201 12.2.0 20.04.2015 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136201/12.02.00_60/ts_136201v120200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.201-12.2.0 V1.0.0 12.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/8YffDz9LCmepfXC>

TTA TTAT.3G-36.201V12.2.0 12.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V12.2.0>

**Release 13**

ARIB ARIB STD-T120-36.201 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36201-d30.pdf>

ATIS ATIS.3GPP.36.201V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.201V1330 13.3.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.201%20V13.3.0.doc>

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TTA TTAT.3G-36.201V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V13.3.0>

**Release 14**

ARIB ARIB STD-T120-36.201 14.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36201-e10.pdf>

ATIS ATIS.3GPP.36.201V1410 14.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.201V1410 14.1.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.201%20V14.1.0.doc>

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TTA TTAT.3G-36.201V14.1.0 14.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V14.1.0>

**Release 15**

ARIB ARIB STD-T120-36.201 15.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36201-f30.pdf>

ATIS ATIS.3GPP.36.201V1530 15.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.201V1530 15.3.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.201%20V15.3.0.docx>

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TTA TTAT.3G-36.201V15.3.0 15.3.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V15.3.0>

**Release 16**

ARIB ARIB STD-T120-36.201 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36201-g00.pdf>

ATIS ATIS.3GPP.36.201V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.201V1600 16.0.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.201%20V16.0.0.docx>

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TTA TTAT.3G-36.201V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.201V16.0.0>

#### 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.

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ARIB ARIB STD-T120-36.211 10.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36211-a70.pdf>

ATIS ATIS.3GPP.36.211V1070 10.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.211V1070 10.7.0 01.02.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.211%20V10.7.0>

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TTA TTAT.3G-36.211V10.7.0 10.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.211V10.7.0>

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ARIB ARIB STD-T120-36.211 11.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36211-b70.pdf>

ATIS ATIS.3GPP.36.211V1170 11.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.211V1170 11.7.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.211%20V11.7.0.doc>

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ARIB ARIB STD-T120-36.211 12.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36211-c90.pdf>

ATIS ATIS.3GPP.36.211V1290 12.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.211V12.9.0 12.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.211V12.9.0>

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ARIB ARIB STD-T120-36.211 13.13.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36211-dd0.pdf>

ATIS ATIS.3GPP.36.211V13130 13.13.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.211V13130 13.13.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.211%20V13.13.0.docx>

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TTA TTAT.3G-36.211V13.13.0 13.13.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.211V13.13.0>

**Release 14**

ARIB ARIB STD-T120-36.211 14.15.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36211-ef0.pdf>

ATIS ATIS.3GPP.36.211V14150 14.15.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.211V14150 14.15.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.211%20V14.15.0>

ETSI ETSI TS 136 211 14.15.0 24.09.2020 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136211/14.15.00_60/ts_136211v141500p.pdf>

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TTA TTAT.3G-36.211V14.15.0 14.15.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.211V14.15.0>

**Release 15**

ARIB ARIB STD-T120-36.211 15.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36211-fa0.pdf>

ATIS ATIS.3GPP.36.211V15100 15.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.211V15100 15.10.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.211%20V15.10.0>

ETSI ETSI TS 136 211 15.10.0 24.09.2020 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136211/15.10.00_60/ts_136211v151000p.pdf>

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TTA TTAT.3G-36.211V15.10.0 15.10.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.211V15.10.0>

**Release 16**

ARIB ARIB STD-T120-36.211 16.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36211-g20.pdf>

ATIS ATIS.3GPP.36.211V1620 16.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

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TTA TTAT.3G-36.211V16.2.0 16.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.211V16.2.0>

#### 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.

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ARIB ARIB STD-T120-36.212 10.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36212-a90.pdf>

ATIS ATIS.3GPP.36.212V1090 10.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.212V1090 10.9.0 01.09.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V10.9.0.doc>

ETSI ETSI TS 136 212 10.9.0 19.10.2015 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136212/10.09.00_60/ts_136212v100900p.pdf>

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TTA TTAT.3G-36.212V10.9.0 10.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V10.9.0>

**Release 11**

ARIB ARIB STD-T120-36.212 11.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36212-b70.pdf>

ATIS ATIS.3GPP.36.212V1170 11.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.212V1170 11.7.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V11.7.0.doc>

ETSI ETSI TS 136 212 11.7.0 22.04.2016 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136212/11.07.00_60/ts_136212v110700p.pdf>

TSDSI TSDSI STD T1.3GPP 36.212-11.7.0 V1.0.0 11.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/gqmibqdbcHqGCKm>

TTA TTAT.3G-36.212V11.7.0 11.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V11.7.0>

**Release 12**

ARIB ARIB STD-T120-36.212 12.9.1 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36212-c91.pdf>

ATIS ATIS.3GPP.36.212V1291 12.9.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.212V1291 12.9.1 01.01.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V12.9.1.doc>

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TSDSI TSDSI STD T1.3GPP 36.212-12.9.1 V1.0.0 12.9.1 30.08.2021 <https://members.tsdsi.in/index.php/s/PsP3zoTE8rsrkJR>

TTA TTAT.3G-36.212V12.9.1 12.9.1 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V12.9.1>

**Release 13**

ARIB ARIB STD-T120-36.212 13.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36212-da0.pdf>

ATIS ATIS.3GPP.36.212V13100 13.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.212V13100 13.10.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V13.10.0.doc>

ETSI ETSI TS 136 212 13.10.0 17.01.2020 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136212/13.10.00_60/ts_136212v131000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.212-13.10.0 V1.1.0 13.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/WeZ5jgtDs2FCYwk>

TTA TTAT.3G-36.212V13.10.0 13.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V13.10.0>

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ARIB ARIB STD-T120-36.212 14.13.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36212-ed0.pdf>

ATIS ATIS.3GPP.36.212V14130 14.13.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.212V14130 14.13.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V14.13.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.212-14.13.0 V1.1.0 14.13.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Mnyag2zHRfKZHpw>

TTA TTAT.3G-36.212V14.13.0 14.13.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V14.13.0>

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ARIB ARIB STD-T120-36.212 15.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36212-fa0.pdf>

ATIS ATIS.3GPP.36.212V15100 15.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.212V15100 15.10.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V15.10.0.docx>

ETSI ETSI TS 136 212 15.10.0 20.07.2020 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136212/15.10.00_60/ts_136212v151000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.212-15.10.0 V1.0.0 15.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/S3o2JNcamg7AMtA>

TTA TTAT.3G-36.212V15.10.0 15.10.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V15.10.0>

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ARIB ARIB STD-T120-36.212 16.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36212-g20.pdf>

ATIS ATIS.3GPP.36.212V1620 16.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.212V1620 16.2.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.212%20V16.2.0.docx>

ETSI ETSI TS 136 212 16.2.0 20.07.2020 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136212/16.02.00_60/ts_136212v160200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.212-16.2.0 V1.0.0 16.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/bXZiLxjNP5o4CP4>

TTA TTAT.3G-36.212V16.2.0 16.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.212V16.2.0>

#### 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.

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ARIB ARIB STD-T120-36.213 10.13.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36213-ad0.pdf>

ATIS ATIS.3GPP.36.213V10130 10.13.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 11**

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**Release 12**

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**Release 14**

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**Release 15**

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**Release 16**

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#### 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.

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**Release 11**

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**Release 12**

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**Release 13**

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**Release 14**

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**Release 15**

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ATIS ATIS.3GPP.36.214V1550 15.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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**Release 16**

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#### 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.

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ARIB ARIB STD-T120-36.216 10.3.1 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36216-a31.pdf>

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**Release 12**

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**Release 13**

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**Release 14**

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TTA TTAT.3G-36.216V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.216V14.0.0>

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ARIB ARIB STD-T120-36.216 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36216-f00.pdf>

ATIS ATIS.3GPP.36.216V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.216V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.216%20V15.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.216-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/jcqMsxTx8j5DXcd>

TTA TTAT.3G-36.216V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.216V15.0.0>

**Release 16**

ARIB ARIB STD-T120-36.216 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36216-g00.pdf>

ATIS ATIS.3GPP.36.216V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.216V1600 16.0.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.216%20V16.0.0.doc>

ETSI ETSI TS 136 216 16.0.0 20.07.2020 <https://www.etsi.org/deliver/etsi_ts/136200_136299/136216/16.00.00_60/ts_136216v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.216-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Cte6XjCgzyQ4y7S>

TTA TTAT.3G-36.216V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.216V16.0.0>

### 2.1.3 Radio Layers 2 and 3

#### 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.

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ARIB ARIB STD-T120-36.300 10.12.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36300-ac0.pdf>

ATIS ATIS.3GPP.36.300V10120 10.12.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.300V10120 10.12.0 01.12.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V10.12.0.doc>

ETSI ETSI TS 136 300 10.12.0 04.02.2015 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/10.12.00_60/ts_136300v101200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.300-10.12.0 V1.0.0 10.12.0 30.08.2021 <https://members.tsdsi.in/index.php/s/ajGMJLWspBZy5xF>

TTA TTAT.3G-36.300V10.12.0 10.12.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.300V10.12.0>

**Release 11**

ARIB ARIB STD-T120-36.300 11.14.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36300-be0.pdf>

ATIS ATIS.3GPP.36.300V11140 11.14.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.300V11140 11.14.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V11.14.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.300-11.14.0 V1.0.0 11.14.0 30.08.2021 <https://members.tsdsi.in/index.php/s/HCGqWySTCaQFj4y>

TTA TTAT.3G-36.300V11.14.0 11.14.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.300V11.14.0>

**Release 12**

ARIB ARIB STD-T120-36.300 12.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36300-ca0.pdf>

ATIS ATIS.3GPP.36.300V12100 12.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.300V12100 12.10.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V12.10.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.300-12.10.0 V1.0.0 12.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/XXwQ6CmwxDoLbmG>

TTA TTAT.3G-36.300V12.10.0 12.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.300V12.10.0>

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ARIB ARIB STD-T120-36.300 13.14.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36300-de0.pdf>

ATIS ATIS.3GPP.36.300V13140 13.14.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.300V13140 13.14.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V13.14.0.docx>

ETSI ETSI TS 136 300 13.14.0 16.04.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/13.14.00_60/ts_136300v131400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.300-13.14.0 V1.1.0 13.14.0 30.08.2021 <https://members.tsdsi.in/index.php/s/qqoXiKtiMnJDyy8>

TTA TTAT.3G-36.300V13.14.0 13.14.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.300V13.14.0>

**Release 14**

ARIB ARIB STD-T120-36.300 14.12.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36300-ec0.pdf>

ATIS ATIS.3GPP.36.300V14120 14.12.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.300V14120 14.12.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V14.12.0.docx>

ETSI ETSI TS 136 300 14.12.0 16.04.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/14.12.00_60/ts_136300v141200p.pdf>

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**Release 15**

ARIB ARIB STD-T120-36.300 15.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36300-fa0.pdf>

ATIS ATIS.3GPP.36.300V15100 15.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.300V15100 15.10.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V15.10.0.docx>

ETSI ETSI TS 136 300 15.10.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/15.10.00_60/ts_136300v151000p.pdf>

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TTA TTAT.3G-36.300V15.10.0 15.10.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.300V15.10.0>

**Release 16**

ARIB ARIB STD-T120-36.300 16.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36300-g20.pdf>

ATIS ATIS.3GPP.36.300V1620 16.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.300V1620 16.2.0 01.07.2020 [http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA TS 36.300 V16.2.0.docx](http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.300%20V16.2.0.docx)

ETSI ETSI TS 136 300 16.2.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136300/16.02.00_60/ts_136300v160200p.pdf>

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TTA TTAT.3G-36.300V16.2.0 16.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.300V16.2.0>

#### 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.

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ARIB ARIB STD-T120-36.302 10.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36302-a60.pdf>

ATIS ATIS.3GPP.36.302V1060 10.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.302V1060 10.6.0 01.09.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V10.6.0.doc>

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TTA TTAT.3G-36.302V10.6.0 10.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V10.6.0>

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ARIB ARIB STD-T120-36.302 11.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36302-b50.pdf>

ATIS ATIS.3GPP.36.302V1150 11.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.302V1150 11.5.0 01.03.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V11.5.0.doc>

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TTA TTAT.3G-36.302V11.5.0 11.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V11.5.0>

**Release 12**

ARIB ARIB STD-T120-36.302 12.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36302-c80.pdf>

ATIS ATIS.3GPP.36.302V1280 12.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.302V1280 12.8.0 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V12.8.0.doc>

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TTA TTAT.3G-36.302V12.8.0 12.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V12.8.0>

**Release 13**

ARIB ARIB STD-T120-36.302 13.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36302-d80.pdf>

ATIS ATIS.3GPP.36.302V1380 13.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.302V1380 13.8.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V13.8.0.doc>

ETSI ETSI TS 136 302 13.8.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136302/13.08.00_60/ts_136302v130800p.pdf>

TSDSI TSDSI STD T1.3GPP 36.302-13.8.0 V1.1.0 13.8.0 30.08.2021 <https://members.tsdsi.in/index.php/s/dmnr2X5dsoQdHiW>

TTA TTAT.3G-36.302V13.8.0 13.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V13.8.0>

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ARIB ARIB STD-T120-36.302 14.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36302-e60.pdf>

ATIS ATIS.3GPP.36.302V1460 14.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.302V1460 14.6.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V14.6.0.docx>

ETSI ETSI TS 136 302 14.6.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136302/14.06.00_60/ts_136302v140600p.pdf>

TSDSI TSDSI STD T1.3GPP 36.302-14.6.0 V1.1.0 14.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/ydpQPqjfY4ykjdp>

TTA TTAT.3G-36.302V14.6.0 14.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V14.6.0>

**Release 15**

ARIB ARIB STD-T120-36.302 15.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36302-f30.pdf>

ATIS ATIS.3GPP.36.302V1530 15.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.302V1530 15.3.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V15.3.0.docx>

ETSI ETSI TS 136 302 15.3.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136302/15.03.00_60/ts_136302v150300p.pdf>

TSDSI TSDSI STD T1.3GPP 36.302-15.3.0 V1.0.0 15.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cwDCA7K772aMqcB>

TTA TTAT.3G-36.302V15.3.0 15.3.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V15.3.0>

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ARIB ARIB STD-T120-36.302 16.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36302-g10.pdf>

ATIS ATIS.3GPP.36.302V1610 16.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.302V1610 16.1.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.302%20V16.1.0.docx>

ETSI ETSI TS 136 302 16.1.0 30.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136302/16.01.00_60/ts_136302v160100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.302-16.1.0 V1.0.0 16.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/CzsjbiJL6YjCQtR>

TTA TTAT.3G-36.302V16.1.0 16.1.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.302V16.1.0>

#### 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.

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ARIB ARIB STD-T120-36.304 10.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36304-a90.pdf>

ATIS ATIS.3GPP.36.304V1090 10.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.304V1090 10.9.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.304%20V10.9.0.doc>

ETSI ETSI TS 136 304 10.9.0 18.01.2016 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136304/10.09.00_60/ts_136304v100900p.pdf>

TSDSI TSDSI STD T1.3GPP 36.304-10.9.0 V1.0.0 10.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/NnzoPWNZQ7b2o6g>

TTA TTAT.3G-36.304V10.9.0 10.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.304V10.9.0>

**Release 11**

ARIB ARIB STD-T120-36.304 11.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36304-b70.pdf>

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ARIB ARIB STD-T120-36.304 12.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36304-c80.pdf>

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ARIB ARIB STD-T120-36.304 14.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36304-e70.pdf>

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TTA TTAT.3G-36.304V14.7.0 14.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.304V14.7.0>

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ATIS ATIS.3GPP.36.304V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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TTA TTAT.3G-36.304V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.304V15.6.0>

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ARIB ARIB STD-T120-36.304 16.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36304-g10.pdf>

ATIS ATIS.3GPP.36.304V1610 16.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.304V1610 16.1.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.304%20V16.1.0.docx>

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#### 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.

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ARIB ARIB STD-T120-36.305 10.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36305-a50.pdf>

ATIS ATIS.3GPP.36.305V1050 10.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.305V1050 10.5.0 01.12.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.305%20V10.5.0.doc>

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ARIB ARIB STD-T120-36.305 11.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36305-b30.pdf>

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**Release 13**

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**Release 14**

ARIB ARIB STD-T120-36.305 14.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36305-e30.pdf>

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ARIB ARIB STD-T120-36.305 15.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36305-f50.pdf>

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ETSI ETSI TS 136 305 15.5.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136305/15.05.00_60/ts_136305v150500p.pdf>

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#### 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.

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TTA TTAT.3G-36.306V12.13.0 12.13.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.306V12.13.0>

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ARIB ARIB STD-T120-36.306 13.13.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36306-dd0.pdf>

ATIS ATIS.3GPP.36.306V13130 13.13.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.306V13130 13.13.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.306%20V13.13.0.docx>

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ARIB ARIB STD-T120-36.306 14.12.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36306-ec0.pdf>

ATIS ATIS.3GPP.36.306V14120 14.12.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.306V14120 14.12.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.306%20V14.12.0.docx>

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TTA TTAT.3G-36.306V14.12.0 14.12.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.306V14.12.0>

**Release 15**

ARIB ARIB STD-T120-36.306 15.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36306-f90.pdf>

ATIS ATIS.3GPP.36.306V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.306V1590 15.9.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.306%20V15.9.0.docx>

ETSI ETSI TS 136 306 15.9.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136306/15.09.00_60/ts_136306v150900p.pdf>

TSDSI TSDSI STD T1.3GPP 36.306-15.9.0 V1.0.0 15.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/oNDz9c6tNWFkBoX>

TTA TTAT.3G-36.306V15.9.0 15.9.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.306V15.9.0>

**Release 16**

ARIB ARIB STD-T120-36.306 16.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36306-g10.pdf>

ATIS ATIS.3GPP.36.306V1610 16.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.306V1610 16.1.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.306%20V16.1.0.docx>

ETSI ETSI TS 136 306 16.1.0 30.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136306/16.01.00_60/ts_136306v160100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.306-16.1.0 V1.0.0 16.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/9B7PK48mjN6xb5D>

TTA TTAT.3G-36.306V16.1.0 16.1.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.306V16.1.0>

#### 2.1.3.6 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).

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ARIB ARIB STD-T120-36.314 10.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36314-a20.pdf>

ATIS ATIS.3GPP.36.314V1020 10.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.314V1020 10.2.0 01.09.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V10.2.0.doc>

ETSI ETSI TS 136 314 10.2.0 04.11.2011 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136314/10.02.00_60/ts_136314v100200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.314-10.2.0 V1.0.0 10.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/5gmcGt2tp8SfoDg>

TTA TTAT.3G-36.314V10.2.0 10.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V10.2.0>

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ARIB ARIB STD-T120-36.314 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36314-b10.pdf>

ATIS ATIS.3GPP.36.314V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.314V1110 11.1.0 01.12.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V11.1.0.doc>

ETSI ETSI TS 136 314 11.1.0 12.02.2013 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136314/11.01.00_60/ts_136314v110100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.314-11.1.0 V1.0.0 11.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/tGLXCfZ6qK7oem4>

TTA TTAT.3G-36.314V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V11.1.0>

**Release 12**

ARIB ARIB STD-T120-36.314 12.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36314-c00.pdf>

ATIS ATIS.3GPP.36.314V1200 12.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.314V1200 12.0.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V12.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.314-12.0.0 V1.0.0 12.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/i6RNLRGik8seB2J>

TTA TTAT.3G-36.314V12.0.0 12.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V12.0.0>

**Release 13**

ARIB ARIB STD-T120-36.314 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36314-d10.pdf>

ATIS ATIS.3GPP.36.314V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.314V1310 13.1.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V13.1.0.doc>

ETSI ETSI TS 136 314 13.1.0 27.04.2016 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136314/13.01.00_60/ts_136314v130100p.pdf>

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TTA TTAT.3G-36.314V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V13.1.0>

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ARIB ARIB STD-T120-36.314 14.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36314-e00.pdf>

ATIS ATIS.3GPP.36.314V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.314V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V14.0.0.doc>

ETSI ETSI TS 136 314 14.0.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136314/14.00.00_60/ts_136314v140000p.pdf>

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TTA TTAT.3G-36.314V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V14.0.0>

**Release 15**

ARIB ARIB STD-T120-36.314 15.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36314-f20.pdf>

ATIS ATIS.3GPP.36.314V1520 15.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.314V1520 15.2.0 01.12.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V15.2.0.doc>

ETSI ETSI TS 136 314 15.2.0 17.04.2019 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136314/15.02.00_60/ts_136314v150200p.pdf>

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TTA TTAT.3G-36.314V15.2.0 15.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V15.2.0>

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ARIB ARIB STD-T120-36.314 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36314-g00.pdf>

ATIS ATIS.3GPP.36.314V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.314V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.314%20V16.0.0.doc>

ETSI ETSI TS 136 314 16.0.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136314/16.00.00_60/ts_136314v160000p.pdf>

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TTA TTAT.3G-36.314V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.314V16.0.0>

#### 2.1.3.7 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.

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ARIB ARIB STD-T120-36.321 10.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36321-aa0.pdf>

ATIS ATIS.3GPP.36.321V10100 10.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.321V10100 10.10.0 01.12.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V10.10.0.doc>

ETSI ETSI TS 136 321 10.10.0 28.01.2014 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136321/10.10.00_60/ts_136321v101000p.pdf>

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TTA TTAT.3G-36.321V10.10.0 10.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V10.10.0>

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ARIB ARIB STD-T120-36.321 11.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36321-b60.pdf>

ATIS ATIS.3GPP.36.321V1160 11.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.321V1160 11.6.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V11.6.0.doc>

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TTA TTAT.3G-36.321V11.6.0 11.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V11.6.0>

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ARIB ARIB STD-T120-36.321 12.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36321-ca0.pdf>

ATIS ATIS.3GPP.36.321V12100 12.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.321V12100 12.10.0 01.09.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V12.10.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.321-12.10.0 V1.0.0 12.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/eay7KbSBijFwCEx>

TTA TTAT.3G-36.321V12.10.0 12.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V12.10.0>

**Release 13**

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ATIS ATIS.3GPP.36.321V1390 13.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.321V1390 13.9.0 01.07.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V13.9.0.doc>

ETSI ETSI TS 136 321 13.9.0 16.07.2018 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136321/13.09.00_60/ts_136321v130900p.pdf>

TSDSI TSDSI STD T1.3GPP 36.321-13.9.0 V1.1.0 13.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/jqpKbKDfMyQyT3Z>

TTA TTAT.3G-36.321V13.9.0 13.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V13.9.0>

**Release 14**

ARIB ARIB STD-T120-36.321 14.12.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36321-ec0.pdf>

ATIS ATIS.3GPP.36.321V14120 14.12.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.321V14120 14.12.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V14.12.0.docx>

ETSI ETSI TS 136 321 14.12.0 17.01.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136321/14.12.00_60/ts_136321v141200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.321-14.12.0 V1.1.0 14.12.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Scsmp4sCg3TfBYt>

TTA TTAT.3G-36.321V14.12.0 14.12.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V14.12.0>

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ARIB ARIB STD-T120-36.321 15.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36321-f90.pdf>

ATIS ATIS.3GPP.36.321V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.321V1590 15.9.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V15.9.0.docx>

ETSI ETSI TS 136 321 15.9.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136321/15.09.00_60/ts_136321v150900p.pdf>

TSDSI TSDSI STD T1.3GPP 36.321-15.9.0 V1.0.0 15.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/ezX8m4naxmEj24N>

TTA TTAT.3G-36.321V15.9.0 15.9.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V15.9.0>

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ARIB ARIB STD-T120-36.321 16.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36321-g10.pdf>

ATIS ATIS.3GPP.36.321V1610 16.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.321V1610 16.1.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.321%20V16.1.0.docx>

ETSI ETSI TS 136 321 16.1.0 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136321/16.01.00_60/ts_136321v160100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.321-16.1.0 V1.0.0 16.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/n6DMeNHHgmJw8YT>

TTA TTAT.3G-36.321V16.1.0 16.1.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.321V16.1.0>

#### 2.1.3.8 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.

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ARIB ARIB STD-T120-36.322 10.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36322-a00.pdf>

ATIS ATIS.3GPP.36.322V1000 10.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.322V1000 10.0.0 01.12.2010 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.322%20V10.0.0.doc>

ETSI ETSI TS 136 322 10.0.0 14.01.2011 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136322/10.00.00_60/ts_136322v100000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.322-10.0.0 V1.0.0 10.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/R8dkysc5p36JBAa>

TTA TTAT.3G-36.322V10.0.0 10.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.322V10.0.0>

**Release 11**

ARIB ARIB STD-T120-36.322 11.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36322-b00.pdf>

ATIS ATIS.3GPP.36.322V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.322V1100 11.0.0 01.09.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.322%20V11.0.0.doc>

ETSI ETSI TS 136 322 11.0.0 02.10.2012 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136322/11.00.00_60/ts_136322v110000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.322-11.0.0 V1.0.0 11.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/WKibimcf4Z7SB7b>

TTA TTAT.3G-36.322V11.0.0 11.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.322V11.0.0>

**Release 12**

ARIB ARIB STD-T120-36.322 12.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36322-c40.pdf>

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#### 2.1.3.9 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).

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ARIB ARIB STD-T120-36.323 10.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36323-a30.pdf>

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#### 2.1.3.10 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.

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**Release 13**

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**Release 14**

ARIB ARIB STD-T120-36.331 14.14.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36331-ee0.pdf>

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ETSI ETSI TS 136 331 16.1.1 31.07.2020 <https://www.etsi.org/deliver/etsi_ts/136300_136399/136331/16.01.01_60/ts_136331v160101p.pdf>

TSDSI TSDSI STD T1.3GPP 36.331-16.1.1 V1.0.0 16.1.1 30.08.2021 <https://members.tsdsi.in/index.php/s/57SMo8DNRw7yYKs>

TTA TTAT.3G-36.331V16.1.1 16.1.1 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.331V16.1.1>

#### 2.1.3.11 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).

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ARIB ARIB STD-T120-36.360 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36360-d10.pdf>

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TTC TS-3GA-36.360(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_360_Rel16v16_0_0.pdf>

#### 2.1.3.12 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.

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ARIB ARIB STD-T120-36.361 13.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36361-d20.pdf>

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TTC TS-3GA-36.361(Rel13)v13.2.0 13.2.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.361(Rel13)v13.2.0.pdf>

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**Release 15**

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#### 2.1.3.13 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.

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ARIB ARIB STD-T120-36.355 10.12.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36355-ac0.pdf>

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ATIS ATIS.3GPP.36.355V1160 11.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.355V1160 11.6.0 01.06.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.355%20V11.6.0.doc>

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TTA TTAT.3G-36.355V11.6.0 11.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.355V11.6.0>

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TTA TTAT.3G-36.355V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.355V13.3.0>

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ATIS ATIS.3GPP.36.355V1470 14.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.355V14.7.0 14.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.355V14.7.0>

**Release 15**

ARIB ARIB STD-T120-37.355 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37355-f00.pdf>

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CCSA CCSA.37.355V 16.1.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.355%20V16.1.0.docx>

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### 2.1.4 Architecture

#### 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.

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ATIS ATIS.3GPP.36.401V1040 10.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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#### 2.1.4.2 TS 36.410

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

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#### 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.

