



LTE;
**Requirements for further advancements for Evolved Universal
Terrestrial Radio Access (E-UTRA) (LTE-Advanced)
(3GPP TR 36.913 version 15.0.0 Release 15)**

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Foreword

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1 Scope

This document contains requirements for the further advancements for E-UTRA/E-UTRAN.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] (void)
 - [2] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
 - [3] 3GPP TR 25.913: "Requirements for Evolved UTRA (E-UTRA) and Evolved UTRAN (E-UTRAN)".
 - [4] ITU-R Circular Letter 5/LCCE/2 on IMT-Advanced
 - [5] 3GPP TR 25.912: "Feasibility study for evolved Universal Terrestrial Radio Access (UTRA) and Universal Terrestrial Radio Access Network (UTRAN)".
-

3 Definitions, symbols and abbreviations

3.1 Definitions

Void

3.2 Symbols

Void

3.3 Abbreviations

For the purposes of the present document, the abbreviations defined in 3GPP TS 21.905 [2] and the following apply:

4 Introduction

At the 3GPP TSG RAN #39 meeting, the Study Item description on "Further Advancements for E-UTRA (LTE-Advanced)" was approved (RP-080137).

The justification of the Study Item was as follows;

IMT-Advanced is entering the phase of the process in ITU-R addressing the development of the terrestrial radio interface recommendations. To announce this stage of the process for IMT-Advanced, ITU-R has issued a Circular Letter (CL) to invite submission of candidate Radio Interface Technologies (RITs) or a set of RITs (SRITs) for IMT-Advanced. The key features of IMT-Advanced delineated in the CL 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; and
- 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) .

The base line requirements for IMT-Advanced will be concluded in ITU-R WP 5D #2 (June 2008) and communicated in an Addendum to the Circular Letter in the July 2008 timeframe.

In the WRC07, the following spectrum bands were proposed as additions to the prior identified bands, and the parts of the existing and new bands are globally or regionally identified for IMT, which is the new