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**Release 15**

ATIS ATIS.3GPP.36.411V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.411V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.411%20V15.0.0.doc>

ETSI ETSI TS 136 411 15.0.0 04.07.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136411/15.00.00_60/ts_136411v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.411-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/PckqmjFsPC5dGj4>

TTA TTAT.3G-36.411V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.411V15.0.0>

TTC TS-3GA-36.411(Rel15)v15.0.0 15.0.0 28.09.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.411(Rel15)v15.0.0.pdf>

**Release 16**

ATIS ATIS.3GPP.36.411V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.411V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.411%20V16.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.411-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/3CXRFYt7DZHE7Nw>

TTA TTAT.3G-36.411V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.411V16.0.0>

TTC TS-3GA-36.411(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_411_Rel16v16_0_0.pdf>

#### 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.

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ATIS ATIS.3GPP.36.412V1010 10.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.412V1010 10.1.0 01.06.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V10.1.0.doc>

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TTA TTAT.3G-36.412V10.1.0 10.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.412V10.1.0>

TTC TS-3GA-36.412(Rel10)v10.1.0 10.1.0 31.08.2011 <https://www.ttc.or.jp/st/docs/3gpps2011/TS/TS-3GA-36.412(Rel10)v10.1.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.412V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.412V1100 11.0.0 01.09.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V11.0.0.doc>

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TTC TS-3GA-36.412(Rel11)v11.0.0 11.0.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.412(Rel11)v11.0.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.412V1200 12.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.412V1200 12.0.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V12.0.0.doc>

ETSI ETSI TS 136 412 12.0.0 25.09.2014 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136412/12.00.00_60/ts_136412v120000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.412-12.0.0 V1.0.0 12.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/oJeSp7rBNygQDSt>

TTA TTAT.3G-36.412V12.0.0 12.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.412V12.0.0>

TTC TS-3GA-36.412(Rel12)v12.0.0 12.0.0 05.03.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.412(Rel12)v12.0.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.412V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.412V1300 13.0.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V13.0.0.doc>

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TTA TTAT.3G-36.412V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.412V13.0.0>

TTC TS-3GA-36.412(Rel13)v13.0.0 13.0.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.412(Rel13)v13.0.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.412V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.412V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V14.0.0.doc>

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TTA TTAT.3G-36.412V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.412V14.0.0>

TTC TS-3GA-36.412(Rel14)v14.0.0 14.0.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.412(Rel14)v14.0.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.412V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.412V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V15.0.0.doc>

ETSI ETSI TS 136 412 15.0.0 04.07.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136412/15.00.00_60/ts_136412v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.412-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/3CxGHsojZ4fBy94>

TTA TTAT.3G-36.412V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.412V15.0.0>

TTC TS-3GA-36.412(Rel15)v15.0.0 15.0.0 28.09.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.412(Rel15)v15.0.0.pdf>

**Release 16**

ATIS ATIS.3GPP.36.412V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.412V1600 16.0.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.412%20V16.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.412-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cw7yJaBMg3baAbQ>

TTA TTAT.3G-36.412V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.412V16.0.0>

TTC TS-3GA-36.412(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_412_Rel16v16_0_0.pdf>

#### 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.

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ATIS ATIS.3GPP.36.413V1090 10.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.413V1090 10.9.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V10.9.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.413-10.9.0 V1.0.0 10.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/BBewMzKtdwD9MZf>

TTA TTAT.3G-36.413V10.9.0 10.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V10.9.0>

TTC TS-3GA-36.413(Rel10)v10.9.0 10.9.0 18.12.2014 <https://www.ttc.or.jp/st/docs/3gpps2014/TS/TS-3GA-36.413(Rel10)v10.9.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.413V1180 11.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.413V1180 11.8.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V11.8.0.doc>

ETSI ETSI TS 136 413 11.8.0 26.09.2014 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136413/11.08.00_60/ts_136413v110800p.pdf>

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TTA TTAT.3G-36.413V11.8.0 11.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V11.8.0>

TTC TS-3GA-36.413(Rel11)v11.8.0 11.8.0 18.12.2014 <https://www.ttc.or.jp/st/docs/3gpps2014/TS/TS-3GA-36.413(Rel11)v11.8.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.413V1270 12.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.413V1270 12.7.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V12.7.0.doc>

ETSI ETSI TS 136 413 12.7.0 20.05.2016 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136413/12.07.00_60/ts_136413v120700p.pdf>

TSDSI TSDSI STD T1.3GPP 36.413-12.7.0 V1.0.0 12.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/k5KzafaXDrLxZBM>

TTA TTAT.3G-36.413V12.7.0 12.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V12.7.0>

TTC TS-3GA-36.413(Rel12)v12.7.0 12.7.0 30.06.2016 <https://www.ttc.or.jp/st/docs/3gpps2016/TS/TS-3GA-36.413(Rel12)v12.7.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.413V1380 13.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.413V1380 13.8.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V13.8.0.doc>

ETSI ETSI TS 136 413 13.8.0 28.09.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136413/13.08.00_60/ts_136413v130800p.pdf>

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TTA TTAT.3G-36.413V13.8.0 13.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V13.8.0>

TTC TS-3GA-36.413(Rel13)v13.8.0 13.8.0 21.12.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.413(Rel13)v13.8.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.413V1490 14.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.413V1490 14.9.0 01.07.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V14.9.0.doc>

ETSI ETSI TS 136 413 14.9.0 23.07.2019 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136413/14.09.00_60/ts_136413v140900p.pdf>

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TTA TTAT.3G-36.413V14.9.0 14.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V14.9.0>

TTC TS-3GA-36.413(Rel14)v14.9.0 14.9.0 11.10.2019 <https://www.ttc.or.jp/st/docs/3gpps2019/TS/TS-3GA-36.413(Rel14)v14.9.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.413V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.413V1590 15.9.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V15.9.0.doc>

ETSI ETSI TS 136 413 15.9.0 21.07.2020 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136413/15.09.00_60/ts_136413v150900p.pdf>

TSDSI TSDSI STD T1.3GPP 36.413-15.9.0 V1.0.0 15.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/EoLfFgcPcG7Hbet>

TTA TTAT.3G-36.413V15.9.0 15.9.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V15.9.0>

TTC TS-3GA-36.413(Rel15)v15.9.0 15.9.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_413_Rel15v15_9_0.pdf>

**Release 16**

ATIS ATIS.3GPP.36.413V1620 16.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.413V1620 16.2.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.413%20V16.2.0.doc>

ETSI ETSI TS 136 413 16.2.0 21.07.2020 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136413/16.02.00_60/ts_136413v160200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.413-16.2.0 V1.0.0 16.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Cb4HynLKoaHrMRt>

TTA TTAT.3G-36.413V16.2.0 16.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.413V16.2.0>

TTC TS-3GA-36.413(Rel16)v16.2.0 16.2.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_413_Rel16v16_2_0.pdf>

#### 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.

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ATIS ATIS.3GPP.36.414V1010 10.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.414V1010 10.1.0 01.06.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.414%20V10.1.0.doc>

ETSI ETSI TS 136 414 10.1.0 30.06.2011 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136414/10.01.00_60/ts_136414v100100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.414-10.1.0 V1.0.0 10.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Xfy2Y9MPn7oZEWW>

TTA TTAT.3G-36.414V10.1.0 10.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.414V10.1.0>

TTC TS-3GA-36.414(Rel10)v10.1.0 10.1.0 31.08.2011 <https://www.ttc.or.jp/st/docs/3gpps2011/TS/TS-3GA-36.414(Rel10)v10.1.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.414V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.414V1100 11.0.0 01.09.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.414%20V11.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.414-11.0.0 V1.0.0 11.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/G98tLbnMSFPLwTz>

TTA TTAT.3G-36.414V11.0.0 11.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.414V11.0.0>

TTC TS-3GA-36.414(Rel11)v11.0.0 11.0.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.414(Rel11)v11.0.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.414V1210 12.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 16**

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CCSA CCSA.36.414V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.414%20V16.0.0.doc>

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#### 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.

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ETSI ETSI TS 136 420 10.2.0 21.10.2011 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136420/10.02.00_60/ts_136420v100200p.pdf>

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**Release 11**

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**Release 12**

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**Release 15**

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CCSA CCSA.36.420V1520 15.2.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.420%20V15.2.0.doc>

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#### 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.

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**Release 13**

ATIS ATIS.3GPP.36.421V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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CCSA CCSA.36.421V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.421%20V14.0.0.doc>

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**Release 15**

ATIS ATIS.3GPP.36.421V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.421V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.421%20V15.0.0.doc>

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**Release 16**

ATIS ATIS.3GPP.36.421V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.421V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.421%20V16.0.0.doc>

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TTA TTAT.3G-36.421V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.421V16.0.0>

TTC TS-3GA-36.421(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_421_Rel16v16_0_0.pdf>

#### 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.

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ATIS ATIS.3GPP.36.422V1010 10.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TSDSI TSDSI STD T1.3GPP 36.422-10.1.0 V1.0.0 10.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Z4dmgsmpzdrXbfz>

TTA TTAT.3G-36.422V10.1.0 10.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.422V10.1.0>

TTC TS-3GA-36.422(Rel10)v10.1.0 10.1.0 31.08.2011 <https://www.ttc.or.jp/st/docs/3gpps2011/TS/TS-3GA-36.422(Rel10)v10.1.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.422V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 12**

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CCSA CCSA.36.422V1200 12.0.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.422%20V12.0.0.doc>

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ATIS ATIS.3GPP.36.422V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.422V1300 13.0.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.422%20V13.0.0.doc>

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**Release 14**

ATIS ATIS.3GPP.36.422V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 16**

ATIS ATIS.3GPP.36.422V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.422V1600 16.0.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.422%20V16.0.0.doc>

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#### 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.

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ATIS ATIS.3GPP.36.423V1070 10.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.423V1070 10.7.0 01.09.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V10.7.0.doc>

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TTC TS-3GA-36.423(Rel10)v10.7.0 10.7.0 22.11.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.423(Rel10)v10.7.0.pdf>

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ATIS ATIS.3GPP.36.423V1190 11.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.423V1190 11.9.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V11.9.0.doc>

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ATIS ATIS.3GPP.36.423V1290 12.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.423V1290 12.9.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V12.9.0.doc>

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**Release 13**

ATIS ATIS.3GPP.36.423V1380 13.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.423V1380 13.8.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V13.8.0.doc>

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**Release 14**

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CCSA CCSA.36.423V1480 14.8.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V14.8.0.doc>

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**Release 15**

ATIS ATIS.3GPP.36.423V15100 15.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.423V15100 15.10.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V15.10.0.doc>

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TTA TTAT.3G-36.423V15.10.0 15.10.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.423V15.10.0>

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**Release 16**

ATIS ATIS.3GPP.36.423V1620 16.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.423V1620 16.2.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.423%20V16.2.0.doc>

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TTA TTAT.3G-36.423V16.2.0 16.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.423V16.2.0>

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#### 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.

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ATIS ATIS.3GPP.36.424V1010 10.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.424V1010 10.1.0 01.06.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.424%20V10.1.0.doc>

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TTA TTAT.3G-36.424V10.1.0 10.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.424V10.1.0>

TTC TS-3GA-36.424(Rel10)v10.1.0 10.1.0 31.08.2011 <https://www.ttc.or.jp/st/docs/3gpps2011/TS/TS-3GA-36.424(Rel10)v10.1.0.pdf>

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ATIS ATIS.3GPP.36.424V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTC TS-3GA-36.424(Rel11)v11.0.0 11.0.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.424(Rel11)v11.0.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.424V1220 12.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.424V1220 12.2.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.424%20V12.2.0.doc>

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TTA TTAT.3G-36.424V12.2.0 12.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.424V12.2.0>

TTC TS-3GA-36.424(Rel12)v12.2.0 12.2.0 30.06.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.424(Rel12)v12.2.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.424V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.424V1310 13.1.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.424%20V13.1.0.doc>

ETSI ETSI TS 136 424 13.1.0 20.05.2016 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136424/13.01.00_60/ts_136424v130100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.424-13.1.0 V1.0.0 13.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/iL3MY7HYyJRPyWy>

TTA TTAT.3G-36.424V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.424V13.1.0>

TTC TS-3GA-36.424(Rel13)v13.1.0 13.1.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.424(Rel13)v13.1.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.424V1410 14.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.424V1410 14.1.0 01.06.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.424%20V14.1.0.doc>

ETSI ETSI TS 136 424 14.1.0 24.08.2017 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136424/14.01.00_60/ts_136424v140100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.424-14.1.0 V1.0.0 14.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/a648z9ZACxFgDFo>

TTA TTAT.3G-36.424V14.1.0 14.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.424V14.1.0>

TTC TS-3GA-36.424(Rel14)v14.1.0 14.1.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.424(Rel14)v14.1.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.424V1510 15.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.424V1510 15.1.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.424%20V15.1.0.doc>

ETSI ETSI TS 136 424 15.1.0 17.01.2020 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136424/15.01.00_60/ts_136424v150100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.424-15.1.0 V1.0.0 15.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/kpf94ny3RKq3eRD>

TTA TTAT.3G-36.424V15.1.0 15.1.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.424V15.1.0>

TTC TS-3GA-36.424(Rel15)v15.1.0 15.1.0 16.04.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_424_Rel15v15_1_0.pdf>

**Release 16**

ATIS ATIS.3GPP.36.424V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.424V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.424%20V16.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.424-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/HexHwXSiQxoWdT2>

TTA TTAT.3G-36.424V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.424V16.0.0>

TTC TS-3GA-36.424(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_424_Rel16v16_0_0.pdf>

#### 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.

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**Release 12**

ATIS ATIS.3GPP.36.425V1210 12.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.425V1210 12.1.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.425%20V12.1.0.doc>

ETSI ETSI TS 136 425 12.1.0 15.04.2015 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136425/12.01.00_60/ts_136425v120100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.425-12.1.0 V1.0.0 12.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/CR9oWoeQCDFbqF4>

TTA TTAT.3G-36.425V12.1.0 12.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.425V12.1.0>

TTC TS-3GA-36.425(Rel12)v12.1.0 12.1.0 0..6..2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.425(Rel12)v12.1.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.425V1311 13.1.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.425V1311 13.1.1 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.425%20V13.1.1.doc>

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TSDSI TSDSI STD T1.3GPP 36.425-13.1.1 V1.0.0 13.1.1 30.08.2021 <https://members.tsdsi.in/index.php/s/TZSfNZsiTPbf6Qk>

TTA TTAT.3G-36.425V13.1.1 13.1.1 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.425V13.1.1>

TTC TS-3GA-36.425(Rel13)v13.1.1 13.1.1 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.425(Rel13)v13.1.1.pdf>

**Release 14**

ATIS ATIS.3GPP.36.425V1420 14.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.425V1420 14.2.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.425%20V14.2.0.doc>

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TTA TTAT.3G-36.425V14.2.0 14.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.425V14.2.0>

TTC TS-3GA-36.425(Rel14)v14.2.0 14.2.0 28.09.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.425(Rel14)v14.2.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.425V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.425V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.425%20V15.0.0.doc>

ETSI ETSI TS 136 425 15.0.0 04.07.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136425/15.00.00_60/ts_136425v150000p.pdf>

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TTA TTAT.3G-36.425V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.425V15.0.0>

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**Release 16**

ATIS ATIS.3GPP.36.425V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.425V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.425%20V16.0.0.doc>

ETSI ETSI TS 136 425 16.0.0 21.07.2020 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136425/16.00.00_60/ts_136425v160000p.pdf>

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TTA TTAT.3G-36.425V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.425V16.0.0>

TTC TS-3GA-36.425(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_425_Rel16v16_0_0.pdf>

#### 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 provides an introduction to the TSG RAN TS 36.44x series of UMTS technical specifications that define the different interfaces introduced for MBMS provision in E-UTRAN.

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**Release 10**

ATIS ATIS.3GPP.36.440V1030 10.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.440V1030 10.3.0 01.06.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V10.3.0.doc>

ETSI ETSI TS 136 440 10.3.0 20.07.2012 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136440/10.03.00_60/ts_136440v100300p.pdf>

TSDSI TSDSI STD T1.3GPP 36.440-10.3.0 V1.0.0 10.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/58BScMp37S6pQ2w>

TTA TTAT.3G-36.440V10.3.0 10.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V10.3.0>

TTC TS-3GA-36.440(Rel10)v10.3.0 10.3.0 19.09.2012 <https://www.ttc.or.jp/st/docs/3gpps2012/TS/TS-3GA-36.440(Rel10)v10.3.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.440V1120 11.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.440V1120 11.2.0 01.03.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V11.2.0.doc>

ETSI ETSI TS 136 440 11.2.0 22.04.2013 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136440/11.02.00_60/ts_136440v110200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.440-11.2.0 V1.0.0 11.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Hq2PdH3FxzHEDXi>

TTA TTAT.3G-36.440V11.2.0 11.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V11.2.0>

TTC TS-3GA-36.440(Rel11)v11.2.0 11.2.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.440(Rel11)v11.2.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.440V1200 12.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.440V1200 12.0.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V12.0.0.doc>

ETSI ETSI TS 136 440 12.0.0 26.09.2014 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136440/12.00.00_60/ts_136440v120000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.440-12.0.0 V1.0.0 12.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/HFy2BR48fRwf2CM>

TTA TTAT.3G-36.440V12.0.0 12.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V12.0.0>

TTC TS-3GA-36.440(Rel12)v12.0.0 12.0.0 05.03.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.440(Rel12)v12.0.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.440V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.440V1300 13.0.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V13.0.0.doc>

ETSI ETSI TS 136 440 13.0.0 21.01.2016 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136440/13.00.00_60/ts_136440v130000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.440-13.0.0 V1.0.0 13.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/nS32bACrPNLs4XJ>

TTA TTAT.3G-36.440V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V13.0.0>

TTC TS-3GA-36.440(Rel13)v13.0.0 13.0.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.440(Rel13)v13.0.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.440V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.440V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V14.0.0.doc>

ETSI ETSI TS 136 440 14.0.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136440/14.00.00_60/ts_136440v140000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.440-14.0.0 V1.0.0 14.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/zk2a77pN7DCaMzN>

TTA TTAT.3G-36.440V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V14.0.0>

TTC TS-3GA-36.440(Rel14)v14.0.0 14.0.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.440(Rel14)v14.0.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.440V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.440V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V15.0.0.doc>

ETSI ETSI TS 136 440 15.0.0 28.09.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136440/15.00.00_60/ts_136440v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.440-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/3Jm8Z92BtjqmArd>

TTA TTAT.3G-36.440V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V15.0.0>

TTC TS-3GA-36.440(Rel15)v15.0.0 15.0.0 21.12.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.440(Rel15)v15.0.0.pdf>

**Release 16**

ATIS ATIS.3GPP.36.440V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.440V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.440%20V16.0.0.doc>

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TTA TTAT.3G-36.440V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.440V16.0.0>

TTC TS-3GA-36.440(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_440_Rel16v16_0_0.pdf>

#### 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.

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**Release 10**

ATIS ATIS.3GPP.36.441V1010 10.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.441V1010 10.1.0 01.06.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.441%20V10.1.0.doc>

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TTA TTAT.3G-36.441V10.1.0 10.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V10.1.0>

TTC TS-3GA-36.441(Rel10)v10.1.0 10.1.0 31.08.2011 <https://www.ttc.or.jp/st/docs/3gpps2011/TS/TS-3GA-36.441(Rel10)v10.1.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.441V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.441V1100 11.0.0 01.09.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.441%20V11.0.0.doc>

ETSI ETSI TS 136 441 11.0.0 18.10.2012 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136441/11.00.00_60/ts_136441v110000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.441-11.0.0 V1.0.0 11.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/FGSZY9eddGKHpFa>

TTA TTAT.3G-36.441V11.0.0 11.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V11.0.0>

TTC TS-3GA-36.441(Rel11)v11.0.0 11.0.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.441(Rel11)v11.0.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.441V1200 12.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.441V1200 12.0.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.441%20V12.0.0.doc>

ETSI ETSI TS 136 441 12.0.0 26.09.2014 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136441/12.00.00_60/ts_136441v120000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.441-12.0.0 V1.0.0 12.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/3qRBR9xRoSfSmge>

TTA TTAT.3G-36.441V12.0.0 12.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V12.0.0>

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**Release 13**

ATIS ATIS.3GPP.36.441V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.441V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V13.0.0>

TTC TS-3GA-36.441(Rel13)v13.0.0 13.0.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.441(Rel13)v13.0.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.441V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.441V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.441%20V14.0.0.doc>

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TTA TTAT.3G-36.441V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V14.0.0>

TTC TS-3GA-36.441(Rel14)v14.0.0 14.0.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.441(Rel14)v14.0.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.441V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.441V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.441%20V15.0.0.doc>

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TTA TTAT.3G-36.441V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V15.0.0>

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**Release 16**

ATIS ATIS.3GPP.36.441V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.441V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.441%20V16.0.0.doc>

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TTA TTAT.3G-36.441V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.441V16.0.0>

TTC TS-3GA-36.441(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_441_Rel16v16_0_0.pdf>

#### 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.

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**Release 10**

ATIS ATIS.3GPP.36.442V1020 10.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.442V1020 10.2.0 01.09.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V10.2.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.442-10.2.0 V1.0.0 10.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/j4ReMoQkfDJ6LtB>

TTA TTAT.3G-36.442V10.2.0 10.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.442V10.2.0>

TTC TS-3GA-36.442(Rel10)v10.2.0 10.2.0 21.12.2011 <https://www.ttc.or.jp/st/docs/3gpps2011/TS/TS-3GA-36.442(Rel10)v10.2.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.442V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.442V1100 11.0.0 01.09.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V11.0.0.doc>

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TTA TTAT.3G-36.442V11.0.0 11.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.442V11.0.0>

TTC TS-3GA-36.442(Rel11)v11.0.0 11.0.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.442(Rel11)v11.0.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.442V1200 12.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.442V1200 12.0.0 01.09.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V12.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.442-12.0.0 V1.0.0 12.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/j7i9bPMb3gb2jLe>

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ATIS ATIS.3GPP.36.442V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.442V1300 13.0.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V13.0.0.doc>

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TTA TTAT.3G-36.442V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.442V13.0.0>

TTC TS-3GA-36.442(Rel13)v13.0.0 13.0.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.442(Rel13)v13.0.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.442V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.442V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V14.0.0.doc>

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TTA TTAT.3G-36.442V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.442V14.0.0>

TTC TS-3GA-36.442(Rel14)v14.0.0 14.0.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.442(Rel14)v14.0.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.442V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.442V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V15.0.0.doc>

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TTA TTAT.3G-36.442V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.442V15.0.0>

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**Release 16**

ATIS ATIS.3GPP.36.442V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.442V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.442%20V16.0.0.doc>

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TTA TTAT.3G-36.442V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.442V16.0.0>

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#### 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.

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**Release 10**

ATIS ATIS.3GPP.36.443V1050 10.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.443V1050 10.5.0 01.03.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V10.5.0.doc>

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TTA TTAT.3G-36.443V10.5.0 10.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V10.5.0>

TTC TS-3GA-36.443(Rel10)v10.5.0 10.5.0 27.06.2012 <https://www.ttc.or.jp/st/docs/3gpps2012/TS/TS-3GA-36.443(Rel10)v10.5.0.pdf>

**Release 11**

ATIS ATIS.3GPP.36.443V1140 11.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.443V1140 11.4.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V11.4.0.doc>

ETSI ETSI TS 136 443 11.4.0 15.04.2015 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136443/11.04.00_60/ts_136443v110400p.pdf>

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TTA TTAT.3G-36.443V11.4.0 11.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V11.4.0>

TTC TS-3GA-36.443(Rel11)v11.4.0 11.4.0 30.06.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.443(Rel11)v11.4.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.443V1220 12.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.443V1220 12.2.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V12.2.0.doc>

ETSI ETSI TS 136 443 12.2.0 15.04.2015 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136443/12.02.00_60/ts_136443v120200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.443-12.2.0 V1.0.0 12.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/CmafAeSF3psntq5>

TTA TTAT.3G-36.443V12.2.0 12.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V12.2.0>

TTC TS-3GA-36.443(Rel12)v12.2.0 12.2.0 30.06.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.443(Rel12)v12.2.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.443V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.443V1330 13.3.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V13.3.0.doc>

ETSI ETSI TS 136 443 13.3.0 20.05.2016 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136443/13.03.00_60/ts_136443v130300p.pdf>

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TTA TTAT.3G-36.443V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V13.3.0>

TTC TS-3GA-36.443(Rel13)v13.3.0 13.3.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.443(Rel13)v13.3.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.443V1410 14.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.443V1410 14.1.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V14.1.0.doc>

ETSI ETSI TS 136 443 14.1.0 28.09.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136443/14.01.00_60/ts_136443v140100p.pdf>

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TTA TTAT.3G-36.443V14.1.0 14.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V14.1.0>

TTC TS-3GA-36.443(Rel14)v14.1.0 14.1.0 21.12.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.443(Rel14)v14.1.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.443V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.443V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V15.0.0.doc>

ETSI ETSI TS 136 443 15.0.0 28.09.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136443/15.00.00_60/ts_136443v150000p.pdf>

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TTA TTAT.3G-36.443V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V15.0.0>

TTC TS-3GA-36.443(Rel15)v15.0.0 15.0.0 21.12.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.443(Rel15)v15.0.0.pdf>

**Release 16**

ATIS ATIS.3GPP.36.443V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.443V1600 16.0.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.443%20V16.0.0.doc>

ETSI ETSI TS 136 443 16.0.0 21.09.2020 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136443/16.00.00_60/ts_136443v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.443-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/FYfpn77KfHjJnk9>

TTA TTAT.3G-36.443V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.443V16.0.0>

TTC TS-3GA-36.443(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_443_Rel16v16_0_0.pdf>

#### 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.

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ATIS ATIS.3GPP.36.444V1040 10.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTC TS-3GA-36.444(Rel10)v10.4.0 10.4.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.444(Rel10)v10.4.0.pdf>

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ATIS ATIS.3GPP.36.444V1160 11.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 12**

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**Release 13**

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**Release 14**

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**Release 15**

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**Release 16**

ATIS ATIS.3GPP.36.444V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.444V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.444%20V16.0.0.doc>

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#### 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.

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**Release 13**

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**Release 14**

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**Release 15**

ATIS ATIS.3GPP.36.445V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.445V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.445%20V15.0.0.doc>

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#### 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.

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ATIS ATIS.3GPP.36.455V1040 10.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ATIS ATIS.3GPP.36.455V1130 11.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ETSI ETSI TS 136 455 11.3.0 11.07.2013 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136455/11.03.00_60/ts_136455v110300p.pdf>

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TTA TTAT.3G-36.455V11.3.0 11.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.455V11.3.0>

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**Release 12**

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ETSI ETSI TS 136 455 12.2.0 15.04.2015 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136455/12.02.00_60/ts_136455v120200p.pdf>

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TTA TTAT.3G-36.455V12.2.0 12.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.455V12.2.0>

TTC TS-3GA-36.455(Rel12)v12.2.0 12.2.0 30.06.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.455(Rel12)v12.2.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.455V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.455V1310 13.1.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.455%20V13.1.0.doc>

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TTA TTAT.3G-36.455V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.455V13.1.0>

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**Release 14**

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CCSA CCSA.36.455V1450 14.5.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.455%20V14.5.0.doc>

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TTA TTAT.3G-36.455V14.5.0 14.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.455V14.5.0>

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ATIS ATIS.3GPP.36.455V1521 15.2.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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TTA TTAT.3G-36.455V15.2.1 15.2.1 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.455V15.2.1>

TTC TS-3GA-36.455(Rel15)v15.2.1 15.2.1 29.03.2019 <https://www.ttc.or.jp/st/docs/3gpps2019/TS/TS-3GA-36.455(Rel15)v15.2.1.pdf>

**Release 16**

ATIS ATIS.3GPP.36.455V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.455V1600 16.0.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.455%20V16.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.455-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/MTTTeNBSbNGtgwd>

TTA TTAT.3G-36.455V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.455V16.0.0>

TTC TS-3GA-36.455(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_455_Rel16v16_0_0.pdf>

#### 2.1.4.20 TS 36.456

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).

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**Release 11**

ATIS ATIS.3GPP.36.456V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.456V1100 11.0.0 01.12.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.456%20V11.0.0.doc>

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**Release 12**

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**Release 13**

ATIS ATIS.3GPP.36.456V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.456V1300 13.0.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.456%20V13.0.0.doc>

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**Release 14**

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CCSA CCSA.36.456V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.456%20V15.0.0.doc>

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**Release 16**

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TTC TS-3GA-36.456(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_456_Rel16v16_0_0.pdf>

#### 2.1.4.21 TS 36.457

SLm interface layer 1

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

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**Release 11**

ATIS ATIS.3GPP.36.457V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.457V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.457V14.0.0>

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**Release 15**

ATIS ATIS.3GPP.36.457V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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ETSI ETSI TS 136 457 15.0.0 04.07.2018 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136457/15.00.00_60/ts_136457v150000p.pdf>

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**Release 16**

ATIS ATIS.3GPP.36.457V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.457V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.457%20V16.0.0.doc>

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TTC TS-3GA-36.457(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_457_Rel16v16_0_0.pdf>

#### 2.1.4.22 TS 36.458

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.

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**Release 11**

ATIS ATIS.3GPP.36.458V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.458V1100 11.0.0 01.12.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.458%20V11.0.0.doc>

ETSI ETSI TS 136 458 11.0.0 12.02.2013 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136458/11.00.00_60/ts_136458v110000p.pdf>

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TTA TTAT.3G-36.458V11.0.0 11.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.458V11.0.0>

TTC TS-3GA-36.458(Rel11)v11.0.0 11.0.0 25.06.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.458(Rel11)v11.0.0.pdf>

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ATIS ATIS.3GPP.36.458V1200 12.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.458V12.0.0 12.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.458V12.0.0>

TTC TS-3GA-36.458(Rel12)v12.0.0 12.0.0 05.03.2015 <https://www.ttc.or.jp/st/docs/3gpps2015/TS/TS-3GA-36.458(Rel12)v12.0.0.pdf>

**Release 13**

ATIS ATIS.3GPP.36.458V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.458V1300 13.0.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.458%20V13.0.0.doc>

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ATIS ATIS.3GPP.36.458V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.458V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.458%20V14.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.458-14.0.0 V1.0.0 14.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/kKrsXngBGaKzS8n>

TTA TTAT.3G-36.458V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.458V14.0.0>

TTC TS-3GA-36.458(Rel14)v14.0.0 14.0.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.458(Rel14)v14.0.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.458V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.458V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.458%20V15.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.458-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/GC5wiixejnwfa7s>

TTA TTAT.3G-36.458V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.458V15.0.0>

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**Release 16**

ATIS ATIS.3GPP.36.458V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

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TSDSI TSDSI STD T1.3GPP 36.458-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/4LdWNKHwzkbnicb>

TTA TTAT.3G-36.458V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.458V16.0.0>

TTC TS-3GA-36.458(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_458_Rel16v16_0_0.pdf>

#### 2.1.4.23 TS 36.459

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.

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**Release 11**

ATIS ATIS.3GPP.36.459V1130 11.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.459V1130 11.3.0 01.09.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.459%20V11.3.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.459-11.3.0 V1.0.0 11.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cKt3x2cAx8SnoDi>

TTA TTAT.3G-36.459V11.3.0 11.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.459V11.3.0>

TTC TS-3GA-36.459(Rel11)v11.3.0 11.3.0 22.11.2013 <https://www.ttc.or.jp/st/docs/3gpps2013/TS/TS-3GA-36.459(Rel11)v11.3.0.pdf>

**Release 12**

ATIS ATIS.3GPP.36.459V1210 12.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.459V1210 12.1.0 01.03.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.459%20V12.1.0.doc>

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TTA TTAT.3G-36.459V12.1.0 12.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.459V12.1.0>

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**Release 13**

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TTC TS-3GA-36.459(Rel13)v13.1.0 13.1.0 31.03.2017 <https://www.ttc.or.jp/st/docs/3gpps2017/TS/TS-3GA-36.459(Rel13)v13.1.0.pdf>

**Release 14**

ATIS ATIS.3GPP.36.459V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.459V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.459%20V14.0.0.doc>

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TTA TTAT.3G-36.459V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.459V14.0.0>

TTC TS-3GA-36.459(Rel14)v14.0.0 14.0.0 13.04.2018 <https://www.ttc.or.jp/st/docs/3gpps2018/TS/TS-3GA-36.459(Rel14)v14.0.0.pdf>

**Release 15**

ATIS ATIS.3GPP.36.459V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.459V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.459%20V15.0.0.doc>

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TTA TTAT.3G-36.459V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.459V15.0.0>

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**Release 16**

ATIS ATIS.3GPP.36.459V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.459V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.459%20V16.0.0.doc>

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TTC TS-3GA-36.459(Rel16)v16.0.0 16.0.0 02.10.2020 <https://www.ttc.or.jp/st/docs/3gpps2020/TS/TS-3GA-36_459_Rel16v16_0_0.pdf>

#### 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.

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**Release 13**

ARIB ARIB STD-T120-36.461 13.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36461-d00.pdf>

ATIS ATIS.3GPP.36.461V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.461V1300 13.0.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.461%20V13.0.0.doc>

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TTA TTAT.3G-36.461V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.461V13.0.0>

**Release 14**

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ATIS ATIS.3GPP.36.461V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.461V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.461%20V14.0.0.doc>

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TTA TTAT.3G-36.461V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.461V14.0.0>

**Release 15**

ARIB ARIB STD-T120-36.461 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36461-f00.pdf>

ATIS ATIS.3GPP.36.461V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.461V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.461%20V15.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.461-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/DNAy2doqCc3gQD3>

TTA TTAT.3G-36.461V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.461V15.0.0>

**Release 16**

ARIB ARIB STD-T120-36.461 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36461-g00.pdf>

ATIS ATIS.3GPP.36.461V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.461V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.461%20V16.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.461-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/g6c2TKsZTeZEZDx>

TTA TTAT.3G-36.461V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.461V16.0.0>

#### 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.

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ARIB ARIB STD-T120-36.462 13.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36462-d00.pdf>

ATIS ATIS.3GPP.36.462V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.462V1300 13.0.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.462%20V13.0.0.doc>

ETSI ETSI TS 136 462 13.0.0 22.04.2016 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136462/13.00.00_60/ts_136462v130000p.pdf>

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TTA TTAT.3G-36.462V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.462V13.0.0>

**Release 14**

ARIB ARIB STD-T120-36.462 14.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36462-e00.pdf>

ATIS ATIS.3GPP.36.462V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.462V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.462%20V14.0.0.doc>

ETSI ETSI TS 136 462 14.0.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136462/14.00.00_60/ts_136462v140000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.462-14.0.0 V1.0.0 14.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/8RtZkedzim655Ri>

TTA TTAT.3G-36.462V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.462V14.0.0>

**Release 15**

ARIB ARIB STD-T120-36.462 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36462-f00.pdf>

ATIS ATIS.3GPP.36.462V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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TSDSI TSDSI STD T1.3GPP 36.462-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/H9iiG9iA3ZAskQz>

TTA TTAT.3G-36.462V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.462V15.0.0>

**Release 16**

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ATIS ATIS.3GPP.36.462V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

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ETSI ETSI TS 136 462 16.0.0 21.07.2020 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136462/16.00.00_60/ts_136462v160000p.pdf>

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TTA TTAT.3G-36.462V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.462V16.0.0>

#### 2.1.4.26 TS 36.463

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless LAN (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.

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ARIB ARIB STD-T120-36.463 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36463-d10.pdf>

ATIS ATIS.3GPP.36.463V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.463V1310 13.1.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.463%20V13.1.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.463-13.1.0 V1.0.0 13.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/SAB8mEdF5nfyiYg>

TTA TTAT.3G-36.463V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.463V13.1.0>

**Release 14**

ARIB ARIB STD-T120-36.463 14.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36463-e20.pdf>

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TSDSI TSDSI STD T1.3GPP 36.463-14.2.0 V1.0.0 14.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/SpN6tosYaECDaPF>

TTA TTAT.3G-36.463V14.2.0 14.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.463V14.2.0>

**Release 15**

ARIB ARIB STD-T120-36.463 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36463-f00.pdf>

ATIS ATIS.3GPP.36.463V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.463V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.463%20V15.0.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.463-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/MFem6KcmqnCDwpe>

TTA TTAT.3G-36.463V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.463V15.0.0>

**Release 16**

ARIB ARIB STD-T120-36.463 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36463-g00.pdf>

ATIS ATIS.3GPP.36.463V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

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#### 2.1.4.27 TS 36.464

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless LAN (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).

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**Release 13**

ARIB ARIB STD-T120-36.464 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36464-d30.pdf>

ATIS ATIS.3GPP.36.464V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ETSI ETSI TS 136 464 13.3.0 18.10.2017 <https://www.etsi.org/deliver/etsi_ts/136400_136499/136464/13.03.00_60/ts_136464v130300p.pdf>

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**Release 14**

ARIB ARIB STD-T120-36.464 14.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36464-e20.pdf>

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#### 2.1.4.28 TS 36.465

Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless LAN (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).

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ARIB ARIB STD-T120-36.465 13.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36465-d20.pdf>

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**Release 14**

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**Release 15**

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TTA TTAT.3G-36.465V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.465V15.0.0>

**Release 16**

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#### 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.

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**Release 10**

ARIB ARIB STD-T120-37.460 10.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37460-a10.pdf>

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**Release 11**

ARIB ARIB STD-T120-37.460 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37460-b10.pdf>

ATIS ATIS.3GPP.37.460V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.460V1110 11.1.0 01.04.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.460%20V11.1.0.doc>

ETSI ETSI TS 137 460 11.1.0 15.05.2019 <https://www.etsi.org/deliver/etsi_ts/137400_137499/137460/11.01.00_60/ts_137460v110100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.460-11.1.0 V1.0.0 11.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/ed2324f5sQap9yL>

TTA TTAT.3G-37.460V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.460V11.1.0>

**Release 12**

ARIB ARIB STD-T120-37.460 12.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/37/A37460-c10.pdf>

ATIS ATIS.3GPP.37.460V1210 12.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.460V1210 12.1.0 01.04.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.460%20V12.1.0.doc>

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**Release 13**

ARIB ARIB STD-T120-37.460 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37460-d10.pdf>

ATIS ATIS.3GPP.37.460V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ETSI ETSI TS 137 460 13.1.0 15.05.2019 <https://www.etsi.org/deliver/etsi_ts/137400_137499/137460/13.01.00_60/ts_137460v130100p.pdf>

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TTA TTAT.3G-37.460V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.460V13.1.0>

**Release 14**

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ATIS ATIS.3GPP.37.460V1410 14.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.460V1410 14.1.0 01.04.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.460%20V14.1.0.doc>

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**Release 15**

ARIB ARIB STD-T120-37.460 15.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37460-f20.pdf>

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CCSA CCSA.37.460V1520 15.2.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.460%20V15.2.0.doc>

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**Release 16**

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TTA TTAT.3G-37.460V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.460V16.0.0>

#### 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.

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ARIB ARIB STD-T120-37.461 10.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37461-a30.pdf>

ATIS ATIS.3GPP.37.461V1030 10.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ATIS ATIS.3GPP.37.461V1220 12.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-37.461V12.2.0 12.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.461V12.2.0>

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ATIS ATIS.3GPP.37.461V1320 13.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-37.461V13.2.0 13.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.461V13.2.0>

**Release 14**

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**Release 15**

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#### 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.

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ARIB ARIB STD-T120-37.462 10.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37462-a20.pdf>

ATIS ATIS.3GPP.37.462V1020 10.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 12**

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TTA TTAT.3G-37.462V12.1.0 12.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.462V12.1.0>

**Release 13**

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TTA TTAT.3G-37.462V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.462V13.1.0>

**Release 14**

ARIB ARIB STD-T120-37.462 14.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37462-e10.pdf>

ATIS ATIS.3GPP.37.462V1410 14.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 15**

ARIB ARIB STD-T120-37.462 15.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37462-f20.pdf>

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CCSA CCSA.37.462V1520 15.2.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.462%20V15.2.0.doc>

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TTA TTAT.3G-37.462V15.2.0 15.2.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.462V15.2.0>

**Release 16**

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#### 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.

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ARIB ARIB STD-T120-37.466 10.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37466-a40.pdf>

ATIS ATIS.3GPP.37.466V1040 10.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 11**

ARIB ARIB STD-T120-37.466 11.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37466-b40.pdf>

ATIS ATIS.3GPP.37.466V1140 11.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 12**

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TTA TTAT.3G-37.466V12.3.0 12.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.466V12.3.0>

**Release 13**

ARIB ARIB STD-T120-37.466 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37466-d30.pdf>

ATIS ATIS.3GPP.37.466V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.466V1330 13.3.0 01.04.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.466%20V13.3.0.doc>

ETSI ETSI TS 137 466 13.3.0 15.05.2019 <https://www.etsi.org/deliver/etsi_ts/137400_137499/137466/13.03.00_60/ts_137466v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.466-13.3.0 V1.0.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/9CQsExkNbGqRaTx>

TTA TTAT.3G-37.466V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.466V13.3.0>

**Release 14**

ARIB ARIB STD-T120-37.466 14.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37466-e30.pdf>

ATIS ATIS.3GPP.37.466V1430 14.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.466V1430 14.3.0 01.04.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.466%20V14.3.0.doc>

ETSI ETSI TS 137 466 14.3.0 15.05.2019 <https://www.etsi.org/deliver/etsi_ts/137400_137499/137466/14.03.00_60/ts_137466v140300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.466-14.3.0 V1.0.0 14.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/tQyJWw7YP7yPaf4>

TTA TTAT.3G-37.466V14.3.0 14.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.466V14.3.0>

**Release 15**

ARIB ARIB STD-T120-37.466 15.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37466-f50.pdf>

ATIS ATIS.3GPP.37.466V1550 15.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.466V1550 15.5.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.466%20V15.5.0.doc>

ETSI ETSI TS 137 466 15.5.0 17.01.2020 <https://www.etsi.org/deliver/etsi_ts/137400_137499/137466/15.05.00_60/ts_137466v150500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.466-15.5.0 V1.0.0 15.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/EeHNBLpXRMtgdTW>

TTA TTAT.3G-37.466V15.5.0 15.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.466V15.5.0>

**Release 16**

ARIB ARIB STD-T120-37.466 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37466-g00.pdf>

ATIS ATIS.3GPP.37.466V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.466V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.466%20V16.0.0.doc>

ETSI ETSI TS 137 466 16.0.0 18.09.2020 <https://www.etsi.org/deliver/etsi_ts/137400_137499/137466/16.00.00_60/ts_137466v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.466-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/e8qXqTXA69FcGtH>

TTA TTAT.3G-37.466V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.466V16.0.0>

#### 2.1.4.33 TS 25.446

MBMS synchronisation protocol (SYNC)

This document specifies the MBMS Synchronisation Protocol. For the release of this specification, it is used on Iu towards UTRAN and M1 towards E-UTRAN.

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ARIB ARIB STD-T120-25.446 10.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/25/A25446-a20.pdf>

ATIS ATIS.3GPP.25.446V1020 10.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.25.446V1020 10.2.0 01.12.2011 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V10.2.0.doc>

ETSI ETSI TS 125 446 10.2.0 10.01.2012 <https://www.etsi.org/deliver/etsi_ts/125400_125499/125446/10.02.00_60/ts_125446v100200p.pdf>

TSDSI TSDSI STD T1.3GPP 25.446-10.2.0 V1.0.0 10.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/KDDKeC5ganfz3HJ>

TTA TTAT.3G-25.446V10.2.0 10.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-25.446V10.2.0>

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ARIB ARIB STD-T120-25.446 11.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/25/A25446-b00.pdf>

ATIS ATIS.3GPP.25.446V1100 11.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.25.446V1100 11.0.0 01.09.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V11.0.0.doc>

ETSI ETSI TS 125 446 11.0.0 10.10.2012 <https://www.etsi.org/deliver/etsi_ts/125400_125499/125446/11.00.00_60/ts_125446v110000p.pdf>

TSDSI TSDSI STD T1.3GPP 25.446-11.0.0 V1.0.0 11.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/sGrfQC7oG64TCN2>

TTA TTAT.3G-25.446V11.0.0 11.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-25.446V11.0.0>

**Release 12**

ARIB ARIB STD-T120-25.446 12.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/25/A25446-c20.pdf>

ATIS ATIS.3GPP.25.446V1220 12.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.25.446V1220 12.2.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V12.2.0.doc>

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**Release 13**

ARIB ARIB STD-T120-25.446 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/25/A25446-d10.pdf>

ATIS ATIS.3GPP.25.446V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.25.446V1310 13.1.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V13.1.0.doc>

ETSI ETSI TS 125 446 13.1.0 11.05.2016 <https://www.etsi.org/deliver/etsi_ts/125400_125499/125446/13.01.00_60/ts_125446v130100p.pdf>

TSDSI TSDSI STD T1.3GPP 25.446-13.1.0 V1.0.0 13.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/LgGDYFkaqwEngZi>

TTA TTAT.3G-25.446V13.1.0 13.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-25.446V13.1.0>

**Release 14**

ARIB ARIB STD-T120-25.446 14.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/25/A25446-e00.pdf>

ATIS ATIS.3GPP.25.446V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.25.446V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V14.0.0.doc>

ETSI ETSI TS 125 446 14.0.0 05.04.2017 <https://www.etsi.org/deliver/etsi_ts/125400_125499/125446/14.00.00_60/ts_125446v140000p.pdf>

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TTA TTAT.3G-25.446V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-25.446V14.0.0>

**Release 15**

ARIB ARIB STD-T120-25.446 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/25/A25446-f00.pdf>

ATIS ATIS.3GPP.25.446V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.25.446V1500 15.0.0 01.07.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V15.0.0.doc>

ETSI ETSI TS 125 446 15.0.0 12.07.2018 <https://www.etsi.org/deliver/etsi_ts/125400_125499/125446/15.00.00_60/ts_125446v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 25.446-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/fyxrMFWT6Zzn3SB>

TTA TTAT.3G-25.446V15.0.0 15.0.0 10.06.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-25.446V15.0.0>

**Release 16**

ARIB ARIB STD-T120-25.446 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/25/A25446-g00.pdf>

ATIS ATIS.3GPP.25.446V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.25.446V1600 16.0.0 01.07.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2025.446%20V16.0.0.doc>

ETSI ETSI TS 125 446 16.0.0 19.08.2020 <https://www.etsi.org/deliver/etsi_ts/125400_125499/125446/16.00.00_60/ts_125446v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 25.446-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/wdQ5S98NJbJa88D>

TTA TTAT.3G-25.446V16.0.0 16.0.0 10.06.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-25.446V16.0.0>

### 2.1.5 Radio-frequency aspects

#### 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).

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ARIB ARIB STD-T120-36.101 10.28.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36101-as0.pdf>

ATIS ATIS.3GPP.36.101V10280 10.28.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.101V10280 10.28.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V10.28.0>

ETSI ETSI TS 136 101 10.28.0 10.01.2019 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/10.28.00_60/ts_136101v102800p.pdf>

TSDSI TSDSI STD T1.3GPP 36.101-10.28.0 V1.1.0 10.28.0 30.08.2021 <https://members.tsdsi.in/index.php/s/nTL8kxF2ATx5foj>

TTA TTAT.3G-36.101V10.28.0 10.28.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V10.28.0>

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ARIB ARIB STD-T120-36.101 11.25.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36101-bp0.pdf>

ATIS ATIS.3GPP.36.101V11250 11.25.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.101V11250 11.25.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V11.25.0>

ETSI ETSI TS 136 101 11.25.0 10.01.2019 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/11.25.00_60/ts_136101v112500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.101-11.25.0 V1.1.0 11.25.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Hn8zkAcqtztAiTi>

TTA TTAT.3G-36.101V11.25.0 11.25.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V11.25.0>

**Release 12**

ARIB ARIB STD-T120-36.101 12.25.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36101-cp0.pdf>

ATIS ATIS.3GPP.36.101V12250 12.25.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.101V12250 12.25.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V12.25.0>

ETSI ETSI TS 136 101 12.25.0 13.08.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/12.25.00_60/ts_136101v122500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.101-12.25.0 V1.1.0 12.25.0 30.08.2021 <https://members.tsdsi.in/index.php/s/g6W7oYfXa7W8wie>

TTA TTAT.3G-36.101V12.25.0 12.25.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V12.25.0>

**Release 13**

ARIB ARIB STD-T120-36.101 13.19.1 23.04.2021 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_10/2_T120/ARIB-STD-T120/Rel13/36/A36101-dj1.pdf>

ATIS ATIS.3GPP.36.101V13191 13.19.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.101V13191 13.19.1 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V13.19.1>

ETSI ETSI TS 136 101 13.19.1 22.09.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/13.19.01_60/ts_136101v131901p.pdf>

TSDSI TSDSI STD T1.3GPP 36.101-13.19.1 V1.1.0 13.19.1 30.08.2021 <https://members.tsdsi.in/index.php/s/DfMCob9FCgJmYtX>

TTA TTAT.3G-36.101V13.19.1 13.19.1 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V13.19.1>

**Release 14**

ARIB ARIB STD-T120-36.101 14.15.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36101-ef0.pdf>

ATIS ATIS.3GPP.36.101V14150 14.15.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.101V14150 14.15.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V14.15.0>

ETSI ETSI TS 136 101 14.15.0 13.08.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/14.15.00_60/ts_136101v141500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.101-14.15.0 V1.1.0 14.15.0 30.08.2021 <https://members.tsdsi.in/index.php/s/caxa3KT34wSEEYP>

TTA TTAT.3G-36.101V14.15.0 14.15.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V14.15.0>

**Release 15**

ARIB ARIB STD-T120-36.101 15.11.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36101-fb0.pdf>

ATIS ATIS.3GPP.36.101V15110 15.11.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.101V15110 15.11.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V15.11.0>

ETSI ETSI TS 136 101 15.11.0 13.08.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/15.11.00_60/ts_136101v151100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.101-15.11.0 V1.0.0 15.11.0 30.08.2021 <https://members.tsdsi.in/index.php/s/LJQr8EfMsEaWjp6>

TTA TTAT.3G-36.101V15.11.0 15.11.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V15.11.0>

**Release 16**

ARIB ARIB STD-T120-36.101 16.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36101-g60.pdf>

ATIS ATIS.3GPP.36.101V1660 16.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.101V1660 16.6.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.101%20V16.6.0>

ETSI ETSI TS 136 101 16.6.0 13.08.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136101/16.06.00_60/ts_136101v160600p.pdf>

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TTA TTAT.3G-36.101V16.6.0 16.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.101V16.6.0>

#### 2.1.5.2 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).

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#### 2.1.5.3 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.

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#### 2.1.5.4 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.

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ARIB ARIB STD-T120-36.111 11.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36111-b40.pdf>

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TTA TTAT.3G-36.111V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.111V16.0.0>

#### 2.1.5.5 TS 36.112

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

This document establishes the conformance requirements for E-UTRAN Location Measurement Units (LMU) operating in the FDD or TDD mode.

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ATIS ATIS.3GPP.36.112V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.112V1110 11.1.0 01.12.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.112%20V11.1.0.doc>

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TTA TTAT.3G-36.112V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.112V11.1.0>

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ATIS ATIS.3GPP.36.112V1220 12.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.112V12.2.0 12.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.112V12.2.0>

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ATIS ATIS.3GPP.36.112V1301 13.0.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TSDSI TSDSI STD T1.3GPP 36.112-13.0.1 V1.0.0 13.0.1 30.08.2021 <https://members.tsdsi.in/index.php/s/WbLZReD9TjbBiyx>

TTA TTAT.3G-36.112V13.0.1 13.0.1 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.112V13.0.1>

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ARIB ARIB STD-T120-36.112 14.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36112-e00.pdf>

ATIS ATIS.3GPP.36.112V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.112V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.112V14.0.0>

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ATIS ATIS.3GPP.36.112V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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TSDSI TSDSI STD T1.3GPP 36.112-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/S23CAqyCATfbm6w>

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ARIB ARIB STD-T120-36.112 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36112-g00.pdf>

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TSDSI TSDSI STD T1.3GPP 36.112-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/mAKMSQbaNN4YJnW>

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#### 2.1.5.6 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.

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ARIB ARIB STD-T120-36.113 10.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36113-a50.pdf>

ATIS ATIS.3GPP.36.113V1050 10.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.113V1050 10.5.0 01.06.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.113%20V10.5.0.doc>

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ATIS ATIS.3GPP.36.113V1130 11.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ARIB ARIB STD-T120-36.113 14.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36113-e20.pdf>

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TTA TTAT.3G-36.113V14.2.0 14.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.113V14.2.0>

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ATIS ATIS.3GPP.36.113V1540 15.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.113V1540 15.4.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.113%20V15.4.0.doc>

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ARIB ARIB STD-T120-36.113 16.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36113-g20.pdf>

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CCSA CCSA.36.113V1620 16.2.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.113%20V16.2.0.doc>

ETSI ETSI TS 136 113 16.2.0 21.09.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136113/16.02.00_60/ts_136113v160200p.pdf>

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#### 2.1.5.7 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.

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ATIS ATIS.3GPP.36.116V1170 11.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.116V1170 11.7.0 01.01.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.116%20V11.7.0.doc>

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TTA TTAT.3G-36.116V11.7.0 11.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.116V11.7.0>

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ATIS ATIS.3GPP.36.116V1240 12.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.116V1240 12.4.0 01.01.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.116%20V12.4.0.doc>

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TTA TTAT.3G-36.116V13.0.1 13.0.1 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.116V13.0.1>

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ATIS ATIS.3GPP.36.116V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.116V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.116V14.0.0>

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ATIS ATIS.3GPP.36.116V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.116V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.116%20V15.0.0.doc>

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ATIS ATIS.3GPP.36.116V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.116V1600 16.0.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.116%20V16.0.0.doc>

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TTA TTAT.3G-36.116V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.116V16.0.0>

#### 2.1.5.8 TS 36.117

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

This document specifies the Radio Frequency (RF) test methods and conformance requirements for E-UTRA Relay. These have been derived from, and are consistent with the E-UTRA Relay specifications defined in TS 36.116.

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CCSA CCSA.36.117V1140 11.4.0 01.01.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.117%20V11.4.0.doc>

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ATIS ATIS.3GPP.36.117V1230 12.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.117V1230 12.3.0 01.01.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.117%20V12.3.0.doc>

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**Release 13**

ATIS ATIS.3GPP.36.117V1301 13.0.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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CCSA CCSA.36.117V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.117%20V14.0.0.doc>

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ATIS ATIS.3GPP.36.117V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.117V1500 15.0.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.117%20V15.0.0.doc>

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**Release 16**

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#### 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.

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ARIB ARIB STD-T120-36.124 10.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36124-a30.pdf>

ATIS ATIS.3GPP.36.124V1030 10.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 14**

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**Release 16**

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#### 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.

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ARIB ARIB STD-T120-36.133 10.22.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36133-am0.pdf>

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ARIB ARIB STD-T120-36.133 13.19.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36133-dj0.pdf>

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**Release 14**

ARIB ARIB STD-T120-36.133 14.15.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36133-ef0.pdf>

ATIS ATIS.3GPP.36.133V14150 14.15.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 15**

ARIB ARIB STD-T120-36.133 15.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36133-fa0.pdf>

ATIS ATIS.3GPP.36.133V15100 15.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.133V15100 15.10.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.133%20V15.10.0>

ETSI ETSI TS 136 133 15.10.0 23.09.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136133/15.10.00_60/ts_136133v151000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.133-15.10.0 V1.0.0 15.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/73KWQfo3JEp35pk>

TTA TTAT.3G-36.133V15.10.0 15.10.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.133V15.10.0>

**Release 16**

ARIB ARIB STD-T120-36.133 16.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36133-g60.pdf>

ATIS ATIS.3GPP.36.133V1660 16.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.133V1660 16.6.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.133%20V16.6.0>

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TSDSI TSDSI STD T1.3GPP 36.133-16.6.0 V1.0.0 16.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/mYWgqpjd2eefBqj>

TTA TTAT.3G-36.133V16.6.0 16.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.133V16.6.0>

#### 2.1.5.11 TS 36.141

Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for E-UTRA Base Stations (BS) operating either in the FDD mode (used in paired bands) or the TDD mode (used in unpaired bands). These have been derived from and are consistent with the E-UTRA Base Station (BS) specifications defined in TS 36 104.

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ARIB ARIB STD-T120-36.141 10.14.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36141-ae0.pdf>

ATIS ATIS.3GPP.36.141V10140 10.14.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.141V10140 10.14.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.141%20V10.14.0.doc>

ETSI ETSI TS 136 141 10.14.0 20.07.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136141/10.14.00_60/ts_136141v101400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.141-10.14.0 V1.1.0 10.14.0 30.08.2021 <https://members.tsdsi.in/index.php/s/WdKGgA5TZJ5S2iQ>

TTA TTAT.3G-36.141V10.14.0 10.14.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.141V10.14.0>

**Release 11**

ARIB ARIB STD-T120-36.141 11.17.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36141-bh0.pdf>

ATIS ATIS.3GPP.36.141V11170 11.17.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.141V11170 11.17.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.141%20V11.17.0.doc>

ETSI ETSI TS 136 141 11.17.0 21.07.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136141/11.17.00_60/ts_136141v111700p.pdf>

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TTA TTAT.3G-36.141V11.17.0 11.17.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.141V11.17.0>

**Release 12**

ARIB ARIB STD-T120-36.141 12.14.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36141-ce0.pdf>

ATIS ATIS.3GPP.36.141V12140 12.14.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.141V12140 12.14.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.141%20V12.14.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.141-12.14.0 V1.1.0 12.14.0 30.08.2021 <https://members.tsdsi.in/index.php/s/jFXtz6iGL4Y6AiX>

TTA TTAT.3G-36.141V12.14.0 12.14.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.141V12.14.0>

**Release 13**

ARIB ARIB STD-T120-36.141 13.14.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36141-de0.pdf>

ATIS ATIS.3GPP.36.141V13140 13.14.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.141V13140 13.14.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.141%20V13.14.0.docx>

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TTA TTAT.3G-36.141V13.14.0 13.14.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.141V13.14.0>

**Release 14**

ARIB ARIB STD-T120-36.141 14.11.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36141-eb0.pdf>

ATIS ATIS.3GPP.36.141V14110 14.11.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.141V14.11.0 14.11.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.141V14.11.0>

**Release 15**

ARIB ARIB STD-T120-36.141 15.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36141-f90.pdf>

ATIS ATIS.3GPP.36.141V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.141V1590 15.9.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.141%20V15.9.0.docx>

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TTA TTAT.3G-36.141V15.9.0 15.9.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.141V15.9.0>

**Release 16**

ARIB ARIB STD-T120-36.141 16.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36141-g60.pdf>

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#### 2.1.5.12 TS 36.143

Evolved Universal Terrestrial Radio Access (E-UTRA); FDD repeater conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for E-UTRA FDD Repeater. These have been derived from, and are consistent with the E-UTRA FDD repeater specifications defined in TS 36.106.

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**Release 10**

ATIS ATIS.3GPP.36.143V1070 10.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.143V1070 10.7.0 01.03.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.143%20V10.7.0.doc>

ETSI ETSI TS 136 143 10.7.0 26.04.2013 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136143/10.07.00_60/ts_136143v100700p.pdf>

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**Release 11**

ATIS ATIS.3GPP.36.143V1120 11.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.143V1120 11.2.0 01.03.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.143%20V11.2.0.doc>

ETSI ETSI TS 136 143 11.2.0 26.04.2013 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136143/11.02.00_60/ts_136143v110200p.pdf>

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TTA TTAT.3G-36.143V11.2.0 11.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.143V11.2.0>

**Release 12**

ATIS ATIS.3GPP.36.143V1210 12.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.143V1210 12.1.0 01.12.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.143%20V12.1.0.doc>

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TTA TTAT.3G-36.143V12.1.0 12.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.143V12.1.0>

**Release 13**

ATIS ATIS.3GPP.36.143V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.143V13.0.0 13.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.143V13.0.0>

**Release 14**

ATIS ATIS.3GPP.36.143V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.143V1400 14.0.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.143%20V14.0.0.doc>

ETSI ETSI TS 136 143 14.0.0 13.04.2017 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136143/14.00.00_60/ts_136143v140000p.pdf>

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TTA TTAT.3G-36.143V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.143V14.0.0>

**Release 15**

ATIS ATIS.3GPP.36.143V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.143V1500 15.0.0 01.12.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.143%20V15.0.0.doc>

ETSI ETSI TS 136 143 15.0.0 18.09.2018 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136143/15.00.00_60/ts_136143v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.143-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/nJPkftY6cffFEcQ>

TTA TTAT.3G-36.143V15.0.0 15.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.143V15.0.0>

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ATIS ATIS.3GPP.36.143V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.143V1600 16.0.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.143%20V16.0.0.doc>

ETSI ETSI TS 136 143 16.0.0 21.07.2020 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136143/16.00.00_60/ts_136143v160000p.pdf>

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TTA TTAT.3G-36.143V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.143V16.0.0>

#### 2.1.5.13 TS 36.171

Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for Support of Assisted Global Navigation Satellite System (A‑GNSS)

This document establishes the minimum performance requirements for A-GNSS (including A-GPS) for FDD or TDD mode of E-UTRA for the User Equipment (UE).

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ARIB ARIB STD-T120-36.171 10.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36171-a20.pdf>

ATIS ATIS.3GPP.36.171V1020 10.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.171V1020 10.2.0 01.07.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.171%20V10.2.0.doc>

ETSI ETSI TS 136 171 10.2.0 19.07.2013 <https://www.etsi.org/deliver/etsi_ts/136100_136199/136171/10.02.00_60/ts_136171v100200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.171-10.2.0 V1.0.0 10.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/e7iTr777XQaiXRA>

TTA TTAT.3G-36.171V10.2.0 10.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.171V10.2.0>

**Release 11**

ARIB ARIB STD-T120-36.171 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36171-b10.pdf>

ATIS ATIS.3GPP.36.171V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-36.171V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.171V11.1.0>

**Release 12**

ARIB ARIB STD-T120-36.171 12.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36171-c10.pdf>

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**Release 13**

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#### 2.1.5.14 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.

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ARIB ARIB STD-T120-36.307 10.24.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36307-ao0.pdf>

ATIS ATIS.3GPP.36.307V10240 10.24.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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#### 2.1.5.15 TS 37.104

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.

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**Release 13**

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ATIS ATIS.3GPP.37.104V1460 14.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.104V1460 14.6.0 01.12.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.104%20V14.6.0.doc>

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**Release 15**

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CCSA CCSA.37.104V15110 15.11.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.104%20V15.11.0.docx>

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**Release 16**

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#### 2.1.5.16 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.

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CCSA CCSA.37.105V13100 13.10.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.105%20V13.10.0.docx>

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TSDSI TSDSI STD T1.3GPP 37.105-14.6.0 V1.1.0 14.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/gn5SYf9CdacbH77>

TTA TTAT.3G-37.105V14.6.0 14.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.105V14.6.0>

**Release 15**

ATIS ATIS.3GPP.37.105V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.105V1590 15.9.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.105%20V15.9.0.docx>

ETSI ETSI TS 137 105 15.9.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137105/15.09.00_60/ts_137105v150900p.pdf>

TSDSI TSDSI STD T1.3GPP 37.105-15.9.0 V1.0.0 15.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/QWgbdftz98gzfRQ>

TTA TTAT.3G-37.105V15.9.0 15.9.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.105V15.9.0>

**Release 16**

ATIS ATIS.3GPP.37.105V1640 16.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.105V1640 16.4.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.105%20V16.4.0.docx>

ETSI ETSI TS 137 105 16.4.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137105/16.04.00_60/ts_137105v160400p.pdf>

TSDSI TSDSI STD T1.3GPP 37.105-16.4.0 V1.0.0 16.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/fQ9mNDXTbYaztXX>

TTA TTAT.3G-37.105V16.4.0 16.4.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.105V16.4.0>

#### 2.1.5.17 TS 37.113

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.

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**Release 10**

ATIS ATIS.3GPP.37.113V1050 10.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.113V1050 10.5.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V10.5.0.doc>

ETSI ETSI TS 137 113 10.5.0 02.08.2016 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137113/10.05.00_60/ts_137113v100500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.113-10.5.0 V1.0.0 10.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/aPi68oj3YGREKPn>

TTA TTAT.3G-37.113V10.5.0 10.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.113V10.5.0>

**Release 11**

ATIS ATIS.3GPP.37.113V1140 11.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.113V1140 11.4.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V11.4.0.doc>

ETSI ETSI TS 137 113 11.4.0 02.08.2016 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137113/11.04.00_60/ts_137113v110400p.pdf>

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TTA TTAT.3G-37.113V11.4.0 11.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.113V11.4.0>

**Release 12**

ATIS ATIS.3GPP.37.113V1240 12.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.113V1240 12.4.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V12.4.0.doc>

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TTA TTAT.3G-37.113V12.4.0 12.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.113V12.4.0>

**Release 13**

ATIS ATIS.3GPP.37.113V1340 13.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.113V1340 13.4.0 01.06.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V13.4.0.doc>

ETSI ETSI TS 137 113 13.4.0 24.08.2017 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137113/13.04.00_60/ts_137113v130400p.pdf>

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TTA TTAT.3G-37.113V13.4.0 13.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.113V13.4.0>

**Release 14**

ATIS ATIS.3GPP.37.113V1420 14.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.113V1420 14.2.0 01.06.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V14.2.0.doc>

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**Release 15**

ATIS ATIS.3GPP.37.113V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.113V1590 15.9.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V15.9.0.docx>

ETSI ETSI TS 137 113 15.9.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137113/15.09.00_60/ts_137113v150900p.pdf>

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**Release 16**

ATIS ATIS.3GPP.37.113V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.113V1600 16.0.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.113%20V16.0.0.docx>

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TTA TTAT.3G-37.113V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.113V16.0.0>

#### 2.1.5.18 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.

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**Release 13**

ATIS ATIS.3GPP.37.114V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.114V1330 13.3.0 01.06.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.114%20V13.3.0.doc>

ETSI ETSI TS 137 114 13.3.0 24.08.2017 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137114/13.03.00_60/ts_137114v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.114-13.3.0 V1.0.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Dt8NzxLgapDc925>

TTA TTAT.3G-37.114V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.114V13.3.0>

**Release 14**

ATIS ATIS.3GPP.37.114V1410 14.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.114V1410 14.1.0 01.06.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.114%20V14.1.0.doc>

ETSI ETSI TS 137 114 14.1.0 24.08.2017 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137114/14.01.00_60/ts_137114v140100p.pdf>

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TTA TTAT.3G-37.114V14.1.0 14.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.114V14.1.0>

**Release 15**

ATIS ATIS.3GPP.37.114V1590 15.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.114V1590 15.9.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.114%20V15.9.0.docx>

ETSI ETSI TS 137 114 15.9.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137114/15.09.00_60/ts_137114v150900p.pdf>

TSDSI TSDSI STD T1.3GPP 37.114-15.9.0 V1.0.0 15.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/fb7dpSMGiM7f82H>

TTA TTAT.3G-37.114V15.9.0 15.9.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.114V15.9.0>

**Release 16**

ATIS ATIS.3GPP.37.114V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.114V1600 16.0.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.114%20V16.0.0.docx>

ETSI ETSI TS 137 114 16.0.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137114/16.00.00_60/ts_137114v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.114-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cgijs55wt4LKsgs>

TTA TTAT.3G-37.114V16.0.0 16.0.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.114V16.0.0>

#### 2.1.5.19 TS 37.141

E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for E-UTRA, UTRA and GSM/EDGE Multi‑Standard Radio (MSR) Base Station (BS).

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ATIS ATIS.3GPP.37.141V10140 10.14.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.141V10140 10.14.0 01.12.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V10.14.0.doc>

ETSI ETSI TS 137 141 10.14.0 04.02.2015 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/10.14.00_60/ts_137141v101400p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-10.14.0 V1.0.0 10.14.0 30.08.2021 <https://members.tsdsi.in/index.php/s/gCXGFe4FcJFWdYX>

TTA TTAT.3G-37.141V10.14.0 10.14.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V10.14.0>

**Release 11**

ATIS ATIS.3GPP.37.141V11150 11.15.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.141V11150 11.15.0 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V11.15.0.doc>

ETSI ETSI TS 137 141 11.15.0 14.10.2016 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/11.15.00_60/ts_137141v111500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-11.15.0 V1.0.0 11.15.0 30.08.2021 <https://members.tsdsi.in/index.php/s/d3H4keXAm7T6z9j>

TTA TTAT.3G-37.141V11.15.0 11.15.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V11.15.0>

**Release 12**

ATIS ATIS.3GPP.37.141V12130 12.13.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.141V12130 12.13.0 01.06.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V12.13.0.doc>

ETSI ETSI TS 137 141 12.13.0 28.08.2017 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/12.13.00_60/ts_137141v121300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-12.13.0 V1.0.0 12.13.0 30.08.2021 <https://members.tsdsi.in/index.php/s/e8tKBiYkH8EZsLy>

TTA TTAT.3G-37.141V12.13.0 12.13.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V12.13.0>

**Release 13**

ATIS ATIS.3GPP.37.141V13130 13.13.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.141V13130 13.13.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V13.13.0.doc>

ETSI ETSI TS 137 141 13.13.0 21.01.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/13.13.00_60/ts_137141v131300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-13.13.0 V1.1.0 13.13.0 30.08.2021 <https://members.tsdsi.in/index.php/s/6Awz46N9aCRPzPD>

TTA TTAT.3G-37.141V13.13.0 13.13.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V13.13.0>

**Release 14**

ATIS ATIS.3GPP.37.141V14110 14.11.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.141V14110 14.11.0 01.12.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V14.11.0.doc>

ETSI ETSI TS 137 141 14.11.0 21.01.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/14.11.00_60/ts_137141v141100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-14.11.0 V1.1.0 14.11.0 30.08.2021 <https://members.tsdsi.in/index.php/s/sL3Q2k52MSpTRaN>

TTA TTAT.3G-37.141V14.11.0 14.11.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V14.11.0>

**Release 15**

ATIS ATIS.3GPP.37.141V15110 15.11.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.141V15110 15.11.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V15.11.0.docx>

ETSI ETSI TS 137 141 15.11.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/15.11.00_60/ts_137141v151100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-15.11.0 V1.0.0 15.11.0 30.08.2021 <https://members.tsdsi.in/index.php/s/jJwBbKtbcaeiJoT>

TTA TTAT.3G-37.141V15.11.0 15.11.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V15.11.0>

**Release 16**

ATIS ATIS.3GPP.37.141V1660 16.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.141V1660 16.6.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.141%20V16.6.0.docx>

ETSI ETSI TS 137 141 16.6.0 15.09.2020 <https://www.etsi.org/deliver/etsi_ts/137100_137199/137141/16.06.00_60/ts_137141v160600p.pdf>

TSDSI TSDSI STD T1.3GPP 37.141-16.6.0 V1.0.0 16.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/NT8T2a7Qjd6Hr4A>

TTA TTAT.3G-37.141V16.6.0 16.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.141V16.6.0>

#### 2.1.5.20 TS 37.144

User Equipment (UE) and Mobile Station (MS) GSM, UTRA and E-UTRA over the air performance requirements

This document establishes over the air antenna minimum requirements for user equipment (UE) and mobile station (MS).

Handheld UE requirements are defined for roaming bands for the speech position (beside the head and beside the head and hand) and hand phantom browsing mode position. Laptop mounted equipment requirements are defined for roaming bands for the data transfer position (laptop ground plane phantom). Laptop embedded equipment requirements are defined for roaming bands for the data transfer position (free space).

All bands are potential roaming bands, and the requirements for roaming bands shall therefore be fulfilled for all bands supported by a UE/MS.

Requirements for operating bands are dependent on how the network has been built and are thus operator specific and cannot be specified here. Recommended performance values for operating bands (Annex B) are however included in this specification for information. It should be recognised that the ability to meet the recommended performance values depends on the number of frequency bands supported by the UE/MS.

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ATIS ATIS.3GPP.37.144V1300 13.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.144V1300 13.0.0 01.06.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.144%20V13.0.0.doc>

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ATIS ATIS.3GPP.37.144V1470 14.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ATIS ATIS.3GPP.37.144V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.144V1500 15.0.0 01.06.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.144%20V15.0.0.docx>

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**Release 16**

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#### 2.1.5.21 TS 37.145-1

Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: conducted conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for Single RAT E-UTRA, UTRA and Multi-Standard Radio (MSR) UTRA and EUTRA Active Antenna System (AAS) Base Station (BS). These have been derived from, and are consistent with the E-UTRA, UTRA AAS BS specification defined in 3GPP TS 25.104. The technical specification is in two parts: part 1 (this document) covers conducted requirements and part 2 covers radiated requirements.

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ATIS ATIS.3GPP.37.145-1V13100 13.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.145-1V13100 13.10.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.145-1%20V13.10.0.docx>

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**Release 14**

ATIS ATIS.3GPP.37.145-1V1480 14.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.145-1V1480 14.8.0 01.09.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.145-1%20V14.8.0.docx>

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TTA TTAT.3G-37.145-1V14.8.0 14.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.145-1V14.8.0>

**Release 15**

ATIS ATIS.3GPP.37.145-1V1570 15.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.145-1V1570 15.7.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.145-1%20V15.7.0.docx>

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ATIS ATIS.3GPP.37.145-1V1640 16.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.145-1V1640 16.4.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.145-1%20V16.4.0.docx>

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#### 2.1.5.22 TS 37.145-2

Active Antenna System (AAS) Base Station (BS) conformance testing; Part 2: radiated conformance testing

This document specifies the Radio Frequency (RF) test methods and conformance requirements for Single RAT E-UTRA, UTRA and Multi-Standard Radio (MSR) UTRA and EUTRA Active Antenna System (AAS) Base Station (BS). These have been derived from, and are consistent with the E-UTRA, UTRA AAS BS specification defined in 3GPP TS 25.104. The technical specification is in 2 parts, part 1 covers conducted requirements and part 2 (this document) covers radiated requirements.

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ATIS ATIS.3GPP.37.145-2V13120 13.12.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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ATIS ATIS.3GPP.37.145-2V1570 15.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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ATIS ATIS.3GPP.37.145-2V1640 16.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

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#### 2.1.5.23 TS 37.171

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA); User Equipment (UE) performance requirements for RAT‑Independent Positioning Enhancements

This document establishes the minimum performance requirements for RAT-Independent Positioning Enhancements (e.g. MBS positioning technology) for FDD or TDD mode of UTRA and E-UTRA for the User Equipment (UE).

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ARIB ARIB STD-T120-37.171 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37171-d10.pdf>

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ATIS ATIS.3GPP.37.171V1530 15.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

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ARIB ARIB STD-T120-37.171 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37171-g00.pdf>

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#### 2.1.5.24 TS 37.320

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 O&M specifications.

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ARIB ARIB STD-T120-37.320 10.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37320-a40.pdf>

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ARIB ARIB STD-T120-37.320 11.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37320-b40.pdf>

ATIS ATIS.3GPP.37.320V1140 11.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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TTA TTAT.3G-37.320V11.4.0 11.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.320V11.4.0>

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### 2.1.6 User Equipment (UE) conformance testing

#### 2.1.6.1 TS 36.508

Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing

This document contains definitions of reference conditions and test signals, default parameters, reference radio bearer configurations used in radio bearer interoperability testing, common radio bearer configurations for other test purposes, common requirements for test equipment and generic set-up procedures for use in conformance tests for the 3rd Generation E-UTRAN User Equipment (UE).

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#### 2.1.6.2 TS 36.509

Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Special conformance testing functions for User Equipment (UE)

This document defines for User Equipment (UE) in E-UTRA FDD or TDD mode those special functions and their activation/deactivation methods that are required in UE for conformance testing purposes.

This document also describes the operation of these special functions for UEs supporting E-UTRA FDD or TDD mode, when operating in UTRA FDD and TDD mode, in GSM/GPRS mode, and in CDMA2000 mode.

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#### 2.1.6.3 TS 36.521-1

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Conformance testing

This document specifies the measurement procedures for the conformance test of the user equipment (UE) that contain transmitting characteristics, receiving characteristics and performance requirements as part of the 3G Long Term Evolution (3G LTE). 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 mobiles 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.

For example, only Release 8 and later UE declared to support LTE shall be tested for this functionality. In the event that for some tests different conditions apply for different releases, this is indicated within the text of the test itself.

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**Release 10**

ARIB ARIB STD-T120-36.521-1 10.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36521-1-a60.pdf>

ATIS ATIS.3GPP.36.521-1V1060 10.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 11**

ARIB ARIB STD-T120-36.521-1 11.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36521-1-b40.pdf>

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**Release 12**

ARIB ARIB STD-T120-36.521-1 12.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36521-1-c90.pdf>

ATIS ATIS.3GPP.36.521-1V1290 12.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 13**

ARIB ARIB STD-T120-36.521-1 13.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36521-1-d40.pdf>

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TTA TTAT.3G-36.521-1V13.4.0 13.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-1V13.4.0>

**Release 14**

ARIB ARIB STD-T120-36.521-1 14.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36521-1-e60.pdf>

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**Release 15**

ARIB ARIB STD-T120-36.521-1 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36521-1-f60.pdf>

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**Release 16**

ARIB ARIB STD-T120-36.521-1 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36521-1-g50.pdf>

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#### 2.1.6.4 TS 36.521-2

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 2: Implementation Conformance Statement (ICS)

This document provides the ICS proforma for 3G Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE), in compliance with the relevant requirements, and in accordance with the relevant guidance given in ISO/IEC 9646-1 and ISO/IEC 9646-7.

This document specifies the recommended applicability statement for the test cases included in 3GPP TS 36.521-1 and 3GPP TS 36.521-3. These applicability statements are based on the features implemented in the UE.

Special conformance testing functions can be found in 3GPP TS 36.509 and the common test environments are included in 3GPP TS 36.508.

This document is valid for UE implemented according to 3GPP releases starting from Release 8 up to the Release indicated on the cover page of this document.

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ARIB ARIB STD-T120-36.521-2 10.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36521-2-a60.pdf>

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**Release 11**

ARIB ARIB STD-T120-36.521-2 11.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36521-2-b40.pdf>

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**Release 12**

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**Release 13**

ARIB ARIB STD-T120-36.521-2 13.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36521-2-d40.pdf>

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**Release 14**

ARIB ARIB STD-T120-36.521-2 14.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36521-2-e60.pdf>

ATIS ATIS.3GPP.36.521-2V1460 14.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

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**Release 15**

ARIB ARIB STD-T120-36.521-2 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36521-2-f60.pdf>

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CCSA CCSA.36.521-2V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-2%20V15.6.0.doc>

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**Release 16**

ARIB ARIB STD-T120-36.521-2 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36521-2-g50.pdf>

ATIS ATIS.3GPP.36.521-2V1650 16.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

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TSDSI TSDSI STD T1.3GPP 36.521-2-16.5.0 V1.0.0 16.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/2yZ8tPiFGgsi48p>

TTA TTAT.3G-36.521-2V16.5.0 16.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-2V16.5.0>

#### 2.1.6.5 TS 36.521-3

Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 3: Radio Resource Management (RRM) conformance testing

This document specifies the measurement procedures for the conformance test of the user equipment (UE) that contain requirements for support of RRM (Radio Resource Management) as part of the 3G Long Term Evolution (3G LTE).

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

For example, only Release 8 and later UE declared to support LTE shall be tested for this functionality. In the event that for some tests different conditions apply for different releases, this is indicated within the text of the test itself.

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ARIB ARIB STD-T120-36.521-3 10.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36521-3-a50.pdf>

ATIS ATIS.3GPP.36.521-3V1050 10.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.521-3V1050 10.5.0 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V10.5.0.doc>

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TSDSI TSDSI STD T1.3GPP 36.521-3-10.5.0 V1.0.0 10.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Gb5gAqHqYqz46wk>

TTA TTAT.3G-36.521-3V10.5.0 10.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V10.5.0>

**Release 11**

ARIB ARIB STD-T120-36.521-3 11.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36521-3-b40.pdf>

ATIS ATIS.3GPP.36.521-3V1140 11.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.521-3V1140 11.4.0 01.03.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V11.4.0.doc>

ETSI ETSI TS 136 521-3 11.4.0 03.04.2014 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652103/11.04.00_60/ts_13652103v110400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.521-3-11.4.0 V1.0.0 11.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/gHkLjASN22wKkjA>

TTA TTAT.3G-36.521-3V11.4.0 11.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V11.4.0>

**Release 12**

ARIB ARIB STD-T120-36.521-3 12.12.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36521-3-cc0.pdf>

ATIS ATIS.3GPP.36.521-3V12120 12.12.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.521-3V12120 12.12.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V12.12.0.doc>

ETSI ETSI TS 136 521-3 12.12.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652103/12.12.00_60/ts_13652103v121200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.521-3-12.12.0 V1.0.0 12.12.0 30.08.2021 <https://members.tsdsi.in/index.php/s/8CTJ7Rt426prYJj>

TTA TTAT.3G-36.521-3V12.12.0 12.12.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V12.12.0>

**Release 13**

ARIB ARIB STD-T120-36.521-3 13.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36521-3-d20.pdf>

ATIS ATIS.3GPP.36.521-3V1320 13.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.521-3V1320 13.2.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V13.2.0.doc>

ETSI ETSI TS 136 521-3 13.2.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652103/13.02.00_60/ts_13652103v130200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.521-3-13.2.0 V1.0.0 13.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/sr6HcXZoFjG8Txn>

TTA TTAT.3G-36.521-3V13.2.0 13.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V13.2.0>

**Release 14**

ARIB ARIB STD-T120-36.521-3 14.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36521-3-e50.pdf>

ATIS ATIS.3GPP.36.521-3V1450 14.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.521-3V1450 14.5.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V14.5.0.doc>

ETSI ETSI TS 136 521-3 14.5.0 28.09.2018 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652103/14.05.00_60/ts_13652103v140500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.521-3-14.5.0 V1.1.0 14.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/qA3mARPGWENcaRC>

TTA TTAT.3G-36.521-3V14.5.0 14.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V14.5.0>

**Release 15**

ARIB ARIB STD-T120-36.521-3 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36521-3-f60.pdf>

ATIS ATIS.3GPP.36.521-3V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.521-3V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V15.6.0.doc>

ETSI ETSI TS 136 521-3 15.6.0 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652103/15.06.00_60/ts_13652103v150600p.pdf>

TSDSI TSDSI STD T1.3GPP 36.521-3-15.6.0 V1.0.0 15.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/wKe3kzjayBoPRRy>

TTA TTAT.3G-36.521-3V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V15.6.0>

**Release 16**

ARIB ARIB STD-T120-36.521-3 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36521-3-g50.pdf>

ATIS ATIS.3GPP.36.521-3V1650 16.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.521-3V1650 16.5.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.521-3%20V16.5.0>

ETSI ETSI TS 136 521-3 16.5.0 30.09.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652103/16.05.00_60/ts_13652103v160500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.521-3-16.5.0 V1.0.0 16.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Ls49MacEF3ZFFPQ>

TTA TTAT.3G-36.521-3V16.5.0 16.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.521-3V16.5.0>

#### 2.1.6.6 TS 36.523-1

Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 1: Protocol conformance specification

This document specifies the protocol conformance testing for the 3rd Generation E-UTRAN User Equipment (UE).

This is the first part of a multi-part test specification. The following information can be found in this part:

– the overall test structure;

– the test configurations;

– the conformance requirement and reference to the core specifications;

– the test purposes; and

– a brief description of the test procedure, the specific test requirements and short message exchange table.

The following information relevant to testing could be found in accompanying specifications:

– the default setting of the test parameters (TS 36.508);

– the applicability of each test case (TS 36.523-2).

A detailed description of the expected sequence of messages could be found in the 3rd part of this test specification.

The Implementation Conformance Statement (ICS) pro-forma could be found in the 2nd part of this document.

This document is valid for UE implemented according to 3GPP releases starting from Release 8 up to the Release indicated on the cover page of this document.

**SDO** **Document No.** **Version** **Issued date** **Location**

**Release 10**

ARIB ARIB STD-T120-36.523-1 10.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36523-1-a40.pdf>

ATIS ATIS.3GPP.36.523-1V1040 10.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-1V1040 10.4.0 01.06.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V10.4.0.doc>

ETSI ETSI TS 136 523-1 10.4.0 29.07.2015 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/10.04.00_60/ts_13652301v100400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-10.4.0 V1.0.0 10.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/rAGmFQ32df6Sios>

TTA TTAT.3G-36.523-1V10.4.0 10.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V10.4.0>

**Release 11**

ARIB ARIB STD-T120-36.523-1 11.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36523-1-b70.pdf>

ATIS ATIS.3GPP.36.523-1V1170 11.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-1V1170 11.7.0 01.06.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V11.7.0.doc>

ETSI ETSI TS 136 523-1 11.7.0 29.07.2015 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/11.07.00_60/ts_13652301v110700p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-11.7.0 V1.0.0 11.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/G3j7x2mRtmD8d4A>

TTA TTAT.3G-36.523-1V11.7.0 11.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V11.7.0>

**Release 12**

ARIB ARIB STD-T120-36.523-1 12.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36523-1-ca0.pdf>

ATIS ATIS.3GPP.36.523-1V12100 12.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-1V12100 12.10.0 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V12.10.0.doc>

ETSI ETSI TS 136 523-1 12.10.0 07.11.2016 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/12.10.00_60/ts_13652301v121000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-12.10.0 V1.0.0 12.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/AyaiyNt2Bapn8g9>

TTA TTAT.3G-36.523-1V12.10.0 12.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V12.10.0>

**Release 13**

ARIB ARIB STD-T120-36.523-1 13.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36523-1-d50.pdf>

ATIS ATIS.3GPP.36.523-1V1350 13.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-1V1350 13.5.0 01.09.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V13.5.0.doc>

ETSI ETSI TS 136 523-1 13.5.0 19.10.2017 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/13.05.00_60/ts_13652301v130500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-13.5.0 V1.0.0 13.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/CmwenDgP47D8EEH>

TTA TTAT.3G-36.523-1V13.5.0 13.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V13.5.0>

**Release 14**

ARIB ARIB STD-T120-36.523-1 14.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36523-1-e40.pdf>

ATIS ATIS.3GPP.36.523-1V1440 14.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-1V1440 14.4.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V14.4.0.doc>

ETSI ETSI TS 136 523-1 14.4.0 11.04.2018 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/14.04.00_60/ts_13652301v140400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-14.4.0 V1.1.0 14.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Qkss2J7CbpfQSTD>

TTA TTAT.3G-36.523-1V14.4.0 14.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V14.4.0>

**Release 15**

ARIB ARIB STD-T120-36.523-1 15.6.1 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36523-1-f61.pdf>

ATIS ATIS.3GPP.36.523-1V1561 15.6.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.523-1V1561 15.6.1 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V15.6.1.doc>

ETSI ETSI TS 136 523-1 15.6.1 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/15.06.01_60/ts_13652301v150601p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-15.6.1 V1.0.0 15.6.1 30.08.2021 <https://members.tsdsi.in/index.php/s/mRQkSGFt3ybgyZH>

TTA TTAT.3G-36.523-1V15.6.1 15.6.1 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V15.6.1>

**Release 16**

ARIB ARIB STD-T120-36.523-1 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36523-1-g50.pdf>

ATIS ATIS.3GPP.36.523-1V1650 16.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.523-1V1650 16.5.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-1%20V16.5.0>

ETSI ETSI TS 136 523-1 16.5.0 01.10.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652301/16.05.00_60/ts_13652301v160500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-1-16.5.0 V1.0.0 16.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/ZDWmJwE57ksJQLt>

TTA TTAT.3G-36.523-1V16.5.0 16.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-1V16.5.0>

#### 2.1.6.7 TS 36.523-2

Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 2: Implementation Conformance Statement (ICS) proforma specification

This document provides the ICS proforma for 3rd Generation User Equipment (UE), in compliance with the relevant EPS (E-UTRA/EPC) requirements, and in accordance with the relevant guidance given in ISO/IEC 9646-1 and ISO/IEC 9646-7.

This document also specifies a recommended applicability statement for the test cases included in TS 36.523-1. These applicability statements are based on the features implemented in the UE.

Special conformance testing functions can be found in TS 36.509 and the common test environments are included in 3GPP TS 36.508.

This document is valid for UE complying with EPS (E-UTRA/EPC) and implemented according to 3GPP releases starting from Release 8 up to the Release indicated on the cover page of this document.

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**Release 10**

ARIB ARIB STD-T120-36.523-2 10.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36523-2-a30.pdf>

ATIS ATIS.3GPP.36.523-2V1030 10.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-2V1030 10.3.0 01.12.2012 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V10.3.0.doc>

ETSI ETSI TS 136 523-2 10.3.0 14.01.2013 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/10.03.00_60/ts_13652302v100300p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-10.3.0 V1.0.0 10.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/JxpmArYtYaa2B6c>

TTA TTAT.3G-36.523-2V10.3.0 10.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V10.3.0>

**Release 11**

ARIB ARIB STD-T120-36.523-2 11.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36523-2-b60.pdf>

ATIS ATIS.3GPP.36.523-2V1160 11.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-2V1160 11.6.0 01.03.2014 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V11.6.0.doc>

ETSI ETSI TS 136 523-2 11.6.0 03.04.2014 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/11.06.00_60/ts_13652302v110600p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-11.6.0 V1.0.0 11.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/qzSaq2aXyY97oC5>

TTA TTAT.3G-36.523-2V11.6.0 11.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V11.6.0>

**Release 12**

ARIB ARIB STD-T120-36.523-2 12.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36523-2-ca0.pdf>

ATIS ATIS.3GPP.36.523-2V12100 12.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-2V12100 12.10.0 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V12.10.0.doc>

ETSI ETSI TS 136 523-2 12.10.0 02.11.2016 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/12.10.00_60/ts_13652302v121000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-12.10.0 V1.0.0 12.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/WsW3QAR2Y733AXo>

TTA TTAT.3G-36.523-2V12.10.0 12.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V12.10.0>

**Release 13**

ARIB ARIB STD-T120-36.523-2 13.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36523-2-d40.pdf>

ATIS ATIS.3GPP.36.523-2V1340 13.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-2V1340 13.4.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V13.4.0.doc>

ETSI ETSI TS 136 523-2 13.4.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/13.04.00_60/ts_13652302v130400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-13.4.0 V1.0.0 13.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/6L3nAco3DDK8MFt>

TTA TTAT.3G-36.523-2V13.4.0 13.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V13.4.0>

**Release 14**

ARIB ARIB STD-T120-36.523-2 14.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36523-2-e50.pdf>

ATIS ATIS.3GPP.36.523-2V1450 14.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-2V1450 14.5.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V14.5.0.doc>

ETSI ETSI TS 136 523-2 14.5.0 10.04.2018 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/14.05.00_60/ts_13652302v140500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-14.5.0 V1.1.0 14.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/dFXFqgkNBjLNL3j>

TTA TTAT.3G-36.523-2V14.5.0 14.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V14.5.0>

**Release 15**

ARIB ARIB STD-T120-36.523-2 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36523-2-f60.pdf>

ATIS ATIS.3GPP.36.523-2V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.523-2V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V15.6.0.doc>

ETSI ETSI TS 136 523-2 15.6.0 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/15.06.00_60/ts_13652302v150600p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-15.6.0 V1.0.0 15.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/GbaqoB43CbqS9d9>

TTA TTAT.3G-36.523-2V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V15.6.0>

**Release 16**

ARIB ARIB STD-T120-36.523-2 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36523-2-g50.pdf>

ATIS ATIS.3GPP.36.523-2V1650 16.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.523-2V1650 16.5.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-2%20V16.5.0.doc>

ETSI ETSI TS 136 523-2 16.5.0 20.07.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652302/16.05.00_60/ts_13652302v160500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-2-16.5.0 V1.0.0 16.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/AFfNfGSbHr7Epbf>

TTA TTAT.3G-36.523-2V16.5.0 16.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-2V16.5.0>

#### 2.1.6.8 TS 36.523-3

Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 3: Test suites

This 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 this 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). The applicability of the individual test cases is specified in the test ICS proforma specification (3GPP TS 36.523‑2).

This document is valid for UE implemented according to 3GPP Rel-9 upwards.

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**Release 10**

ARIB ARIB STD-T120-36.523-3 10.5.1 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/36/A36523-3-a51.pdf>

ATIS ATIS.3GPP.36.523-3V1051 10.5.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-3V1051 10.5.1 01.10.2013 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523->[3%20V10.5.1.doc](http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V10.5.1.doc)

ETSI ETSI TS 136 523-3 10.5.1 15.10.2013 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/10.05.01_60/ts_13652303v100501p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-10.5.1 V1.0.0 10.5.1 30.08.2021 <https://members.tsdsi.in/index.php/s/nitCdPtqsgnrSGr>

TTA TTAT.3G-36.523-3V10.5.1 10.5.1 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V10.5.1>

**Release 11**

ARIB ARIB STD-T120-36.523-3 11.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/36/A36523-3-b70.pdf>

ATIS ATIS.3GPP.36.523-3V1170 11.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-3V1170 11.7.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V11.7.0.doc>

ETSI ETSI TS 136 523-3 11.7.0 18.01.2016 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/11.07.00_60/ts_13652303v110700p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-11.7.0 V1.0.0 11.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/j2X2fmHAftiifbW>

TTA TTAT.3G-36.523-3V11.7.0 11.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V11.7.0>

**Release 12**

ARIB ARIB STD-T120-36.523-3 12.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/36/A36523-3-c80.pdf>

ATIS ATIS.3GPP.36.523-3V1280 12.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-3V1280 12.8.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V12.8.0.doc>

ETSI ETSI TS 136 523-3 12.8.0 11.04.2017 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/12.08.00_60/ts_13652303v120800p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-12.8.0 V1.0.0 12.8.0 30.08.2021 <https://members.tsdsi.in/index.php/s/aoyMf6eEcrg6yJA>

TTA TTAT.3G-36.523-3V12.8.0 12.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V12.8.0>

**Release 13**

ARIB ARIB STD-T120-36.523-3 13.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36523-3-d40.pdf>

ATIS ATIS.3GPP.36.523-3V1340 13.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-3V1340 13.4.0 01.09.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V13.4.0.doc>

ETSI ETSI TS 136 523-3 13.4.0 11.10.2017 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/13.04.00_60/ts_13652303v130400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-13.4.0 V1.0.0 13.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/RWBcYQQY8wRz2bH>

TTA TTAT.3G-36.523-3V13.4.0 13.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V13.4.0>

**Release 14**

ARIB ARIB STD-T120-36.523-3 14.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36523-3-e50.pdf>

ATIS ATIS.3GPP.36.523-3V1450 14.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.523-3V1450 14.5.0 01.09.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V14.5.0.doc>

ETSI ETSI TS 136 523-3 14.5.0 16.10.2018 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/14.05.00_60/ts_13652303v140500p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-14.5.0 V1.1.0 14.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/yNEtd4DHDYo7X6Y>

TTA TTAT.3G-36.523-3V14.5.0 14.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V14.5.0>

**Release 15**

ARIB ARIB STD-T120-36.523-3 15.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/36/A36523-3-f40.pdf>

ATIS ATIS.3GPP.36.523-3V1540 15.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.523-3V1540 15.4.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V15.4.0.doc>

ETSI ETSI TS 136 523-3 15.4.0 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/15.04.00_60/ts_13652303v150400p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-15.4.0 V1.0.0 15.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/XDJGtZmTYEeYrbb>

TTA TTAT.3G-36.523-3V15.4.0 15.4.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V15.4.0>

**Release 16**

ARIB ARIB STD-T120-36.523-3 16.5.1 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/36/A36523-3-g51.pdf>

ATIS ATIS.3GPP.36.523-3V1651 16.5.1 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.36.523-3V1651 16.5.1 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.523-3%20V16.5.1>

ETSI ETSI TS 136 523-3 16.5.1 25.09.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13652303/16.05.01_60/ts_13652303v160501p.pdf>

TSDSI TSDSI STD T1.3GPP 36.523-3-16.5.1 V1.0.0 16.5.1 30.08.2021 <https://members.tsdsi.in/index.php/s/foG5BHD8DmJ59bk>

TTA TTAT.3G-36.523-3V16.5.1 16.5.1 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.523-3V16.5.1>

#### 2.1.6.9 TS 36.579-1

Mission Critical (MC) services over LTE; Part 1: Common test environment

This document defines the common test environment required for testing Client and Server implementations for compliance to the Mission Critical Services over LTE protocol requirements defined by 3GPP.

It contains definitions of reference conditions and test signals, default messages and other parameters, generic procedures, and common requirements for test equipment with the goal for facilitating testing in general and test procedures specification in particular. Various parts of its content are referred to from other parts of the Mission Critical Services over LTE protocol conformance testing specification e.g. TS 36.579-2 and TS 36.579-3.

This document does not define the common test environment required for testing the implementation of the underlying LTE protocols, i.e. the LTE bearers used for transport of the Mission Critical Services signalling and media. This is defined in TS 36.508 and referred to from this document whenever needed.

In regard to default messages or other information elements contents, this document refers to content defined in requirements specifications specified by 3GPP or other organisations. In the case of Session Initiation Protocol (SIP) and Session Description Protocol (SDP) information elements this document refers to those specified in TS 34.229-1 and explicitly specifies only those relevant for the purposes of the Mission Critical Services over LTE protocol conformance testing.

In this release of the specification only Mission Critical Push To Talk (MCPTT) Services are considered. Future releases may include other Mission Critical Services.

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**Release 13**

ARIB ARIB STD-T120-36.579-1 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36579-1-d30.pdf>

ATIS ATIS.3GPP.36.579-1V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-1V1330 13.3.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-1%20V13.3.0.doc>

ETSI ETSI TS 136 579-1 13.3.0 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657901/13.03.00_60/ts_13657901v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-1-13.3.0 V1.1.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/mAwDMFjRARgeEqj>

TTA TTAT.3G-36.579-1V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-1V13.3.0>

**Release 14**

ARIB ARIB STD-T120-36.579-1 14.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36579-1-e70.pdf>

ATIS ATIS.3GPP.36.579-1V1470 14.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-1V1470 14.7.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-1%20V14.7.0.doc>

ETSI ETSI TS 136 579-1 14.7.0 23.07.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657901/14.07.00_60/ts_13657901v140700p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-1-14.7.0 V1.1.0 14.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/aAom2rZ7y5gATR5>

TTA TTAT.3G-36.579-1V14.7.0 14.7.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-1V14.7.0>

**Release 15**

ARIB ARIB STD-T120-36.579-1 15.0.0 23.04.2021 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_20/2_T120/ARIB-STD-T120/Rel15/36/A36579-1-f00.pdf>

ATIS ATIS.3GPP.36.579-1V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.36.579-1V1500 15.0.0 01.12.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-1%20V15.0.0.doc>

ETSI ETSI TS 136 579-1 15.0.0 25.01.2021 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657901/15.00.00_60/ts_13657901v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-1-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/fc3z9oZNPW98Nmd>

TTA TTAT.3G-36.579-1V15.1.0 15.1.0 10.06.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-1V15.1.0>

#### 2.1.6.10 TS 36.579-2

Mission Critical (MC) services over LTE; Part 2: Mission Critical Push To Talk (MCPTT) User Equipment (UE) Protocol conformance specification

This document specifies the protocol conformance testing for testing a MCPTT Client for compliance to the Mission Critical Push To Talk (MCPTT) over LTE protocol requirements defined by 3GPP.

In particular this document contains:

– the overall test structure;

– the test configurations;

– the conformance requirement and reference to the core specifications;

– the test purposes; and

– a brief description of the test procedure, the specific test requirements and short message exchange table.

This document is valid for MCPTT Clients implemented according to 3GPP releases starting from Release 13 up to the Release indicated on the cover page of this document.

The following information relevant to testing specified in this document could be found in accompanying specifications:

– default setting of the test parameters TS 36.579-1;

– Implementation Conformance Statement (ICS) TS 36.579-4 and Implementation eXtra Information for Testing (IXIT) TS 36.579-5;

– the applicability of each test case TS 36.579-4.

The test cases are expected to be executed through the 3GPP radio interface. This document does not specify the protocol conformance testing for the EPS (LTE) bearers, which carry the MCPTT data sent or received by the MCPTT Client and which are required to be supported by the UE in which the MCPTT Client is installed. This is defined in TS 36.523-1.

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ARIB ARIB STD-T120-36.579-2 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36579-2-d30.pdf>

ATIS ATIS.3GPP.36.579-2V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-2V1330 13.3.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-2%20V13.3.0.doc>

ETSI ETSI TS 136 579-2 13.3.0 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657902/13.03.00_60/ts_13657902v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-2-13.3.0 V1.1.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/KTtP8diTHxksCwz>

TTA TTAT.3G-36.579-2V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-2V13.3.0>

**Release 14**

ARIB ARIB STD-T120-36.579-2 14.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36579-2-e70.pdf>

ATIS ATIS.3GPP.36.579-2V1470 14.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-2V1470 14.7.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-2%20V14.7.0.doc>

ETSI ETSI TS 136 579-2 14.7.0 20.07.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657902/14.07.00_60/ts_13657902v140700p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-2-14.7.0 V1.1.0 14.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/m3Xim2k898cjbPC>

TTA TTAT.3G-36.579-2V14.7.0 14.7.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-2V14.7.0>

#### 2.1.6.11 TS 36.579-3

Mission Critical (MC) services over LTE; Part 3: Mission Critical Push To Talk (MCPTT) Server Application conformance specification

This document specifies the protocol conformance testing for testing a MCPTT Server for compliance to the Mission Critical Push To Talk (MCPTT) over LTE protocol requirements defined by 3GPP. This document addresses only MCPTT Server-Client, and MCPTT Server-Server communication scenarios. It does not cover, e.g. MCPTT Server-EPS, MCPTT Server-SIP Core, etc., scenarios which involve interfaces which implementation may widely vary.

In particular this specification contains:

– the overall test structure;

– the test configurations;

– the conformance requirement and reference to the core specifications;

– the test purposes; and

– a brief description of the test procedure, the specific test requirements and short message exchange table.

This document is valid for MCPTT Servers implemented according to 3GPP releases starting from Release 13 up to the Release indicated on the cover page of this document.

The following information relevant to testing specified in this document could be found in accompanying specifications:

– default setting of the test parameters TS 36.579-1;

– Implementation Conformance Statement (ICS) TS 36.579-4 and Implementation eXtra Information for Testing (IXIT) TS 36.579-5;

– the applicability of each test case TS 36.579-4.

This document does not specify the protocol conformance testing for the EPS (LTE) bearers which carry the MCPTT data sent or received by the MCPTT Server. The specification of such testing is out of the scope of RAN5.

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ARIB ARIB STD-T120-36.579-3 13.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36579-3-d10.pdf>

ATIS ATIS.3GPP.36.579-3V1310 13.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-3V1310 13.1.0 01.03.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-3%20V13.1.0.doc>

ETSI ETSI TS 136 579-3 13.1.0 13.05.2019 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657903/13.01.00_60/ts_13657903v130100p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-3-13.1.0 V1.1.0 13.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/YEFt3n93aBzgP2j>

TTA TTAT.3G-36.579-3V13.1.0 13.1.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-3V13.1.0>

#### 2.1.6.12 TS 36.579-4

Mission Critical (MC) services over LTE; Part 4: Test Applicability and Implementation Conformance Statement (ICS) proforma specification

This document provides the Implementation Conformance Statement (ICS) proforma for testing Client or Server implementations for compliance to the Mission Critical Services over LTE protocol requirements defined by 3GPP, and in accordance with the relevant guidance given in ISO/IEC 9646-1 and ISO/IEC 9646-7.

This document specifies the recommended applicability statement for the test cases included in 3GPP TS 36.579-2 and 3GPP TS 36.579-3. These applicability statements are based on the features implemented in the Client or the Server respectively.

This document is valid for Mission Critical Services Servers and Clients implemented according to 3GPP releases starting from Release 13 up to the Release indicated on the cover page of this document.

This document does not specify applicability or ICS for protocol conformance testing for the EPS (LTE) bearers which carry the Mission Critical Services data sent or received by the Client and/or the Server. These are defined in TS 36.523-2.

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**Release 13**

ARIB ARIB STD-T120-36.579-4 13.2.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36579-4-d20.pdf>

ATIS ATIS.3GPP.36.579-4V1320 13.2.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-4V1320 13.2.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-4%20V13.2.0.doc>

ETSI ETSI TS 136 579-4 13.2.0 02.04.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657904/13.02.00_60/ts_13657904v130200p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-4-13.2.0 V1.1.0 13.2.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cqnfqkszysboFn7>

TTA TTAT.3G-36.579-4V13.2.0 13.2.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-4V13.2.0>

**Release 14**

ARIB ARIB STD-T120-36.579-4 14.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/36/A36579-4-e30.pdf>

ATIS ATIS.3GPP.36.579-4V1430 14.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-4V1430 14.3.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-4%20V14.3.0.doc>

ETSI ETSI TS 136 579-4 14.3.0 23.07.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657904/14.03.00_60/ts_13657904v140300p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-4-14.3.0 V1.1.0 14.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/rYjiCpoJz9LoZ2D>

TTA TTAT.3G-36.579-4V14.3.0 14.3.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-4V14.3.0>

#### 2.1.6.13 TS 36.579-5

Mission Critical (MC) services over LTE; Part 5: Abstract test suite (ATS)

This document specifies the protocol and signalling conformance testing in TTCN-3 for the Mission Critical services over LTE signalling and protocol requirements defined by 3GPP.

The following TTCN test specification and design considerations can be found in this 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 Implementation eXtra Information for Testing (IXIT) proforma;

– the test suites.

The Abstract Test Suites designed in the document are based on the test cases specified in 3GPP TS 36.579-2. The test cases specified in 3GPP TS 36.579-3 are out of scope of this document.

The applicability of the individual test cases is specified in the test ICS proforma specification in 3GPP TS 36.579-4). Where appropriate the Abstract Test Suites belonging to this specification may refer to other Abstract Test Suites, e.g. 3GPP TS 36.523-3 for test requirements related to the EPS (LTE) bearers which carry the Mission Critical services data.

This document is valid for TTCN development for Mission Critical services clients' conformance tests according to 3GPP Releases starting from Release 13 up to the Release indicated on the cover page of this document.

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**Release 13**

ARIB ARIB STD-T120-36.579-5 13.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/36/A36579-5-d60.pdf>

ATIS ATIS.3GPP.36.579-5V1360 13.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-5V1360 13.6.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-5%20V13.6.0.doc>

ETSI ETSI TS 136 579-5 13.6.0 30.07.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657905/13.06.00_60/ts_13657905v130600p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-5-13.6.0 V1.1.0 13.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/aAoDxQ52fmt697d>

TTA TTAT.3G-36.579-5V13.6.0 13.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-5V13.6.0>

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ARIB ARIB STD-T120-36.579-5 14.0.0 23.04.2021 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_10/2_T120/ARIB-STD-T120/Rel14/36/A36579-5-e00.pdf>

ATIS ATIS.3GPP.36.579-5V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-5V1400 14.0.0 01.09.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-5%20V14.0.0.doc>

ETSI ETSI TS 136 579-5 14.0.0 10.11.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657905/14.00.00_60/ts_13657905v140000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-5-14.0.0 V1.0.0 14.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/kxsmYtG3bnEoCqX>

TTA TTAT.3G-36.579-5V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-5V14.0.0>

#### 2.1.6.14 TS 36.579-6

Mission Critical (MC) services over LTE; Part 6: Mission Critical Video (MCVideo) User Equipment (UE) Protocol conformance specification

This document specifies the protocol conformance testing for testing a MCVideo Client for compliance to the Mission Critical Video (MCVideo) over LTE protocol requirements defined by 3GPP.

In particular this document contains:

– the overall test structure;

– the test configurations;

– the conformance requirement and reference to the core specifications;

– the test purposes; and

– a brief description of the test procedure, the specific test requirements and short message exchange table.

This document is valid for MCVideo Clients implemented according to 3GPP releases starting from Release 13 up to the Release indicated on the cover page of this document.

The following information relevant to testing specified in this document could be found in accompanying specifications:

– default setting of the test parameters TS 36.579-1;

– Implementation Conformance Statement (ICS) TS 36.579-4 and Implementation eXtra Information for Testing (IXIT) TS 36.579-5;

– the applicability of each test case TS 36.579-4.

The test cases are expected to be executed through the 3GPP radio interface. This document does not specify the protocol conformance testing for the EPS (LTE) bearers which carry the MCVideo data sent or received by the MCVideo Client and which are required to be supported by the UE in which the MCVideo Client is installed. This is defined in TS 36.523-1.

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ARIB ARIB STD-T120-36.579-6 14.0.0 23.04.2021 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_10/2_T120/ARIB-STD-T120/Rel14/36/A36579-6-e00.pdf>

ATIS ATIS.3GPP.36.579-6V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-6V1400 14.0.0 01.09.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-6%20V14.0.0.doc>

ETSI ETSI TS 136 579-6 14.0.0 23.11.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657906/14.00.00_60/ts_13657906v140000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-6-14.0.0 V1.0.0 14.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/GHXwEfPm9a23skd>

TTA TTAT.3G-36.579-6V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-6V14.0.0>

#### 2.1.6.15 TS 36.579-7

Mission Critical (MC) services over LTE; Part 7: Mission Critical Data (MCData) User Equipment (UE) Protocol conformance specification

This document specifies the protocol conformance testing for testing a MCData Client for compliance to the Mission Critical Data (MCData) over LTE protocol requirements defined by 3GPP.

In particular this document contains:

– the overall test structure;

– the test configurations;

– the conformance requirement and reference to the core specifications;

– the test purposes; and

– a brief description of the test procedure, the specific test requirements and short message exchange table.

This document is valid for MCData Clients implemented according to 3GPP releases starting from Release 13 up to the Release indicated on the cover page of this document.

The following information relevant to testing specified in this document could be found in accompanying specifications:

– default setting of the test parameters TS 36.579-1;

– Implementation Conformance Statement (ICS) TS 36.579-4 and Implementation eXtra Information for Testing (IXIT) TS 36.579-5;

– the applicability of each test case TS 36.579-4.

The test cases are expected to be executed through the 3GPP radio interface. This document does not specify the protocol conformance testing for the EPS (LTE) bearers which carry the MCData data sent or received by the MCData Client and which are required to be supported by the UE in which the MCData Client is installed. This is defined in TS 36.523-1.

According to 3GPP drafting rules, the references clause shall list only documents that are explicitly mentioned in the deliverable. This reference is not used within the document and thus shall be removed from references clause.

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**Release 14**

ARIB ARIB STD-T120-36.579-7 14.0.0 23.04.2021 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_10/2_T120/ARIB-STD-T120/Rel14/36/A36579-7-e00.pdf>

ATIS ATIS.3GPP.36.579-7V1400 14.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.36.579-7V1400 14.0.0 01.09.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2036.579-7%20V14.0.0.doc>

ETSI ETSI TS 136 579-7 14.0.0 23.11.2020 <https://www.etsi.org/deliver/etsi_ts/136500_136599/13657907/14.00.00_60/ts_13657907v140000p.pdf>

TSDSI TSDSI STD T1.3GPP 36.579-7-14.0.0 V1.0.0 14.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/fimQETYSTmjD5qe>

TTA TTAT.3G-36.579-7V14.0.0 14.0.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-36.579-7V14.0.0>

#### 2.1.6.16 TS 37.544

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA); User Equipment (UE) Over The Air (OTA) performance; Conformance testing

This document describes the test procedure for the radiated performances measurements of the user equipment (UE).

The handheld UE measurement procedures explained in this document are defined for roaming bands for the speech mode position (beside the head and beside the head and hand) and hand phantom browsing mode position. Laptop mounted equipment (LME) measurement procedures are defined for roaming bands for the data mode transfer position (laptop ground plane phantom). Laptop embedded equipment (LEE) measurement procedures are defined for roaming bands for the data mode transfer position (free space).

The browsing mode position explained in this document applies when the UE is held in hand, but not pressed against ear (such as web browsing and navigation).

The data mode transfer position (free space) explained in this document applies when the UE is used away from the user’s head. Free space measurements are applicable to devices used in the data mode transfer position that consist of the laptop mounted equipment (LME) plug-in UEs and laptop embedded equipment (LEE) UEs.

All bands are potential roaming bands, and the requirements for roaming bands shall therefore be fulfilled for all bands supported by a UE.

Radiated performance of multiple-antenna receivers for handheld UE is defined for roaming bands in free space configuration.

Recommended performance values for operating bands (Annex I) are however included in this specification for information. It should be recognised that the ability to meet the recommended performance values depends on the number of frequency bands supported by the UE.

The radiated radio tests considered here are:

1 The measurement of the Total Radiated Power (TRP)

2 The measurement of the Total Radiated Sensitivity (TRS)

3 The measurement of Total Radiated Multi-antenna Sensitivity (TRMS).

The test procedure described in this document measures the performance of the transmitter and the receiver, including the antenna and also the effects of the user.

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ARIB ARIB STD-T120-37.544 14.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37544-e70.pdf>

ATIS ATIS.3GPP.37.544V1470 14.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.544V1470 14.7.0 01.12.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.544%20V14.7.0.doc>

ETSI ETSI TS 137 544 14.7.0 21.12.2018 <https://www.etsi.org/deliver/etsi_ts/137500_137599/137544/14.07.00_60/ts_137544v140700p.pdf>

TSDSI TSDSI STD T1.3GPP 37.544-14.7.0 V1.1.0 14.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/6cc8e3xytwnE8Hs>

TTA TTAT.3G-37.544V14.7.0 14.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.544V14.7.0>

**Release 15**

ARIB ARIB STD-T120-37.544 15.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37544-f00.pdf>

ATIS ATIS.3GPP.37.544V1500 15.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.544V1500 15.0.0 01.06.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.544%20V15.0.0.doc>

ETSI ETSI TS 137 544 15.0.0 17.09.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/137544/15.00.00_60/ts_137544v150000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.544-15.0.0 V1.0.0 15.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/RKw3SewHzjybmrZ>

TTA TTAT.3G-37.544V15.0.0 15.0.0 10.06.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.544V15.0.0>

**Release 16**

ARIB ARIB STD-T120-37.544 16.0.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37544-g00.pdf>

ATIS ATIS.3GPP.37.544V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.544V1600 16.0.0 01.06.2019 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.544%20V16.0.0.doc>

ETSI ETSI TS 137 544 16.0.0 17.09.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/137544/16.00.00_60/ts_137544v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.544-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Pox7wSgmQwzkoAw>

TTA TTAT.3G-37.544V16.0.0 16.0.0 10.06.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.544V16.0.0>

#### 2.1.6.17 TS 37.571-1

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 1: Conformance test specification

This document specifies the procedures for the conformance test of the measurement requirements for FDD mode of UTRA and FDD or TDD mode of E-UTRA for the User Equipment (UE) that supports one or more of the defined positioning methods. These positioning methods are for UTRA: Assisted Global Positioning System (A-GPS), Assisted Global Navigation Satellite Systems (A-GNSS) and for E-UTRA: Assisted Global Navigation Satellite System (A-GNSS), Observed Time Difference of Arrival (OTDOA), Enhanced Cell ID (ECID).

Tests are only applicable to those mobiles that are intended to support the appropriate functionality. To indicate the circumstances in which tests apply, this is noted in the “Test applicability” part of the test.

The Implementation Conformance Statement (ICS) pro-forma could be found in the 3rd part of this document.

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**Release 10**

ARIB ARIB STD-T120-37.571-1 10.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37571-1-a80.pdf>

ATIS ATIS.3GPP.37.571-1V1080 10.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-1V1080 10.8.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V10.8.0.doc>

ETSI ETSI TS 137 571-1 10.8.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/10.08.00_60/ts_13757101v100800p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-10.8.0 V1.0.0 10.8.0 30.08.2021 <https://members.tsdsi.in/index.php/s/66PirScocYmJySf>

TTA TTAT.3G-37.571-1V10.8.0 10.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V10.8.0>

**Release 11**

ARIB ARIB STD-T120-37.571-1 11.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37571-1-b30.pdf>

ATIS ATIS.3GPP.37.571-1V1130 11.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-1V1130 11.3.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V11.3.0.doc>

ETSI ETSI TS 137 571-1 11.3.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/11.03.00_60/ts_13757101v110300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-11.3.0 V1.0.0 11.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/DEbKBrx9Zq3DSjF>

TTA TTAT.3G-37.571-1V11.3.0 11.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V11.3.0>

**Release 12**

ARIB ARIB STD-T120-37.571-1 12.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/37/A37571-1-c80.pdf>

ATIS ATIS.3GPP.37.571-1V1280 12.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-1V1280 12.8.0 01.09.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V12.8.0.doc>

ETSI ETSI TS 137 571-1 12.8.0 03.11.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/12.08.00_60/ts_13757101v120800p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-12.8.0 V1.0.0 12.8.0 30.08.2021 <https://members.tsdsi.in/index.php/s/59zY8gjMsSnzBji>

TTA TTAT.3G-37.571-1V12.8.0 12.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V12.8.0>

**Release 13**

ARIB ARIB STD-T120-37.571-1 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37571-1-d30.pdf>

ATIS ATIS.3GPP.37.571-1V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-1V1330 13.3.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V13.3.0.doc>

ETSI ETSI TS 137 571-1 13.3.0 10.04.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/13.03.00_60/ts_13757101v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-13.3.0 V1.0.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/EZNXTCE4BDctjeX>

TTA TTAT.3G-37.571-1V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V13.3.0>

**Release 14**

ARIB ARIB STD-T120-37.571-1 14.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37571-1-e50.pdf>

ATIS ATIS.3GPP.37.571-1V1450 14.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-1V1450 14.5.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V14.5.0.doc>

ETSI ETSI TS 137 571-1 14.5.0 10.04.2018 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/14.05.00_60/ts_13757101v140500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-14.5.0 V1.1.0 14.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cL35DJ4S5MXjsB8>

TTA TTAT.3G-37.571-1V14.5.0 14.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V14.5.0>

**Release 15**

ARIB ARIB STD-T120-37.571-1 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37571-1-f60.pdf>

ATIS ATIS.3GPP.37.571-1V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.571-1V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V15.6.0.doc>

ETSI ETSI TS 137 571-1 15.6.0 03.04.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/15.06.00_60/ts_13757101v150600p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-15.6.0 V1.0.0 15.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/oP6HXcHwP4TXQF2>

TTA TTAT.3G-37.571-1V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V15.6.0>

**Release 16**

ARIB ARIB STD-T120-37.571-1 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37571-1-g50.pdf>

ATIS ATIS.3GPP.37.571-1V1650 16.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.571-1V1650 16.5.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-1%20V16.5.0.doc>

ETSI ETSI TS 137 571-1 16.5.0 24.07.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757101/16.05.00_60/ts_13757101v160500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-1-16.5.0 V1.0.0 16.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/fAedDxCEySX6A7n>

TTA TTAT.3G-37.571-1V16.5.0 16.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-1V16.5.0>

#### 2.1.6.18 TS 37.571-2

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 2: Protocol conformance

This document specifies the protocol conformance testing for the 3rd Generation UTRAN and E-UTRAN User Equipment (UE) supporting UE positioning.

This is the second part of a multi-part test specification. The following information can be found in this part:

– the overall protocol conformance test structure;

– the protocol conformance test configurations;

– the conformance requirement and reference to the core specifications;

– the test purposes; and

– a brief description of the test procedure, the specific test requirements and short message exchange table.

The Implementation Conformance Statement (ICS) pro-forma could be found in the 3rd part of this document.

This document is valid for UE supporting UE positioning implemented according to 3GPP releases starting from Release 99 up to the Release indicated on the cover page of this document.

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**Release 10**

ARIB ARIB STD-T120-37.571-2 10.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37571-2-aa0.pdf>

ATIS ATIS.3GPP.37.571-2V10100 10.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-2V10100 10.10.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V10.10.0.doc>

ETSI ETSI TS 137 571-2 10.10.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/10.10.00_60/ts_13757102v101000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-10.10.0 10.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/BQXFsMWW4PaFFYx>

V1.0.0

TTA TTAT.3G-37.571-2V10.10.0 10.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V10.10.0>

**Release 11**

ARIB ARIB STD-T120-37.571-2 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37571-2-b10.pdf>

ATIS ATIS.3GPP.37.571-2V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-2V1110 11.1.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V11.1.0.doc>

ETSI ETSI TS 137 571-2 11.1.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/11.01.00_60/ts_13757102v110100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-11.1.0 V1.0.0 11.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cPPERyXyMtZyTLC>

TTA TTAT.3G-37.571-2V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V11.1.0>

**Release 12**

ARIB ARIB STD-T120-37.571-2 12.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/37/A37571-2-c70.pdf>

ATIS ATIS.3GPP.37.571-2V1270 12.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-2V1270 12.7.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V12.7.0.doc>

ETSI ETSI TS 137 571-2 12.7.0 10.04.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/12.07.00_60/ts_13757102v120700p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-12.7.0 V1.0.0 12.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/cMfFDi9qjJsbZBP>

TTA TTAT.3G-37.571-2V12.7.0 12.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V12.7.0>

**Release 13**

ARIB ARIB STD-T120-37.571-2 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37571-2-d30.pdf>

ATIS ATIS.3GPP.37.571-2V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-2V1330 13.3.0 01.09.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V13.3.0.doc>

ETSI ETSI TS 137 571-2 13.3.0 11.10.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/13.03.00_60/ts_13757102v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-13.3.0 V1.0.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/wkcd34oKwbwfg6s>

TTA TTAT.3G-37.571-2V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V13.3.0>

**Release 14**

ARIB ARIB STD-T120-37.571-2 14.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37571-2-e40.pdf>

ATIS ATIS.3GPP.37.571-2V1440 14.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-2V1440 14.4.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V14.4.0.doc>

ETSI ETSI TS 137 571-2 14.4.0 10.04.2018 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/14.04.00_60/ts_13757102v140400p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-14.4.0 V1.1.0 14.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/DRaQZkyt6Xkowta>

TTA TTAT.3G-37.571-2V14.4.0 14.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V14.4.0>

**Release 15**

ARIB ARIB STD-T120-37.571-2 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37571-2-f60.pdf>

ATIS ATIS.3GPP.37.571-2V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.571-2V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V15.6.0.doc>

ETSI ETSI TS 137 571-2 15.6.0 03.04.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/15.06.00_60/ts_13757102v150600p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-15.6.0 V1.0.0 15.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/PJDJoNBmFfyq2P7>

TTA TTAT.3G-37.571-2V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V15.6.0>

**Release 16**

ARIB ARIB STD-T120-37.571-2 16.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37571-2-g40.pdf>

ATIS ATIS.3GPP.37.571-2V1640 16.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.571-2V1640 16.4.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-2%20V16.4.0.doc>

ETSI ETSI TS 137 571-2 16.4.0 10.11.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757102/16.04.00_60/ts_13757102v160400p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-2-16.4.0 V1.0.0 16.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/AQZ9z97qPjPNanT>

TTA TTAT.3G-37.571-2V16.4.0 16.4.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-2V16.4.0>

#### 2.1.6.19 TS 37.571-3

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 3: Implementation Conformance Statement (ICS)

This document provides the ICS proforma for 3rd Generation UTRAN and E-UTRAN User Equipment (UE) supporting UE positioning, in compliance with the relevant requirements, and in accordance with the relevant guidance given in ISO/IEC 9646-1 and ISO/IEC 9646-7.

This document also specifies a recommended applicability statement for the test cases included in 3GPP TS 37.571-1 and 3GPP TS 37.571-2. These applicability statements are based on the features implemented in the UE.

Special conformance testing functions can be found in 3GPP TS 34.109 for UTRA and 3GPP TS 36.509 for E-UTRA. The common test environments are included in 3GPP TS 34.108 for UTRA and in 3GPP TS 36.508 for E-UTRA.

This document is valid for UE supporting UE positioning implemented according to 3GPP releases starting from Release 99 up to the Release indicated on the cover page of this document.

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ARIB ARIB STD-T120-37.571-3 10.8.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37571-3-a80.pdf>

ATIS ATIS.3GPP.37.571-3V1080 10.8.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-3V1080 10.8.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V10.8.0.doc>

ETSI ETSI TS 137 571-3 10.8.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/10.08.00_60/ts_13757103v100800p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-10.8.0 V1.0.0 10.8.0 30.08.2021 <https://members.tsdsi.in/index.php/s/BdoFYCBQm3WmyNR>

TTA TTAT.3G-37.571-3V10.8.0 10.8.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V10.8.0>

**Release 11**

ARIB ARIB STD-T120-37.571-3 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37571-3-b10.pdf>

ATIS ATIS.3GPP.37.571-3V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-3V1110 11.1.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V11.1.0.doc>

ETSI ETSI TS 137 571-3 11.1.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/11.01.00_60/ts_13757103v110100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-11.1.0 V1.0.0 11.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/L3nHCnJqaJg92cQ>

TTA TTAT.3G-37.571-3V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V11.1.0>

**Release 12**

ARIB ARIB STD-T120-37.571-3 12.9.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/37/A37571-3-c90.pdf>

ATIS ATIS.3GPP.37.571-3V1290 12.9.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-3V1290 12.9.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V12.9.0.doc>

ETSI ETSI TS 137 571-3 12.9.0 10.04.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/12.09.00_60/ts_13757103v120900p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-12.9.0 V1.0.0 12.9.0 30.08.2021 <https://members.tsdsi.in/index.php/s/GFMwWLCBGpRWQCM>

TTA TTAT.3G-37.571-3V12.9.0 12.9.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V12.9.0>

**Release 13**

ARIB ARIB STD-T120-37.571-3 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37571-3-d30.pdf>

ATIS ATIS.3GPP.37.571-3V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-3V1330 13.3.0 01.09.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V13.3.0.doc>

ETSI ETSI TS 137 571-3 13.3.0 11.10.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/13.03.00_60/ts_13757103v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-13.3.0 V1.0.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/JPFYBWgra7wKpYM>

TTA TTAT.3G-37.571-3V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V13.3.0>

**Release 14**

ARIB ARIB STD-T120-37.571-3 14.4.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37571-3-e40.pdf>

ATIS ATIS.3GPP.37.571-3V1440 14.4.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-3V1440 14.4.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V14.4.0.doc>

ETSI ETSI TS 137 571-3 14.4.0 10.04.2018 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/14.04.00_60/ts_13757103v140400p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-14.4.0 V1.1.0 14.4.0 30.08.2021 <https://members.tsdsi.in/index.php/s/4L39X7WwtaqZ5GY>

TTA TTAT.3G-37.571-3V14.4.0 14.4.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V14.4.0>

**Release 15**

ARIB ARIB STD-T120-37.571-3 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37571-3-f60.pdf>

ATIS ATIS.3GPP.37.571-3V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.571-3V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V15.6.0.doc>

ETSI ETSI TS 137 571-3 15.6.0 03.04.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/15.06.00_60/ts_13757103v150600p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-15.6.0 V1.0.0 15.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/Wy9YEkjZkrrrmss>

TTA TTAT.3G-37.571-3V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V15.6.0>

**Release 16**

ARIB ARIB STD-T120-37.571-3 16.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37571-3-g50.pdf>

ATIS ATIS.3GPP.37.571-3V1650 16.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.571-3V1650 16.5.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-3%20V16.5.0.doc>

ETSI ETSI TS 137 571-3 16.5.0 24.07.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757103/16.05.00_60/ts_13757103v160500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-3-16.5.0 V1.0.0 16.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/ZXz3RgWP6BW6L3M>

TTA TTAT.3G-37.571-3V16.5.0 16.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-3V16.5.0>

#### 2.1.6.20 TS 37.571-4

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 4: Test suites

This document specifies the protocol and signalling conformance testing in TTCN for the UE:

– A-GPS at the UTRA Uu interface;

– LTE positioning at the LTE-Uu interface;

– A-GNSS at the UTRA Uu interface.

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

– Test system architecture;

– Test models and ASP definitions;

– Test methods and usage of communication ports definitions;

– Test configurations;

– Design principles and assumptions;

– TTCN styles and conventions;

– Partial PIXIT proforma;

– Test suites in TTCN-2 and TTCN-3;

– The Test Suites designed and implemented in this document are based on the test specifications in prose in 3GPP TS 37.571-2;

– The applicability of the individual test cases is specified in the test ICS proforma specification in 3GPP TS 37.571-3.

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ARIB ARIB STD-T120-37.571-4 10.10.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37571-4-aa0.pdf>

ATIS ATIS.3GPP.37.571-4V10100 10.10.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-4V10100 10.10.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V10.10.0.doc>

ETSI ETSI TS 137 571-4 10.10.0 15.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757104/10.10.00_60/ts_13757104v101000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-4-10.10.0 V1.0.0 10.10.0 30.08.2021 <https://members.tsdsi.in/index.php/s/xojNjmDibeiAPwD>

TTA TTAT.3G-37.571-4V10.10.0 10.10.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V10.10.0>

**Release 11**

ARIB ARIB STD-T120-37.571-4 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37571-4-b10.pdf>

ATIS ATIS.3GPP.37.571-4V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-4V1110 11.1.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V11.1.0.doc>

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TTA TTAT.3G-37.571-4V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V11.1.0>

**Release 12**

ARIB ARIB STD-T120-37.571-4 12.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/37/A37571-4-c60.pdf>

ATIS ATIS.3GPP.37.571-4V1260 12.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-4V1260 12.6.0 01.03.2016 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V12.6.0.doc>

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TSDSI TSDSI STD T1.3GPP 37.571-4-12.6.0 V1.0.0 12.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/4dQct5Nbotmy7Ar>

TTA TTAT.3G-37.571-4V12.6.0 12.6.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V12.6.0>

**Release 13**

ARIB ARIB STD-T120-37.571-4 13.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37571-4-d50.pdf>

ATIS ATIS.3GPP.37.571-4V1350 13.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-4V1350 13.5.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V13.5.0.doc>

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TSDSI TSDSI STD T1.3GPP 37.571-4-13.5.0 V1.1.0 13.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/GdZ9BgBME6P8JZY>

TTA TTAT.3G-37.571-4V13.5.0 13.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V13.5.0>

**Release 14**

ARIB ARIB STD-T120-37.571-4 14.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37571-4-e50.pdf>

ATIS ATIS.3GPP.37.571-4V1450 14.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-4V1450 14.5.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V14.5.0.doc>

ETSI ETSI TS 137 571-4 14.5.0 17.04.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757104/14.05.00_60/ts_13757104v140500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-4-14.5.0 V1.1.0 14.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/73RoEPrKz2jXdTr>

TTA TTAT.3G-37.571-4V14.5.0 14.5.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V14.5.0>

**Release 15**

ARIB ARIB STD-T120-37.571-4 15.5.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37571-4-f50.pdf>

ATIS ATIS.3GPP.37.571-4V1550 15.5.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.571-4V1550 15.5.0 01.06.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V15.5.0.doc>

ETSI ETSI TS 137 571-4 15.5.0 19.01.2021 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757104/15.05.00_60/ts_13757104v150500p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-4-15.5.0 V1.0.0 15.5.0 30.08.2021 <https://members.tsdsi.in/index.php/s/8zZyXoTRfTMLCi2>

TTA TTAT.3G-37.571-4V15.5.0 15.5.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V15.5.0>

**Release 16**

ARIB ARIB STD-T120-37.571-4 16.0.0 23.04.2021 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_20/2_T120/ARIB-STD-T120/Rel16/37/A37571-4-g00.pdf>

ATIS ATIS.3GPP.37.571-4V1600 16.0.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.571-4V1600 16.0.0 01.12.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-4%20V16.0.0.doc>

ETSI ETSI TS 137 571-4 16.0.0 19.01.2021 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757104/16.00.00_60/ts_13757104v160000p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-4-16.0.0 V1.0.0 16.0.0 30.08.2021 <https://members.tsdsi.in/index.php/s/5EWMbZok2Lgf6XY>

TTA TTAT.3G-37.571-4V16.1.0 16.1.0 10.06.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-4V16.1.0>

#### 2.1.6.21 TS 37.571-5

Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 5: Test scenarios and assistance data

This document specifies the test scenarios and assistance data required for the conformance test for FDD or TDD mode of UTRA and E-UTRA for the User Equipment (UE) that supports one or more of the defined positioning methods. For UTRA these are Assisted Global Positioning System (A‑GPS) and Assisted Global Navigation Satellite System (A-GNSS). For E-UTRA these are A-GNSS, Observed Time Difference of Arrival (OTDOA) and Enhanced Cell ID (ECID).

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ARIB ARIB STD-T120-37.571-5 10.11.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel10/37/A37571-5-ab0.pdf>

ATIS ATIS.3GPP.37.571-5V10110 10.11.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-5V10110 10.11.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V10.11.0.doc>

ETSI ETSI TS 137 571-5 10.11.0 18.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/10.11.00_60/ts_13757105v101100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-5-10.11.0 V1.0.0 10.11.0 30.08.2021 <https://members.tsdsi.in/index.php/s/P63DTWqAwdkirrk>

TTA TTAT.3G-37.571-5V10.11.0 10.11.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V10.11.0>

**Release 11**

ARIB ARIB STD-T120-37.571-5 11.1.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel11/37/A37571-5-b10.pdf>

ATIS ATIS.3GPP.37.571-5V1110 11.1.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-5V1110 11.1.0 01.12.2015 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V11.1.0.doc>

ETSI ETSI TS 137 571-5 11.1.0 18.01.2016 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/11.01.00_60/ts_13757105v110100p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-5-11.1.0 V1.0.0 11.1.0 30.08.2021 <https://members.tsdsi.in/index.php/s/rjyPXTKmEDaHsd5>

TTA TTAT.3G-37.571-5V11.1.0 11.1.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V11.1.0>

**Release 12**

ARIB ARIB STD-T120-37.571-5 12.7.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel12/37/A37571-5-c70.pdf>

ATIS ATIS.3GPP.37.571-5V1270 12.7.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-5V1270 12.7.0 01.03.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V12.7.0.doc>

ETSI ETSI TS 137 571-5 12.7.0 10.04.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/12.07.00_60/ts_13757105v120700p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-5-12.7.0 V1.0.0 12.7.0 30.08.2021 <https://members.tsdsi.in/index.php/s/63P4nFFF5zL96Fb>

TTA TTAT.3G-37.571-5V12.7.0 12.7.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V12.7.0>

**Release 13**

ARIB ARIB STD-T120-37.571-5 13.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel13/37/A37571-5-d30.pdf>

ATIS ATIS.3GPP.37.571-5V1330 13.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-5V1330 13.3.0 01.09.2017 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V13.3.0.doc>

ETSI ETSI TS 137 571-5 13.3.0 11.10.2017 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/13.03.00_60/ts_13757105v130300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-5-13.3.0 V1.0.0 13.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/bQCngiMb6gGJTao>

TTA TTAT.3G-37.571-5V13.3.0 13.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V13.3.0>

**Release 14**

ARIB ARIB STD-T120-37.571-5 14.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel14/37/A37571-5-e30.pdf>

ATIS ATIS.3GPP.37.571-5V1430 14.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel99-14/>

CCSA CCSA.37.571-5V1430 14.3.0 01.03.2018 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V14.3.0.doc>

ETSI ETSI TS 137 571-5 14.3.0 10.04.2018 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/14.03.00_60/ts_13757105v140300p.pdf>

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TTA TTAT.3G-37.571-5V14.3.0 14.3.0 30.07.2021 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V14.3.0>

**Release 15**

ARIB ARIB STD-T120-37.571-5 15.6.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel15/37/A37571-5-f60.pdf>

ATIS ATIS.3GPP.37.571-5V1560 15.6.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel15>

CCSA CCSA.37.571-5V1560 15.6.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V15.6.0.doc>

ETSI ETSI TS 137 571-5 15.6.0 03.04.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/15.06.00_60/ts_13757105v150600p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-5-15.6.0 V1.0.0 15.6.0 30.08.2021 <https://members.tsdsi.in/index.php/s/7tzqwKEn4m2oznj>

TTA TTAT.3G-37.571-5V15.6.0 15.6.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V15.6.0>

**Release 16**

ARIB ARIB STD-T120-37.571-5 16.3.0 28.09.2020 <http://www.arib.or.jp/english/html/overview/doc/T120_T23_v2_00/2_T120/ARIB-STD-T120/Rel16/37/A37571-5-g30.pdf>

ATIS ATIS.3GPP.37.571-5V1630 16.3.0 28.06.2021 <http://www.atis.org/3gpp-documents/Rel16>

CCSA CCSA.37.571-5V1630 16.3.0 01.03.2020 <http://www.ccsa.org.cn:9001/portalsFile/downloadOldFile?type=17&oldFileUrl=M.2012.5/CCSA%20TS%2037.571-5%20V16.3.0.doc>

ETSI ETSI TS 137 571-5 16.3.0 16.11.2020 <https://www.etsi.org/deliver/etsi_ts/137500_137599/13757105/16.03.00_60/ts_13757105v160300p.pdf>

TSDSI TSDSI STD T1.3GPP 37.571-5-16.3.0 V1.0.0 16.3.0 30.08.2021 <https://members.tsdsi.in/index.php/s/iqw9HoWSgLkmrEi>

TTA TTAT.3G-37.571-5V16.3.0 16.3.0 11.09.2020 <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAT.3G-37.571-5V16.3.0>

## 2.2 Other specifications

The foundations of the radio aspects of *LTE-Advanced* are based on LTE Release 8 and LTE Release 9 specifications, available on the 3GPP web site.

Information on 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).

Annex 2  
  
Specification of the WirelessMAN-Advanced radio interface technology

Background

IMT-Advanced is a system with global development activity and the IMT-Advanced terrestrial radio interface specifications identified in this Recommendation have been developed by the ITU in collaboration with the GCS[[10]](#footnote-10) Proponents and the Transposing Organizations. It is noted from Document IMT-ADV/24(Rev.3), that:

– The GCS Proponent must be one of the RIT[[11]](#footnote-11)/SRIT[[12]](#footnote-12) Proponents for the relevant technology, and must have legal authority to grant to ITU-R the relevant legal usage rights to the relevant specifications provided within a GCS corresponding to a technology in Recommendation ITU-R M.2012

– A Transposing Organization must have been authorized by the relevant GCS Proponent to produce transposed standards for a particular technology, and must have the relevant legal usage rights.

It is further noted that GCS Proponents and Transposing Organizations must also qualify appropriately under the auspices of Resolution ITU-R 9-5 and the ITU-R “Guidelines for the contribution of material of other organizations to the work of the Study Groups and for inviting other organizations to take part in the study of specific matters (Resolution ITU-R 9-5)”.

The ITU has provided the global and overall framework and requirements, and has developed the Global Core Specification jointly with the GCS Proponent. The detailed standardization has been undertaken within the recognized Transposing Organizations which operate in concert with the GCS Proponent. This Recommendation therefore makes extensive use of references to externally developed specifications.

This approach was considered to be the most appropriate solution to enable completion of this Recommendation within the aggressive schedules set by the ITU and by the needs of administrations, operators and manufacturers.

This Recommendation has therefore been constructed to take full advantage of this method of work and to allow the global standardization time-scales to be maintained. The main body of this Recommendation has been developed by the ITU, with each Annex containing references pointing to the location of the more detailed information.

This Annex 2 contains the detailed information developed by the ITU and “IEEE” (the GCS Proponent) and IEEE, ARIB, TTA, ITRI and WiMAX Forum (the Transposing Organizations). Such use of referencing enables timely completion and update of the high-level elements of this Recommendation, with change control procedures, transposition, and public enquiry procedures being undertaken within the external organization. This information has generally been adopted unchanged, recognizing the need to minimize duplication of work, and the need to facilitate and support an ongoing maintenance and update process.

This general agreement, noting that the detailed information of the radio interface should to a large extent be achieved by reference to the work of external organizations, highlights not only the ITU’s significant role as a catalyst in stimulating, coordinating and facilitating the development of advanced telecommunications technologies, but also its forward-looking and flexible approach to the development of this and other telecommunications standards for the 21st century.

A more detailed understanding of the process for the development of the first release of this Recommendation may be found in Document IMT-ADV/24(Rev.3) whereas details on the process for the development of Revisions of this Recommendation may be found in Document IMT‑ADV/25(Rev.2).

# 1 Overview of the radio interface technology

The WirelessMAN-Advanced radio interface specification is developed by IEEE. A complete end‑to-end system based on WirelessMAN-Advanced is called WiMAX 2, as developed by the WiMAX Forum.

## 1.1 Overview of physical layer

The following sections highlights selected physical layer (PHY) features.

### 1.1.1 Multiple access scheme

*WirelessMAN-Advanced* uses OFDMA as the multiple-access scheme in downlink (DL) and uplink (UL). It further supports both TDD and FDD duplex schemes including H-FDD operation of the mobile stations (MSs) in the FDD networks. The frame structure attributes, and baseband processing are common for both duplex schemes. The OFDMA parameters are summarized in Table 2. *WirelessMAN-Advanced* also supports wider channel bandwidths, up to 160 MHz, with carrier aggregation. In Table 2, TTG and RTG denote transmit/receive and receive/transmit transition gaps, respectively.

TABLE 2

OFDMA parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Nominal channel bandwidth (MHz) | | | 5 | 7 | 8.75 | 10 | 20 |
| Sampling factor | | | 28/25 | 8/7 | 8/7 | 28/25 | 28/25 |
| Sampling frequency (MHz) | | | 5.6 | 8 | 10 | 11.2 | 22.4 |
| FFT size | | | 512 | 1 024 | 1 024 | 1 024 | 2 048 |
| Subcarrier spacing (kHz) | | | 10.94 | 7.81 | 9.76 | 10.94 | 10.94 |
| Useful symbol time Tu (µs) | | | 91.429 | 128 | 102.4 | 91.429 | 91.429 |
| CP Tg = 1/8 Tu | Symbol time Ts (µs) | | 102.857 | 144 | 115.2 | 102.857 | 102.857 |
| FDD | Number of OFDM symbols per 5 ms frame | 48 | 34 | 43 | 48 | 48 |
| Idle time (µs) | 62.857 | 104 | 46.40 | 62.857 | 62.857 |
| TDD | Number of OFDM symbols per 5 ms frame | 47 | 33 | 42 | 47 | 47 |
| TTG + RTG (µs) | 165.714 | 248 | 161.6 | 165.714 | 165.714 |
| CP Tg = 1/16 Tu | Symbol time Ts (µs) | | 97.143 | 136 | 108.8 | 97.143 | 97.143 |
| FDD | Number of OFDM symbols per 5 ms frame | 51 | 36 | 45 | 51 | 51 |
| Idle time (µs) | 45.71 | 104 | 104 | 45.71 | 45.71 |
| TDD | Number of OFDM symbols per 5 ms frame | 50 | 35 | 44 | 50 | 50 |
| TTG + RTG (µs) | 142.853 | 240 | 212.8 | 142.853 | 142.853 |
| CP Tg= 1/4 Tu | Symbol Time Ts (µs) | | 114.286 | 160 | 128 | 114.286 | 114.286 |
| FDD | Number of OFDM symbols per 5 ms frame | 43 | 31 | 39 | 43 | 43 |
| Idle time (µs) | 85.694 | 40 | 8 | 85.694 | 85.694 |
| TDD | Number of OFDM symbols per 5 ms frame | 42 | 30 | 37 | 42 | 42 |
| TTG + RTG (µs) | 199.98 | 200 | 264 | 199.98 | 199.98 |

### 1.1.2 Frame structure

A superframe is a collection of consecutive equally-sized radio frames whose beginning is marked with a superframe header (SFH), which carries short-term and long-term system configuration information.

In order to decrease the air-link access latency, the radio frames are further divided into a number of subframes where each subframe comprises of an integer number of OFDM symbols. The transmission time interval (TTI) is defined as the transmission latency over the air-link and is equal to a multiple of subframe length (default is one subframe). There are four types of subframes: 1) type-1 subframe, which consists of six OFDM symbols, 2) type-2 subframe, which consists of seven OFDM symbols, 3) type-3 subframe which consists of five OFDM symbols, and 4) type-4 subframe, which consists of nine OFDM symbols and can be used only in UL for channel bandwidth of 8.75 MHz when supporting legacy, i.e. OFDMA TDD WMAN, frames.

The basic frame structure is shown in Fig. 13, where superframe length is 20 ms (comprised of four radio frames), radio frame size is 5 ms, and subframe length depends on channel bandwidth, length of cyclic prefix, and subframe type, i.e. type-1/2/3/4. The number of subframes per radio frame is predetermined to maximize the spectral efficiency for each frame configuration depending on channel bandwidth, length of cyclic prefix, subframe type, and duplex mode.

The concept of time zones applies to both TDD and FDD systems. These time zones are time‑division multiplexed across time domain in the DL to support both new and legacy MSs. For UL transmissions both time and frequency-division multiplexing approaches can be used to support legacy and new terminals. The non-backward compatible improvements and features are restricted to the new zones. All backward compatible features and functions are used in the legacy zones.

Figure 13

Basic frame structure

Timeline

Description automatically generated

### 1.1.3 Physical structure and resource unit

The DL/UL subframes are divided into a number of frequency partitions, where each partition consists of a set of physical resource units (PRUs) over the available number of OFDM symbols in the subframe. Each frequency partition can include localized and/or distributed physical resource units. Frequency partitions can be used for different purposes such as fractional frequency reuse (FFR). The DL/UL resource partitioning and mapping is illustrated in Fig. 14. PRU is the basic physical unit for resource allocation that comprises 18 contiguous subcarriers by Nsym contiguous OFDM symbols where Nsym is 6, 7, 5 and 9 OFDM symbols for type-1, type-2, type-3 and type-4 subframes, respectively (type-4 is used only for UL). A logical resource unit (LRU) is the basic logical unit for distributed and localized resource allocations. LRU comprises of 18 × Nsym subcarriers.

Figure 14

Resource mapping process

Diagram

Description automatically generated

### 1.1.4 Resource mapping

The resource mapping process is defined as follows as illustrated in Fig. 14, where Pi denotes the i‑th frequency partition.

The PRUs are first subdivided into sub-bands and mini-bands where a sub-band comprises four adjacent PRUs and a mini-band comprises one PRU. The sub-bands are suitable for frequency selective allocations as they provide a contiguous allocation of PRUs in frequency. The mini-bands are suitable for frequency diverse allocations and are permuted in frequency (outer permutation in Fig. 14).

After frequency partitioning, the partition between localized or contiguous resource units (CRUs) and distributed resource units (DRUs) is done on a sector specific basis. All sub-bands are categorized into CRU, while mini-bands are categorized into either CRU or DRU. CRUs are used to achieve frequency-selective scheduling gain. A CRU comprises a group of subcarriers which are contiguous across frequency. DRUs are used to achieve frequency diversity gain. A DRU contains a group of subcarriers which are spread across a frequency partition. The sizes of the CRU and DRU are equal to that of PRU.

To form CRUs and DRUs, the subcarriers over the OFDM symbols of a sub-frame are partitioned into guard and used subcarriers. The DC subcarrier is not used. The used subcarriers are divided into PRUs. Each PRU contains pilot and data subcarriers. The number of used pilot and data subcarriers depends on MIMO mode, rank and number of multiplexed MS, as well as the number of OFDM symbols within a sub-frame.

The subcarrier (tone-pair) permutation defined for DRU of a DL frequency partition spreads the subcarriers across all the distributed resource allocations within a frequency partition. After mapping all pilots, the remaining used subcarriers are paired into contiguous subcarrier-pairs (tone‑pairs), and then are permuted to define the distributed logical resource units (DLRUs). The DL subcarrier permutation is performed per OFDM symbol within a sub-frame. Each of the DRUs of an UL frequency partition is divided into 3 tiles of 6 adjacent subcarriers over Nsym symbols. The tiles are collectively permuted across all the distributed resource allocations within a frequency partition to define DLRUs. The contiguous logical resource unit (CLRU) are obtained from direct mapping of CRUs. CLRUs are categorized into sub-band-based LRUs, so-called sub-band logical resource unit (SLRU), and mini-band-based LRUs, so called mini-band logical resource unit (NLRU).

### 1.1.5 Modulation and coding

Figure 15

Coding and modulation procedures

A picture containing text, clock, device, gauge

Description automatically generated

Figure 15 shows the channel coding and modulation procedures. A cyclic redundancy check (CRC) is appended to a burst (i.e. a physical layer data unit) prior to partitioning. The 16-bit CRC is calculated over the entire bits in the burst. If the burst size including burst CRC exceeds the maximum FEC block size, the burst is partitioned into KFB FEC blocks, each of which is encoded separately. If a burst is partitioned into more than one forward error correction (FEC) blocks, a FEC block CRC is appended to each FEC block before the FEC encoding. The FEC block CRC of a FEC block is calculated based on the entire bits in that FEC block. Each partitioned FEC block including 16-bit FEC block CRC has the same length. The maximum FEC block size is 4 800 bits. Concatenation rules are based on the number of information bits and do not depend on the structure of the resource allocation (number of logical resource units and their size). *WirelessMAN-Advanced* utilizes the convolutional turbo code (CTC) with code rate of 1/3. The CTC scheme is extended to support additional FEC block sizes. Furthermore, the FEC block sizes can be regularly increased with predetermined block size resolutions. The FEC block sizes which are multiple of seven are removed for the tail-biting encoding structure. The encoder block depicted in Fig. 15 includes the interleaver.

Bit selection and repetition are used in *WirelessMAN-Advanced* to achieve rate matching. Bit selection adapts the number of coded-bits to the size of the resource allocation which may vary depending on the resource unit size and sub-frame type. The total subcarriers in the allocated resource unit are segmented to each FEC block. The total number of information and parity bits generated by FEC encoder are considered as the maximum size of circular buffer. Repetition is performed when the number of transmitted bits is larger than the number of selected bits. The selection of coded bits is done cyclically over the buffer. The mother-code bits, the total number of information and parity bits generated by FEC encoder, are considered as a maximum size of circular buffer. In case that the size of the circular buffer Nbuffer is smaller than the number of mother-code bits, the first Nbuffer bits of mother-code bits are considered as selected bits.

Modulation constellations of QPSK, 16-QAM, and 64-QAM are supported. The mapping of bits to the constellation point depends on the constellation-rearrangement (CoRe) version used for HARQ retransmission as described and further depends on the MIMO scheme. The QAM symbols are mapped into the input of the MIMO encoder. The sizes include the addition of CRC (per burst and per FEC block), if applicable. Other sizes require padding to the next burst size. The code rate and modulation depend on the burst size and the resource allocation.

Incremental redundancy HARQ (HARQ-IR) is used in *WirelessMAN-Advanced* by determining the starting position of the bit selection for HARQ retransmissions. Chase combining HARQ (HARQ‑CC) is also supported and considered as a special case of HARQ-IR. The 2-bit sub-packet identifier (SPID) is used to identify the starting position. The CoRe scheme can be expressed by a bit-level interleaver.

The resource allocation and transmission formats in each retransmission in DL can be adapted with control signalling. The resource allocation in each retransmission in UL can be fixed or adaptive according to control signalling. In HARQ re-transmissions, the bits or symbols can be transmitted in a different order to exploit the frequency diversity of the channel.

For HARQ retransmission, the mapping of bits or modulated symbols to spatial streams may be applied to exploit spatial diversity with given mapping pattern, depending on the type of HARQ-IR. In this case, the predefined set of mapping patterns should be known to the transmitter and receiver. In DL HARQ, the base station (BS) may transmit coded bits exceeding current available soft buffer capacity.

### 1.1.6 Pilot structure

Transmission of pilot subcarriers in DL is necessary to allow channel estimation, channel quality measurement (e.g. channel quality indicator, CQI), frequency offset estimation, etc. To optimize the system performance in different propagation environments, *WirelessMAN-Advanced* supports both common and dedicated pilot structures. The classification of pilots into common and dedicated is done based on their usage. The common pilots can be used in distributed allocation by all MSs. Dedicated pilots can be used with both localized and distributed allocations. They are associated with user specific pilot index. The dedicated pilots are associated with a specific resource allocation, are intended to be used by the MSs allocated to specific resource allocation, and therefore shall be precoded or beamformed in the same way as the data subcarriers of the resource allocation. The pilot structure is defined for up to eight streams and there is a unified design for common and dedicated pilots. There is equal pilot density per spatial stream; however, there is not necessarily equal pilot density per OFDM symbols.

Figure 16

Pilot structures for 1, 2, 4 and 8 streams for Type-1 sub-frame

A picture containing text, crossword puzzle, receipt

Description automatically generated

For the sub-frame consisting of five OFDM symbols, the last OFDM symbol is deleted. For the sub‑frame consisting of seven OFDM symbols, the first OFDM symbol is added as the 7th OFDM symbol. To overcome the effects of pilot interference among the neighbouring sectors or BSs, an interlaced pilot structure is utilized by cyclically shifting the base pilot pattern such that the pilots of neighbouring cells do not overlap.

The UL pilots are dedicated to localized and distributed resource units and are precoded using the same precoding as the data subcarriers of the resource allocation. The pilot structure is defined for up to four transmit streams for SU-MIMO and up to eight streams for CSM. When pilots are power‑boosted, each data subcarrier should have the same transmission power across all OFDM symbols in a resource block.

The 18 × 6 UL resource blocks use the same pilot patterns as the DL counterpart. The pilot pattern for 6 × 6 tile structure is used for DLRU only in case the number of streams is one or two and it is also shown in Fig. 16.

### 1.1.7 Control channels

DL control channels carry essential information for system operation. Depending on the type of control signalling, information is transmitted over different time intervals (i.e. from superframe to sub-frame intervals). The system configuration parameters are transmitted at the superframe intervals, whereas control signalling related to user data allocations is transmitted at the frame/sub-frame intervals.

#### 1.1.7.1 Downlink control channels

Superframe Header (SFH)

The superframe header (SFH) carries essential system parameters and configuration information. The content of SFH is divided into two segments; i.e. primary and secondary SFHs. The primary SFH is transmitted every superframe, whereas the secondary SFH is transmitted over one or more superframes. The primary and secondary SFHs are located in the first sub-frame within a superframe and are time-division-multiplexed with the advanced preamble. The SFH occupies no more than 5 MHz bandwidth. The primary SFH is transmitted using predetermined modulation and coding scheme. The secondary SFH is transmitted using predetermined modulation scheme while its repetition coding factor is signalled in the primary SFH. The primary and secondary SFHs are transmitted using two spatial streams and space-frequency block coding to improve coverage and reliability. The MS is not required to know the antenna configuration prior to decoding the primary SFH. The information transmitted in the secondary SFH is divided into different sub-packets. The secondary SFH sub-packet 1 (SP1) includes information needed for network re-entry. The secondary SFH sub-packet 2 (SP2) contains information for initial network entry. The secondary SFH sub-packet 3 (SP3) contains remaining system information for maintaining communication with the BS.

Advanced MAP (A-MAP)

The advanced MAP (A-MAP) consists of both user-specific and non-user-specific control information. Non-user-specific control information includes information that is not dedicated to a specific user or a specific group of users. It contains information required to decode user-specific control signalling. User specific control information consists of information intended for one or more users. It includes scheduling assignment, power control information, and HARQ feedback. Resources can be allocated persistently to the MSs. Group control information is used to allocate resources and/or configure resources to one or multiple MSs within a user group. Within a subframe, control and data channels are frequency-division-multiplexed. Both control and data channels are transmitted on logical resource units that span over all OFDM symbols within a subframe.

Each DL subframe contains a control region including both non-user-specific and user-specific control information. All A-MAPs share a time-frequency region known as A-MAP region. The control regions are located in every subframe. The corresponding UL allocations occurs L subframes later, where L is determined by A-MAP relevance. The coding rate is predetermined for non-user-specific information while it is indicated by SFH for user-specific control information.

An A-MAP allocation Information Element (IE) is defined as the basic element of unicast service control. A unicast control IE may be addressed to one user using a unicast identifier or to multiple users using a multicast/broadcast identifier. The identifier is masked with CRC in the A-MAP allocation IE. It may contain information related to resource allocation, HARQ, MIMO transmission mode, etc. Each A-MAP IE is coded separately.

Non-user-specific control information is encoded separately from the user-specific control information. In the DL subframes, frequency partition for reuse-1 and/or frequency partition for power-boosted reuse-3 may contain an A-MAP region. The A-MAP region occupies the first few DLRUs in a frequency partition. The structure of an A-MAP region is illustrated in Fig. 17. The resource occupied by each A-MAP physical channel may vary depending on the system configuration and scheduler operation. There are different types of A-MAPs as follows:

– **Assignment A-MAP** contains resource assignment information which is categorized into multiple types of resource assignment IEs (assignment A-MAP IE).

– **HARQ Feedback A-MAP** contains HARQ ACK/NACK information for UL data transmission.

– **Power Control A-MAP** includes fast power control command to MSs.

There are different assignment A-MAP IE types that distinguish between DL/UL, persistent/non-persistent, single user/group resource allocation, basic/extended IE scenarios.

Figure 17

A-MAP location and structure (example)

Diagram

Description automatically generated

#### 1.1.7.2 Uplink control channels

Fast Feedback Channel (FBCH)

The UL fast feedback channel (FBCH) carries CQI and MIMO feedback.

CQI feedback provides information about channel conditions as seen by the MS. This information is used by the BS for link adaptation, resource allocation, power control, etc. The channel quality measurement includes both narrowband and wideband measurements. The CQI feedback overhead can be reduced through differential feedback or other compression techniques. Examples of CQI include effective carrier to interference plus noise ratio (CINR), band selection, etc.

MIMO feedback provides wideband and/or narrowband spatial characteristics of the channel that are required for MIMO operation. The MIMO mode, preferred matrix index, rank adaptation information, channel covariance matrix elements, and best sub-band index are examples of MIMO feedback information.

There are two types of UL FBCHs: a) primary fast feedback channel (P-FBCH) and b) secondary fast feedback channel (S-FBCH).S-FBCH can be used to support CQI reporting at higher code rate and thus more CQI information bits. FBCH is frequency-division-multiplexed with other UL control and data channels.

FBCH starts at a predetermined location, with the size defined in a DL broadcast control message. Fast feedback allocations to an MS can be periodic and the allocations are configurable. The specific type of feedback information carried on each fast feedback opportunity can be different. The number of bits carried in the fast feedback channel can be adaptive. For efficient transmission of feedback channels, a mini-tile is defined comprising two subcarriers by six OFDM symbols. One LRU consists of nine mini-tiles and can be shared by multiple FBCHs.

HARQ feedback channel

HARQ feedback (ACK/NACK) is used to acknowledge DL data transmissions. The UL HARQ feedback channel starts at a predetermined offset with respect to the corresponding DL transmission. The HARQ feedback channel is frequency-division-multiplexed with other control and data channels. Orthogonal codes are used to multiplex multiple HARQ feedback channels. The HARQ feedback channel comprises three distributed mini-tiles.

Sounding channel

The sounding channel is used by an MS to transmit sounding reference signals to enable the BS to measure UL channel conditions. The sounding channel may occupy either specific UL sub-bands or the entire bandwidth over an OFDM symbol. The BS can configure an MS to transmit the UL sounding signal over predefined subcarriers within specific sub-bands or the entire bandwidth. The sounding channel is orthogonally multiplexed (in time or frequency) with other control and data channels. Furthermore, the BS can configure multiple user terminals to transmit sounding signals on the corresponding sounding channels using code-, frequency-, or time-division multiplexing. Power control for the sounding channel can be utilized to adjust the sounding quality. The transmit power from each mobile terminal may be separately controlled according to certain CINR target values.

Ranging channel

The ranging channel is used for UL synchronization. The ranging channel can be further classified into ranging for non-synchronized and synchronized MSs. The ranging channel for non‑synchronized MS(NS-RCH) is used for initial network entry and for handover to a target BS. The ranging channel for synchronized MS(S-RCH) is used for periodic ranging. In a femtocell, MSs shall perform initial ranging, handover ranging, and periodic ranging by using the S-RCH.

Bandwidth request (BR) channel

Bandwidth request (BR) channels are used to request UL grant. BRs are transmitted through BR preamble with or without messages. BR messages can include information about the status of queued traffic at the MS such as buffer size and quality of service parameters. Contention or non‑contention based random access is used to transmit BR information on this control channel.

The BR channel starts at a configurable location with the configuration defined in a DL broadcast control message. The BR channel is frequency-division-multiplexed with other UL control and data channels. A BR tile is defined as six contiguous subcarriers by six OFDMA symbols. Each BR channel consists of three distributed BR tiles. Multiple BR preamble can be transmitted on the same BR channel using code-division multiplexing.

### 1.1.8 Power control

Power control mechanism is supported for DL and UL. Using DL power control, user-specific information with dedicated pilot is received by the terminal with the controlled power level. The DL advanced MAPs can be power-controlled based on the terminal UL channel quality feedback.

The UL power control is supported to compensate the path loss, shadowing, fast fading and implementation loss as well as to mitigate inter-cell and intra-cell interference. The BS can transmit necessary information through control channel or message to terminals to support UL power control. The parameters of power control algorithm are optimized on system-wide basis by the BS and broadcasted periodically.

In high-mobility scenarios, power control scheme may not be able to compensate the fast fading channel effect because of the variations of the channel impulse response. As a result, the power control is used to compensate the distance-dependent path loss, shadowing and implementation loss only.

The channel variations and implementation loss are compensated via open-loop power control without frequently interacting with the BS. The terminal can determine the transmit power based on the transmission parameters sent by the serving BS, UL channel transmission quality, DL channel state information, and interference knowledge obtained from DL. Open-loop power control provides a coarse initial power setting of the terminal when an initial connection is established.

The dynamic channel variations are compensated via closed-loop power control with power control commands from the serving BS. The BS measures UL channel state and interference information using UL data and/or control channel transmissions and sends power control commands to the terminal. The terminal adjusts its transmission power based on the power control commands from the BS.

### 1.1.9 Downlink synchronization

WirelessMAN-Advanced utilizes a new hierarchical structure for the DL synchronization where two types of preambles, a) primary advanced preamble (PA-Preamble) and b) secondary advanced preamble (SA-Preamble), are transmitted (Fig. 18). One PA-Preamble symbol and two SA‑Preamble symbols exist within the superframe. The location of the A-Preamble symbol is specified as the first symbol of frame except for the last frame. PA-Preamble is located at the first symbol of second frame in a superframe while SA-Preamble is located at the first symbol of the first and the third frames. The PA-Preamble carries information about system bandwidth and carrier configuration. The PA-Preamble has a fixed bandwidth of 5 MHz. A frequency reuse of one is applied to the PA-Preamble in frequency domain. SA-Preamble is repeated once every two frames and spans the entire system bandwidth and carries the cell ID. A frequency reuse of three is used for this set of sequences to mitigate inter-cell interference. SA-Preamble carries 768 distinct cell IDs.

The set of SA-Preamble sequences is partitioned, and each partition is dedicated to specific BS type such as macro BS, femto BS, etc. The partition information is broadest in the secondary SFH and AAI-SCD message.

Figure 18

Structure of advanced preambles

Table

Description automatically generated

### 1.1.10 Multi-antenna techniques

#### 1.1.10.1 MIMO structure

WirelessMAN-Advancedsupports several advanced multi-antenna techniques including single and multi-user MIMO (spatial multiplexing and beamforming) as well as a number of transmit diversity schemes. In single-user MIMO (SU-MIMO) scheme only one user can be scheduled over one (time, frequency, space) resource unit. In multi-user MIMO (MU-MIMO), on the other hand, multiple users can be scheduled in one resource unit. Vertical encoding utilizes one encoder block (or layer), whereas multi-layer encoding uses multiple encoders (or multiple layers). A layer is defined as a coding and modulation input path to the MIMO encoder. A stream is defined as the output of the MIMO encoder that is further processed through the beamforming or the precoder block. For spatial multiplexing, the rank is defined as the number of streams to be used for the user.

Figure 19

MIMO structure

Diagram

Description automatically generated

The MIMO transmitter structure is shown in Fig. 19. The encoder block contains the channel encoder, interleaving, rate-matching, and modulating blocks per layer. The resource mapping block maps the complex-valued modulation symbols to the corresponding time-frequency resources. The MIMO encoder block maps the layers onto the streams, which are further processed through the precoder block.

The precoder block maps the streams to antennas by generating the antenna-specific data symbols according to the selected MIMO mode. The OFDM symbol construction block maps antenna‑specific data to the OFDM symbols. Table 3 contains information on various MIMO modes supported by WirelessMAN-Advanced.

TABLE 3

DL MIMO modes

| Mode index | Description | MIMO encoding format | MIMO precoding |
| --- | --- | --- | --- |
| Mode 0 | Open-Loop SU-MIMO (TX Diversity) | Space-Frequency Block Coding (SFBC) | Non-Adaptive |
| Mode 1 | Open-Loop SU-MIMO (Spatial Multiplexing) | Vertical Encoding | Non-Adaptive |
| Mode 2 | Closed-Loop SU-MIMO (Spatial Multiplexing) | Vertical Encoding | Adaptive |
| Mode 3 | Open-Loop MU-MIMO (Spatial Multiplexing) | Multi-layer Encoding | Non-Adaptive |
| Mode 4 | Closed-Loop MU-MIMO (Spatial Multiplexing) | Multi-layer Encoding | Adaptive |
| Mode 5 | Open-Loop SU-MIMO (TX Diversity) | Conjugate Data Repetition (CDR) | Non-Adaptive |

The minimum antenna configuration in the DL and UL is 2 × 2 and 1 × 2, respectively. For open‑loop spatial multiplexing and closed-loop SU-MIMO, the number of streams is constrained to the minimum of number of transmit or receive antennas. The MU-MIMO can support up to two streams with two transmit antennas and up to four streams for four transmit antennas and up to eight streams for eight transmit antennas. Table 4 summarized the DL MIMO parameters for various MIMO modes.

TABLE 4

DL MIMO parameters

|  | Number of transmit antennas | STC rate per layer | Number of streams | Number of subcarriers | Number of layers |
| --- | --- | --- | --- | --- | --- |
| MIMO Mode 0 | 2 | 1 | 2 | 2 | 1 |
| 4 | 1 | 2 | 2 | 1 |
| 8 | 1 | 2 | 2 | 1 |
| MIMO Mode 1 and MIMO Mode 2 | 2 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 |
| 4 | 2 | 2 | 1 | 1 |
| 4 | 3 | 3 | 1 | 1 |
| 4 | 4 | 4 | 1 | 1 |
| 8 | 1 | 1 | 1 | 1 |
| 8 | 2 | 2 | 1 | 1 |
| 8 | 3 | 3 | 1 | 1 |
| 8 | 4 | 4 | 1 | 1 |
| 8 | 5 | 5 | 1 | 1 |

TABLE 4 (*end*)

|  | Number of transmit antennas | STC rate per layer | Number of streams | Number of subcarriers | Number of layers |
| --- | --- | --- | --- | --- | --- |
|  | 8 | 6 | 6 | 1 | 1 |
| 8 | 7 | 7 | 1 | 1 |
| 8 | 8 | 8 | 1 | 1 |
| MIMO Mode 3 and MIMO Mode 4 | 2 | 1 | 2 | 1 | 2 |
| 4 | 1 | 2 | 1 | 2 |
| 4 | 1 | 3 | 1 | 3 |
| 4 | 1 | 4 | 1 | 4 |
| 8 | 1 | 2 | 1 | 2 |
| 8 | 1 | 3 | 1 | 3 |
| 8 | 1 | 4 | 1 | 4 |
| MIMO Mode 4 | 4 | 2 and 1a | 3 | 1 | 2 |
| 4 | 2 and 1b | 4 | 1 | 3 |
| 4 | 2 | 4 | 1 | 2 |
| 8 | 2 and 1a | 3 | 1 | 2 |
| 8 | 2 and 1b | 4 | 1 | 3 |
| 8 | 2 | 4 | 1 | 2 |
| 8 | 1 | 8 | 1 | 8 |
| 8 | 2 and 1c | 8 | 1 | 7 |
| 8 | 2 and 1d | 8 | 1 | 6 |
| 8 | 2 and 1e | 8 | 1 | 5 |
| 8 | 2 | 8 | 1 | 4 |
| MIMO Mode 5 | 2 | 1/2 | 1 | 2 | 1 |
| 4 | 1/2 | 1 | 2 | 1 |
| 7 | 1/2 | 1 | 2 | 1 |
| a 2 streams to one MS and 1 stream to another MS, with 1 layer each.  b 2 streams to one MS and 1 stream each to the other two MSs, with 1 layer each.  c 2 streams to one MS and 1 stream each to the other six MSs, with 1 layer each.  d 2 streams each to two MS and 1 stream each to the other four MSs, with 1 layer each.  e 2 streams each to three MS and 1 stream each to the other two MSs, with 1 layer each. | | | | | |

The stream to antenna mapping depends on the MIMO scheme. In DL, the CQI and rank feedback are transmitted to assist the BS in rank adaptation, mode switching, and rate adaptation. For spatial multiplexing, the rank is defined as the number of streams to be used for each user. In FDD and TDD systems, unitary codebook based precoding is used for closed-loop SU-MIMO. In DL, an MS may feedback some information to the BS in closed-loop SU-MIMO such as rank, sub-band selection, CQI, precoding matrix index, and long-term channel state information.

In DL, the MU-MIMO transmission with up to two streams per user is supported. Beamforming is enabled with this precoding mechanism. *WirelessMAN-Advanced* has the capability to adapt between SU-MIMO and MU-MIMO in a predefined and flexible manner. Multi-BS MIMO techniques are also supported for improving sector and cell-edge throughput using multi-BS collaborative precoding, network coordinated beamforming, or inter-cell interference cancellation.

For UL MIMO, the BS will schedule users to resource blocks and determines the modulation and coding scheme (MCS) level and MIMO parameters (mode, rank, etc.). The supported antenna configurations include one, two or four transmit antennas and more than two receive antennas. The UL MIMO modes and parameters are shown in Table 5 and Table 6, respectively.

TABLE 5

UL MIMO modes

|  |  |  |  |
| --- | --- | --- | --- |
| Mode Index | Description | MIMO Encoding Format | MIMO Precoding |
| Mode 0 | Open-Loop SU-MIMO (TX Diversity) | SFBC | Non-Adaptive |
| Mode 1 | Open-Loop SU-MIMO (Spatial Multiplexing) | Vertical Encoding | Non-Adaptive |
| Mode 2 | Closed-Loop SU-MIMO (Spatial Multiplexing) | Vertical Encoding | Adaptive |
| Mode 3 | Open-Loop Collaborative Spatial Multiplexing (MU-MIMO) | Vertical Encoding | Non-Adaptive |
| Mode 4 | Closed-Loop Collaborative Spatial Multiplexing (MU-MIMO) | Vertical Encoding | Adaptive |

TABLE 6

UL MIMO parameters

|  | Number of transmit antennas | STC rate per layer | Number of streams | Number of subcarriers | Number of layers |
| --- | --- | --- | --- | --- | --- |
| MIMO Mode 0 | 2 | 1 | 2 | 2 | 1 |
| 4 | 1 | 2 | 2 | 1 |
| MIMO Mode 1 | 1 | 1 | 1 | 1 | 1 |
| MIMO Mode 1 and MIMO Mode 2 | 2 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 |
| 4 | 2 | 2 | 1 | 1 |
| 4 | 3 | 3 | 1 | 1 |
| 4 | 4 | 4 | 1 | 1 |
| MIMO Mode 3 and MIMO Mode 4 | 1 | 1 | 1 | 1 | 1 |
| 2 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 1 | 1 |
| 4 | 1 | 1 | 1 | 1 |
| 4 | 2 | 2 | 1 | 1 |
| 4 | 3 | 3 | 1 | 1 |
| 4 | 4 | 4 | 1 | 1 |

The supported UL transmit diversity modes include two and four transmit antenna schemes with rate 1 such as space frequency block coding (SFBC) and two stream precoder. In FDD and TDD systems, unitary codebook-based precoding is supported. In this mode, the MS transmits a sounding reference signal in the UL to assist the UL scheduling and precoder selection in the BS. The BS signals the resource allocation, MCS, rank, preferred precoder index, and packet size to the MS. UL MU-MIMO enables multiple MSs to be spatially multiplexed on the same radio resources. Both open-loop and closed-loop MU-MIMO are supported. The MSs with single transmit antenna can operate in open-loop SU- or MU-MIMO mode.

## 1.2 Overview of MAC layer

The following sections describe selected MAC features.

### 1.2.1 MAC addressing

*WirelessMAN-Advanced* defines global and logical addresses for an MS that identify the user and its connections during a session. The MS is identified by the globally unique 48-bit IEEE extended unique identifier assigned by the IEEE Registration Authority. The MS is further assigned the following logical identifiers: 1) A station identifier during network entry (or network re-entry), that uniquely identifies the MS within the cell, and 2) a flow identifier (FID) that uniquely identifies the control connections and transport connections with the MS. A temporary station identifier is used to protect the mapping between the actual station identifier during network entry. A deregistration identifier is defined to uniquely identify the MS within the set of paging group identifiers, paging cycle, and paging offset.

### 1.2.2 Network entry

Network entry is the procedure through which an MS detects a cellular network and establishes a connection with that network. The network entry has the following steps (see Fig. 20):

– synchronization with the BS by acquiring the preambles;

– acquiring necessary system information such as BS and network service provider identifiers for initial network entry and cell selection;

– initial ranging;

– basic capability negotiation;

– authentication/authorization and key exchange;

– registration and service flow setup.

Figure 20

Network entry procedures

Diagram

Description automatically generated

### 1.2.3 Connection management and quality of service

A connection is defined as a mapping between the MAC layers of a BS and one (or several) MS. If there is a one-to-one mapping between one BS and one MS, the connection is called a unicast connection; otherwise, it is called a multicast or broadcast connection. Two types of connections are specified: control connections and transport connections. Control connections are used to carry MAC control messages. Transport connections are used to carry user data including upper layer signalling messages. A MAC control message is never transferred over transport connection, and user data is never transferred over the control connections. One pair of bi-directional (DL/UL) unicast control connections are automatically established when an MS performs initial network entry.

All the user data communications are in the context of transport connections. A transport connection is unidirectional and established with a unique FID. Each transport connection is associated with an active service flow to provide various levels of QoS required by the service flow. An MS may have multiple transport connections which have different set of QoS parameters, and each transport connection may have one or more sets of QoS parameters.

The transport connection is established when the associated active service flow is admitted or activated, and released when the associated service flow becomes inactive. Transport connections can be preprovisioned or dynamically created. Pre-provisioned connections are those established by system for an MS during the MS network entry. On the other hand, the BS or the MS can create new connections dynamically if required.

### 1.2.4 MAC header

WirelessMAN-Advanced specifies a number of efficient MAC headers for various applications comprising of fewer fields with shorter size compared to the generic MAC header of OFDMA TDD WMAN. The advanced generic MAC header in Fig. 21 consists of Extended Header Indicator, FID, and Payload Length fields. Other MAC header types include two-byte short-packet MAC header, which is defined to support small-payload applications such as VoIP and is characterized by small data packets and non-ARQ connection, Fragmentation extended header, Packing extended header for transport connections, MAC Control extended header for control connections, and Multiplexing extended header that is used when data from multiple connections associated with the same security association is present in the payload of the MAC protocol data unit (PDU).

Figure 21

Advanced generic MAC headers

Diagram

Description automatically generated

### 1.2.5 ARQ and HARQ functions

An ARQ block is generated from one or multiple MAC service data units (SDUs) or MAC SDU fragment(s). ARQ blocks can be variable in size and are sequentially numbered.

WirelessMAN-Advanceduses adaptive asynchronous and non-adaptive synchronous HARQ schemes in the DL and UL, respectively. The HARQ operation is relying on an N-process (multi‑channel) stop-and-wait protocol. In adaptive asynchronous HARQ, the resource allocation and transmission format for the HARQ retransmissions may be different from the initial transmission. In case of retransmission, control signalling is required to indicate the resource allocation and transmission format along with other HARQ necessary parameters. A non-adaptive synchronous HARQ scheme is used in the UL where the parameters and the resource allocation for the retransmission are knowna priori.

### 1.2.6 Mobility management and handover

WirelessMAN-Advanced supports both network-controlled and MS-assisted handover (HO). As illustrated in Fig. 22, the handover procedures may be initiated by either MS or BS; the final handover decision and target BS selection may be made either by the serving BS or the MS. The MS executes the handover or cancels the procedure through HO cancellation message. The network re-entry procedures with the target BS, as shown in Fig. 22, may be optimized by target BS possession of MS information obtained from serving BS via core network. The MS may also maintain communication with serving BS while performing network re-entry at target BS as directed by serving BS.

Figure 22

Handover procedures

Diagram

Description automatically generated

### 1.2.7 Power management

WirelessMAN-Advanced provides power management functions including sleep mode and idle mode to mitigate power consumption of the MS. Sleep mode is a state in which an MS performs prenegotiated periods of absence from the serving BS. The sleep mode may be enacted when an MS is in the connected state. Using the sleep mode, the MS is provided with a series of alternative listening and sleep windows. The listening window is the time interval in which MS is available for transmit/receive of control signalling and data. The WirelessMAN-Advanced has the capability of dynamically adjusting the duration of sleep and listening windows within a sleep cycle based on changing traffic patterns and HARQ operations. When MS is in active mode, sleep parameters are negotiated between MS and BS. The base station instructs the MS to enter sleep mode. MAC management messages can be used for sleep mode request/response. The period of the sleep cycle is measured in units of frames or superframes and is the sum of a sleep and listening windows. During the MS listening window, BS may transmit the traffic indication message intended for one or multiple MSs. The listening window can be extended through explicit or implicit signalling. The maximum length of the extension is to the end of the current sleep cycle.

Idle mode allows the MS to become periodically available for DL broadcast traffic messaging such as paging message without registration with the network. The network assigns MSs in the idle mode to a paging group during idle mode entry or location update. If an MS is assigned to multiple paging groups, it may also be assigned multiple paging offsets within a paging cycle where each paging offset corresponds to a separate paging group. The assignment of multiple paging offsets to an MS allows monitoring of the paging messages at different paging offset when the MS is located in one of its paging groups. The distance between two adjacent paging offsets should be long enough so that the MS paged in the first paging offset can inform the network before the next paging offset in the same paging cycle occurs, thereby avoiding unnecessary paging in the next paging offset. The MS monitors the paging message during listening interval. The paging message contains identification of the MSs to be notified of pending traffic or location update. The start of the paging listening interval is calculated based on paging cycle and paging offset are defined in terms of number of superframes.

The serving BS transmits the list of paging group identifiers (PGID) at the predetermined location at the beginning of the paging available interval. During paging available interval, the MS monitors the SFH and if there is an indication of any change in system configuration information, the MS will acquire the latest system information at the next instance of SFH transmission (i.e. next SFH). To provide location privacy, the paging controller assigns Deregistration identifiers to uniquely identify the MSs in the idle mode in a particular paging group.

An MS in idle mode performs location update, if either of these conditions are met, paging group location update, timer based location update, or power down location update. The MS performs the location update when the MS detects a change in paging group by monitoring the PGIDs, which are transmitted by the BS. The MS periodically performs location update procedure prior to the expiration of idle mode timer. At every location update including paging group update, the idle mode timer is reset.

### 1.2.8 Security

Security functions provide subscribers with privacy, authentication, and confidentiality across WirelessMAN-Advancednetwork. The PKM protocol provides mutual and unilateral authentication and establishes confidentiality between the MS and the BS by supporting transparent exchange of authentication and authorization (EAP) messages.

The MS and the BS may support encryption methods and algorithms for secure transmission of MAC PDUs. WirelessMAN-Advancedsupports selectively confidentiality or integrity protection over MAC control messages. Figure 23 shows the functional blocks of security architecture.

Figure 23

Functional blocks of security architecture

Table

Description automatically generated

The security architecture is divided into security management and encryption and integrity logical entities. The security management functions include overall security management and control, EAP encapsulation/de-encapsulation, privacy key management (PKM) control, security association management, and identity/location privacy. To accomplish identity/location privacy, the MSID (i.e. MS MAC address) is not disclosed over the air even during network entry. The BS assigns a station identifier (STID) to the MS which is securely transmitted to the MS so that the MS’s identity and location can be hidden. The encryption and integrity protection entity functions include encryption of user data and authentication, control message authentication, message confidentiality protection.

# 2 Detailed specification of the radio interface technology[[13]](#footnote-13)

The material in § 2 reflects the structure of the IEEE specifications from the first release of Recommendation ITU-R M.2012 (01-2012) prior to the IEEE revising the structure of the specifications related to WirelessMAN-Advanced on 8 June 2013.

Detailed specifications described in this Annex are developed around a “Global Core Specification” (GCS)[[14]](#footnote-14), 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 IMT-ADV/24(Rev.3).

The IMT-Advanced standards contained in this section are derived from the global core specification for WirelessMAN-Advancedcontained at [http://ties.itu.int/u/itu-r/ede/rsg5/IMT-Advanced/GCS/M.2012-0/WirelessMAN-Advanced/](%20http://ties.itu.int/u/itu-r/ede/rsg5/IMT-Advanced/GCS/M.2012-3/WirelessMAN-Advanced/). The following notes apply to the sections below:

1) The identified relevant ***Transposing Organizations*** 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.

## 2.1 Description of the global core specification and the transposed standards

IEEE Std 802.16 is composed of IEEE Std 802.16-2009, as amended, consecutively, by IEEE Std 802.16j-2009, IEEE Std 802.16h-2010, and IEEE Std 802.16m-2011. IEEE Std 802.16 is described in § 2.2.1.1.

In accordance with Clause 16.1.1 of IEEE Std 802.16, the *WirelessMAN-Advanced* GCS is specified in the clauses of IEEE Std 802.16 as indicated in Table 7. Anything in IEEE Std 802.16 that is not included in Table 7 is excluded from the *WirelessMAN-Advanced* GCS.

TABLE 7

Description of the *WirelessMAN-Advanced* GCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IEEE Std 802.16 Clause and Subject | IEEE Std 802.16-2009 | IEEE Std 802.16j-2009 | IEEE Std 802.16h-2010 | IEEE Std 802.16m-2011 |
| Clause 1.4: Reference models | Base specification |  | Amended | Amended |
| Clause 2: Normative references | Base specification |  | Amended | Amended |
| Clause 3: Definitions | Base specification | Amended | Amended | Amended |
| Clause 4: Abbreviations and acronyms | Base specification | Amended | Amended | Amended |
| Clause 5.2: Packet convergence sublayer | Base specification |  |  | Amended |
| Clause 16: *WirelessMAN-Advanced* air interface |  |  |  | Base specification |
| Annex R: MAC control messages |  |  |  | Base specification |
| Annex S: Test vectors |  |  |  | Base specification |
| Annex T: Supported frequency bands |  |  |  | Base specification |
| Annex U: Radio specifications |  |  |  | Base specification |
| Annex V: Default capability class and parameters |  |  |  | Base specification |

### 2.1.1 IEEE Std 802.16

IEEE Std 802.16: Standard for local and metropolitan area networks – Air interface for broadband wireless access systems

This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support multiple PHY specifications, each suited to a particular operational environment.

IEEE Std 802.16 is composed of IEEE Std 802.16-2009, as amended, consecutively, by IEEE Std 802.16j-2009, IEEE Std 802.16h-2010, and IEEE Std 802.16m-2011.

#### 2.1.1.1 IEEE Std 802.16-2009

Standard for local and metropolitan area networks – Part 16: Air interface for broadband wireless access systems

This standard specifies the air interface, including the medium access control layer (MAC) and physical layer (PHY), of combined fixed and mobile point-to-multipoint broadband wireless access (BWA) systems providing multiple services. The MAC is structured to support multiple PHY specifications, each suited to a particular operational environment.

#### 2.1.1.2 IEEE Std 802.16j-2009

Standard for local and metropolitan area networks – Part 16: Air interface for broadband wireless access systems – Amendment 1: Multiple relay specification

This amendment updates and expands IEEE Std 802.16-2009, specifying physical layer and medium access control layer enhancements to IEEE Std 802.16 for licensed bands to enable the operation of relay stations. Subscriber station specifications are not changed.

#### 2.1.1.3 IEEE Std 802.16h-2010

Standard for local and metropolitan area networks – Part 16: Air interface for broadband wireless access systems – Amendment 2: Improved coexistence mechanisms for license-exempt operation

This amendment updates and expands IEEE Std 802.16, specifying improved mechanisms, as policies and medium access control enhancements, to enable coexistence among license-exempt systems and to facilitate the coexistence of such systems with primary users.

#### 2.1.1.4 IEEE Std 802.16m-2011

Standard for local and metropolitan area networks – Part 16: Air interface for broadband wireless access systems – Amendment 3: Advanced air interface

This amendment specifies the *WirelessMAN-Advanced* air interface, an enhanced air interface designed to meet the requirements of the IMT-Advanced standardization activity conducted by the ITU-R. The amendment is based on the WirelessMAN-OFDMA specification of IEEE Std 802.16 and provides continuing support for WirelessMAN-OFDMA subscriber stations.

### 2.1.2 Transposed standards

#### 2.1.2.1 Transpositions: IEEE

Reserved.

#### 2.1.2.2 Transpositions: ARIB

|  | Base specification per IEEE Std 802.16-2009 | Amendment per IEEE Std 802.16j-2009 | Amendment per IEEE Std 802.16h-2010 | Amendment per IEEE Std 802.16m-2011 |
| --- | --- | --- | --- | --- |
| Transposing Organization | ARIB | ARIB | ARIB | ARIB |
| Document number | ARIB STD-T105 Annex 1 | ARIB STD-T105 Annex 2 | ARIB STD-T105 Annex 3 | ARIB STD-T105 Annex 4 |
| Version | 1.30 | 1.30 | 1.30 | 1.30 |
| Date | 18 December 2012 | 18 December 2012 | 18 December 2012 | 18 December 2012 |
| Clause 1.4: Reference models | [http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%201\_IEEE%20Std%20802%2016-2009.pdf](http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.00/ARIB%20STD-T105%20Annex%201_IEEE%20Std%20802%2016-2009.pdf)  (Clause 1.4, ARIB transposition of IEEE Std 802.16-2009) | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%203_IEEE%20Std%20802%2016h-2010.pdf>  (Clause 1.4, ARIB transposition of IEEE Std 802.16h) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Clause 1.4, ARIB transposition of IEEE Std 802.16m) |
| Clause 2: Normative references | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%201_IEEE%20Std%20802%2016-2009.pdf>  (Clause 2, ARIB transposition of IEEE Std 802.16-2009) | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%203_IEEE%20Std%20802%2016h-2010.pdf>  (Clause 2, ARIB transposition of IEEE Std 802.16h) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Clause 2, ARIB transposition of IEEE Std 802.16m) |
| Clause 3: Definitions | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%201_IEEE%20Std%20802%2016-2009.pdf>  (Clause 3, ARIB transposition of IEEE Std 802.16-2009) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%202_IEEE%20Std%20802%2016j-2009.pdf>  (Clause 3, ARIB transposition of IEEE Std 802.16j) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%203_IEEE%20Std%20802%2016h-2010.pdf>  (Clause 3, ARIB transposition of IEEE Std 802.16h) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Clause 3, ARIB transposition of IEEE Std 802.16m) |
| Clause 4: Abbreviations and acronyms | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%201_IEEE%20Std%20802%2016-2009.pdf>  (Clause 4, ARIB transposition of IEEE Std 802.16-2009) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%202_IEEE%20Std%20802%2016j-2009.pdf>  (Clause 4, ARIB transposition of IEEE Std 802.16j) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%203_IEEE%20Std%20802%2016h-2010.pdf>  (Clause 4, ARIB transposition of IEEE Std 802.16h) | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Clause 4, ARIB transposition of IEEE Std 802.16m) |
| Clause 5.2: Packet convergence sublayer | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%201_IEEE%20Std%20802%2016-2009.pdf>  (Clause 5.2, ARIB transposition of IEEE Std 802.16-2009) | Not applicable | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Clause 5.2, ARIB transposition of IEEE Std 802.16m) |
| Clause 16: WirelessMAN-Advanced air interface | Not applicable | Not applicable | Not applicable | [http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204\_IEEE%20Std%20802%2016m-2011.pdf](http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.00/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf)  (Clause 16, ARIB transposition of IEEE Std 802.16m) |
| Annex R: MAC control messages | Not applicable | Not applicable | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Annex R, ARIB transposition of IEEE Std 802.16m) |
| Annex S: Test vectors | Not applicable | Not applicable | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Annex S, ARIB transposition of IEEE Std 802.16m) |
| Annex T: Supported frequency bands | Not applicable | Not applicable | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Annex T, ARIB transposition of IEEE Std 802.16m) |
| Annex U: Radio specifications | Not applicable | Not applicable | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Annex U, ARIB transposition of IEEE Std 802.16m) |
| Annex V: Default capability class and parameters | Not applicable | Not applicable | Not applicable | <http://www.arib.or.jp/IMT-Advanced/WirelessMAN-Advanced.1.30/ARIB%20STD-T105%20Annex%204_IEEE%20Std%20802%2016m-2011.pdf>  (Annex V, ARIB transposition of IEEE Std 802.16m) |

#### 2.1.2.3 Transpositions: TTA

|  | Base specification per IEEE Std 802.16‑2009 | Amendment per IEEE Std 802.16j‑2009 | Amendment per IEEE Std 802.16h‑2010 | Amendment per IEEE Std 802.16m‑2011 |
| --- | --- | --- | --- | --- |
| Transposing Organization | TTA | TTA | TTA | TTA |
| Document number | TTAE.IE-802.16-2009 | TTAE.IE-802.16j | TTAE.IE-802.16h | TTAE.IE-802.16m |
| Version | 1.0 | 1.0 | 1.0 | 1.0 |
| Date | 29 June 2011 | 29 June 2011 | 29 June 2011 | 29 June 2011 |
| Clause 1.4: Reference models | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16-2009>  (Clause 1.4, TTA transposition of IEEE Std 802.16-2009) | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16h>  (Clause 1.4, TTA transposition of IEEE Std 802.16h) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Clause 1.4, TTA transposition of IEEE Std 802.16m) |
| Clause 2: Normative references | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16-2009>  (Clause 2, TTA transposition of IEEE Std 802.16-2009) | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16h>  (Clause 2, TTA transposition of IEEE Std 802.16h) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Clause 2, TTA transposition of IEEE Std 802.16m) |
| Clause 3: Definitions | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16-2009>  (Clause 3, TTA transposition of IEEE Std 802.16-2009) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16j>  (Clause 3, TTA transposition of IEEE Std 802.16j) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16h>  (Clause 3, TTA transposition of IEEE Std 802.16h) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Clause 3, TTA transposition of IEEE Std 802.16m) |
| Clause 4: Abbreviations and acronyms | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16-2009>  (Clause 4, TTA transposition of IEEE Std 802.16-2009) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16j>  (Clause 4, TTA transposition of IEEE Std 802.16j) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16h>  (Clause 4, TTA transposition of IEEE Std 802.16h) | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Clause 4, TTA transposition of IEEE Std 802.16m) |
| Clause 5.2: Packet convergence sublayer | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16-2009>  (Clause 5.2, TTA transposition of IEEE Std 802.16-2009) | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Clause 5.2, TTA transposition of IEEE Std 802.16m) |
| Clause 16: WirelessMAN-Advanced air interface | Not applicable | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Clause 16, TTA transposition of IEEE Std 802.16m) |
| Annex R: MAC control messages | Not applicable | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Annex R, TTA transposition of IEEE Std 802.16m) |
| Annex S: Test vectors | Not applicable | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Annex S, TTA transposition of IEEE Std 802.16m) |
| Annex T: Supported frequency bands | Not applicable | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Annex T, TTA transposition of IEEE Std 802.16m) |
| Annex U: Radio specifications | Not applicable | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Annex U, TTA transposition of IEEE Std 802.16m) |
| Annex V: Default capability class and parameters | Not applicable | Not applicable | Not applicable | <http://www.tta.or.kr/data/ttasDown.jsp?where=14688&pk_num=TTAE.IE-802.16m>  (Annex V, TTA transposition of IEEE Std 802.16m) |

#### 2.1.2.4 Transpositions: WiMAX Forum

|  | Base specification per IEEE  Std 802.16-2009 | Amendment per IEEE Std 802.16j-2009 | Amendment per IEEE Std 802.16h-2010 | Amendment per IEEE Std 802.16m-2011 |
| --- | --- | --- | --- | --- |
| Transposing Organization | WIMAX FORUM | WIMAX FORUM | WIMAX FORUM | WIMAX FORUM |
| Document number | T28-001-R020v01, WIMAX FORUM transposition of IEEE Std 802.16-2009 | T28-001-R020v01, WIMAX FORUM transposition of IEEE Std 802.16j | T28-001-R020v01, WIMAX FORUM transposition of IEEE Std 802.16h | T28-001-R020v01, WIMAX FORUM transposition of IEEE Std 802.16m |
| Version | V01 | V01 | V01 | V01 |
| Date | 20 September 2011 | 20 September 2011 | 20 September 2011 | 20 September 2011 |
| Clause 1.4: Reference models | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 1.4, WIMAX FORUM transposition of IEEE Std 802.16-2009) | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 1.4, WIMAX FORUM transposition of IEEE Std 802.16h) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 1.4, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Clause 2: Normative references | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 2, WIMAX FORUM transposition of IEEE Std 802.16-2009) | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 2, WIMAX FORUM transposition of IEEE Std 802.16h) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 2, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Clause 3: Definitions | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 3, WIMAX FORUM transposition of IEEE Std 802.16-2009) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 3, WIMAX FORUM transposition of IEEE Std 802.16j) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 3, WIMAX FORUM transposition of IEEE Std 802.16h) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 3, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Clause 4: Abbreviations and acronyms | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 4, WIMAX FORUM transposition of IEEE Std 802.16-2009) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 4, WIMAX FORUM transposition of IEEE Std 802.16j) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 4, WIMAX FORUM transposition of IEEE Std 802.16h) | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 4, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Clause 5.2: Packet convergence sublayer | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 5.2, WIMAX FORUM transposition of IEEE Std 802.16-2009) | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 5.2, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Clause 16: WirelessMAN-Advanced air interface | Not applicable | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Clause 16, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Annex R: MAC control messages | Not applicable | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Annex R, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Annex S: Test vectors | Not applicable | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Annex S, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Annex T: Supported frequency bands | Not applicable | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Annex T, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Annex U: Radio specifications | Not applicable | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Annex U, WIMAX FORUM transposition of IEEE Std 802.16m) |
| Annex V: Default capability class and parameters | Not applicable | Not applicable | Not applicable | <http://www.wimaxforum.org/files/WMF-IMT-Advanced-Spec-T28-001-R020v01.pdf>  (Annex V, WIMAX FORUM transposition of IEEE Std 802.16m) |

# 3 Detailed specification of the radio interface technology[[15]](#footnote-15)

The material in § 2.3 reflects the structure of the IEEE specifications subsequent to the IEEE revising the structure of the relevant IEEE specifications related to WirelessMAN-Advancedon 8 June 2013 beginning with Revision 1 of Recommendation ITU-R M.2012 (2014).

Detailed specifications described in this Annex are developed around a “Global Core Specification” (GCS), 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 IMT-ADV/24(Rev.3).

The IMT-Advanced standards contained in this section are derived from the global core specification for WirelessMAN-Advancedcontained at <http://ties.itu.int/u/itu-r/ede/rsg5/IMT-Advanced/GCS/M.2012-1/WirelessMAN-Advanced/>. The following notes apply to the sections below:

1) The identified relevant Transposing Organizations 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.

## 3.1 Description of the global core specification and the transposed standards

IEEE Std 802.16.1 is composed of IEEE Std 802.16.1-2012, as amended, consecutively, by IEEE Std 802.16.1b-2012 and IEEE Std 802.16.1a-2013. IEEE Std 802.16.1 is described in § 3.1.1.

TABLE 8

Description of the *WirelessMAN-Advanced* GCS

| IEEE Std 802.16.1 Clause  and Subject | IEEE Std 802.16.1-2012 | IEEE Std 802.16.1b-2012 | IEEE Std 802.16.1a-2013 |
| --- | --- | --- | --- |
| Clause 1: Overview | Base specification | Amended | Amended |
| Clause 2: Normative references | Base specification |  |  |
| Clause 3: Definitions | Base specification | Amended | Amended |
| Clause 4: Abbreviations and acronyms | Base specification |  | Amended |
| Clause 5: Service-Specific Convergence Sublayer | Base specification |  | Amended |
| Clause 6: WirelessMAN-Advanced Air Interface | Base specification | Amended | Amended |
| Annex A: Bibliography | Base specification |  |  |
| Annex B: Control Messages | Base specification | Amended | Amended |
| Annex C: Test Vectors | Base specification |  |  |
| Annex D: Supported frequency bands | Base specification |  |  |
| Annex E: Radio specifications | Base specification |  |  |
| Annex F: Default capability class and parameters | Base specification |  |  |

### 3.1.1 IEEE Std 802.16.1

IEEE Std 802.16.1: IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems

This standard specifies the WirelessMAN-Advanced Air Interface, including the medium access control layer (MAC) and physical layer (PHY), of a broadband wireless access (BWA) system supporting multiple services

IEEE Std 802.16.1 is composed of IEEE Std 802.16.1-2012, as amended, consecutively, by IEEE Std 802.16.1b-2012 and IEEE Std 802.16.1a-2013.

#### 3.1.1.1 IEEE Std 802.16.1-2012

IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems

This standard specifies the WirelessMAN-Advanced Air Interface, including the medium access control layer (MAC) and physical layer (PHY), of a broadband wireless access (BWA) system supporting multiple services.

#### 3.1.1.2 IEEE Std 802.16.1b-2012

IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems – Amendment 1: Enhancements to Support Machine-to-Machine Applications

This amendment specifies enhancements to the WirelessMAN-Advanced Air Interface. The enhancements provide improved support for machine-to-machine applications. As of the approval date, the applicable version of IEEE Std 802.16.1 is IEEE Std 802.16.1-2012, as amended by IEEE 802.16.1b-2012.

#### 3.1.1.3 IEEE Std 802.16.1a-2013

IEEE Standard for WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems – Amendment 2: Higher Reliability Networks

This amendment updates and expands IEEE Std 802.16.1, specifying enhanced mechanisms to support Higher Reliability Networks. As of the publication date, the current version of IEEE Std 802.16.1 is IEEE Std 802.16.1-2012, as amended by IEEE Std 802.16.1b-2012 and IEEE Std 802.16.1a-2013.

### 3.1.2 Transposed standards

#### 3.1.2.1 Transpositions: IEEE

|  |  |  |  |
| --- | --- | --- | --- |
|  | Base standard per  IEEE Std 802.16.1-2012 | Amendment per IEEE Std 802.16.1b-2012 | Amendment per IEEE Std 802.16.1a-2013 |
| Transposing Organization | IEEE | IEEE | IEEE |
| Document Number | IEEE Std 802.16.1-2012 | IEEE Std 802.16.1b-2012 | IEEE Std 802.16.1a-2013 |
| Version | 2012 | 2012 | 2013 |
| Issued Date | 8 June 2012 | 30 August 2012 | 6 March 2013 |
| Document | IEEE transposition of IEEE Std 802.16.1-2012 | IEEE transposition of IEEE Std 802.16.1b-2012 | IEEE transposition of IEEE Std 802.16.1a-2013 |

#### 3.1.2.2 Transpositions: ARIB

Reserved.

#### 3.1.2.3 Transpositions: TTA

|  |  |  |  |
| --- | --- | --- | --- |
|  | Base standard per IEEE Std 802.16.1-2012 | Amendment per IEEE Std 802.16.1b-2012 | Amendment per IEEE Std 802.16.1a-2013 |
| Transposing Organization | TTA | TTA | TTA |
| Document Number | TTAE.IE-802.16.1-2012 | TTAE.IE-802.16.1b-2012 | *Not applicable* |
| Version | 1.0 | 1.0 | *Not applicable* |
| Issued Date | 21 December 2012 | 26 June 2013 | *Not applicable* |
| Document | [http://committee.tta.or.kr/include/Download.jsp?filename=stnfile/TTAE\_[1].IE-802.16.1-2012.pdf](http://committee.tta.or.kr/include/Download.jsp?filename=stnfile/TTAE_%5b1%5d.IE-802.16.1-2012.pdf)  (TTA transposition of IEEE Std 802.16.1-2012) | <http://committee.tta.or.kr/include/Download.jsp?filename=stnfile/TTAE.IE-802.16.1b-2012.zip>  (TTA transposition of IEEE Std 802.16.1b-2012) | *Not applicable* |

#### 3.1.2.4 Transpositions: WiMAX Forum

Reserved.

#### 3.1.2.5 Transpositions: ITRI

|  |  |  |  |
| --- | --- | --- | --- |
|  | Base standard per IEEE Std 802.16.1‑2012 | Amendment per IEEE Std 802.16.1b-2012 | Amendment per IEEE Std 802.16.1a-2013 |
| Transposing Organization | ITRI | ITRI | ITRI |
| Document Number | ITRI-2013-Std-001 | ITRI-2013-Std-001 | ITRI-2013-Std-001 |
| Version | 2013 | 2013 | 2013 |
| Issued Date | 6 September 2013 | 6 September 2013 | 6 September 2013 |
| Document | http://std-share.itri.org.tw/Content/Files/Stdlink/ITRI-BWA-001.pdf | <http://std-share.itri.org.tw/Content/Files/Stdlink/ITRI-BWA-001.pdf> | <http://std-share.itri.org.tw/Content/Files/Stdlink/ITRI-BWA-001.pdf> |

Attachment  
to Annex 2  
  
Abbreviations

AAS Active antenna system

ACK/NAK Acknowledgement / Negative Acknowledgement

A-GNSS Assisted Global Navigation Satellite Systems

A-GPS Assisted Global Positioning System

AP Application Protocol

ARIB Association of Radio Industries and Businesses

ARQ Automatic repeat request

AS Access Stratum

ATIS Alliance for Telecommunications Industry Solutions

ATS Abstract test suite

BCH Broadcast channel

CCSA China Communications Standards Association

CMAS Commercial mobile alert system

CoMP Coordinated multipoint

CQI Channel quality identifier

CSI Channel-state information

CTC Convolutional turbo code

DCI Downlink control information

DFTS Discrete Fourier transform-spread

DLC Data link control layer

DL-CoMP Downlink coordinated multipoint

DL-SCH Downlink shared channel

DRX Discontinuous reception

DwPTS Downlink part

ECID Enhanced Cell ID

EMC Electromagnetic compatibility

EPC Evolved packet core

EPDCCH Enhanced physical downlink control channel

E-SMLC Evolved serving mobile location centre

ETSI European Telecommunications Standards Institute

ETWS Earthquake and tsunami warning system

E-UTRA Evolved Universal Terrestrial Radio Access

FDD Frequency-division duplex

FEC Forward error correction

FFR Fractional frequency reuse

FSTD Frequency switched transmit diversity

GCS Global core specifications

GNSS Global navigation satellite system

GPRS General Packet Radio Service

GPS Global positioning system

GSM Global system for mobile communications

HARQ Hybrid automatic-repeat-request

ICIC Inter-cell interference coordination

ICS Implementation Conformance Statement

IMEI International mobile station equipment identities

IMS IP multimedia subsystems

IMT International mobile telecommunications

IXIT Implementation eXtra Information for Testing

LAA Licensed-assisted access

LBT Listen before talk

LEE laptop embedded equipment

LME Laptop mounted equipment

LMU Location measurement unit

LPP LTE positioning protocol

LTE Long term evolution

LWA LTE/WLAN aggregation

LWAAP LTE-WLAN aggregation adaptation protocol

LWIP Level integration using IPsec tunnel

MAC Medium access control

MBMS Multimedia broadcast multicast service

MBSFN Multimedia broadcast multicast service single frequency network

MC Mission critical

MCE Multiple channel equipment

MCPTT Mission critical push to talk

MCS Modulation and coding scheme

MIMO Multiple-input/multiple-output

MME Mobility management entity

MPDCCH MTC physical downlink control channel

MTC Machine-type communications

NB-IoT Narrow-band Internet of Things

NPBCH Narrowband physical broadcast channel

NPDCCH Narrowband physical downlink control channel

NPDSCH Narrowband physical downlink shared channel

NPRACH Narrowband physical random access channel

NPUSCH Narrowband physical uplink shared channel

O&M Operations and maintenance

OFDM Orthogonal frequency-division multiplexing

OFDMA Orthogonal frequency-division multiple access

OTA Over the air

OTDOA Observed time difference of arrival

PAPR Peak-to-average power ratio

PBCH Physical broadcast channel

PCFICH Physical control format indicator channel

PDCCH Physical downlink control channel

PDCP Packet data convergence protocol

PDSCH Physical downlink shared channel

PDU Protocol data unit

PHICH Physical hybrid automatic-repeat-request indicator channel

PHS Payload header suppression

PHY Physical layer

PIXIT Protocol implementation extra information for testing

PMCH Physical multicast channel

PRACH Physical random access channel

PRBs Physical resource blocks

ProSe Proximity based Services

PSBCH Physical sidelink broadcast channel

PSCCH Physical sidelink control channel

PSDCH Physical sidelink discovery channel

PSSCH Physical sidelink shared channel

PUCCH Physical uplink control channel

PUSCH Physical uplink shared channel

PWS Public warning system

QAM Quadrature amplitude modulation

QoS Quality of service

QPSK Quadrature phase shift keying

RI Radio interface

RIT Radio interface technology

RLC Radio link control

RRC Radio resource control

RRM Radio resource management

SDP Session description protocol

SDU Service data unit

SFBC Space-frequency block coding

SFH Super frame header

SIM Subscriber identity module

SIP Session initiation protocol

SLmAP SLm interface application protocol

SON Self-organizing networks

SPDCCH Short physical downlink control channel

SPS Semi-persient scheduling

SPUCCH Short physical uplink control channel

SRIT Set of radio interface technology

TDD Time division duplex

TD-SCDMA Time division synchronous code division multiple access

TF Transport format

TRMS Total radiated multi-antenna sensitivity

TRP Total radiated power

TRS Total radiated sensitivity

TSDSI Telecommunications Standards Development Society, India

TTA Telecommunications Technology Association

TTC Telecommunication Technology Committee

TTCN Testing and Test Control Notation

TTI Transmission time interval

UCI Uplink control information

UE User equipment

UL-CoMP Uplink coordinated MULTIPOINT

UL-SCH Uplink shared channel

UpPTS Uplink part

V2V Vehicle to vehicle

WirelessMAN Wireless metropolitan area networks

WLAN Wireless local area network

WT Wireless local area network termination

XwAP Xw application protocol

1. The latest edition of the Recommendation/Reports in force should be used. [↑](#footnote-ref-1)
2. Recommendations ITU-R M.1457 and ITU-R M.2012 are two separate, independent, and self‑contained Recommendations, each one with a specific scope. Both Recommendations will evolve independently, and there could be some overlap reflected by commonality in content between the two documents. [↑](#footnote-ref-2)
3. Data rates sourced from Recommendation ITU-R M.1645. [↑](#footnote-ref-3)
4. Developed by 3GPP as LTE Release 10 and Beyond (Long Term Evolution-Advanced). [↑](#footnote-ref-4)
5. Developed by IEEE as the WirelessMAN-Advanced specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m. [↑](#footnote-ref-5)
6. A “GCS” (Global Core Specification) is the set of specifications that defines a single RIT, an SRIT, or a RIT within an SRIT. [↑](#footnote-ref-6)
7. Radio Interface Technology. [↑](#footnote-ref-7)
8. Set of Radio Interface Technologies. [↑](#footnote-ref-8)
9. 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-9)
10. Global Core Specifications. [↑](#footnote-ref-10)
11. Radio Interface Technology. [↑](#footnote-ref-11)
12. Set of Radio Interface Technologies. [↑](#footnote-ref-12)
13. On 8 June 2012, the IEEE-SA Standards Board approved IEEE Std 802.16.1 (*WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems*) as a new IEEE standard. IEEE Std 802.16.1 encompasses the WirelessMAN-Advanced air interface, with some minor improvements. On the same date, the Standards Board approved IEEE Std 802.16-2012 as a new revision of IEEE Std 802.16, which now excludes the WirelessMAN-Advanced air interface.

    Accordingly, the material in § 2.2 reflects IEEE’s structure of the WirelessMAN-Advanced air interface specification IEEE Std 802.16 which is composed of IEEE Std 802.16-2009, as amended, consecutively, by IEEE Std 802.16j-2009, IEEE Std 802.16h-2010, and IEEE Std 802.16m-2011. [↑](#footnote-ref-13)
14. A “GCS” (Global Core Specification) is the set of specifications that defines a single RIT, an SRIT, or a RIT within an SRIT. [↑](#footnote-ref-14)
15. On 8 June 2012, the IEEE-SA Standards Board approved IEEE Std 802.16.1 (*WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems*) as a new IEEE standard. IEEE Std 802.16.1 encompasses the WirelessMAN-Advanced air interface, with some minor improvements. On the same date, the Standards Board approved IEEE Std 802.16-2012 as a new revision of IEEE Std 802.16, which now excludes the WirelessMAN-Advanced air interface.

    Accordingly, the material in § 3 reflects IEEE’s transfer of the WirelessMAN-Advanced air interface specification to IEEE Std 802.16.1. The WirelessMAN-Advanced GCS for § 3 includes IEEE Std 802.16.1 but not IEEE Std 802.16.

    IEEE has further enhanced IEEE Std 802.16.1 with two amendments:

    – IEEE Std 802.16.1a: WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems – Amendment: Higher Reliability Networks.

    – IEEE Std 802.16.1b: WirelessMAN-Advanced Air Interface for Broadband Wireless Access Systems – Amendment: Enhancements to Support Machine-to-Machine Applications.

    The content of these two standards is also included in § 3. [↑](#footnote-ref-15)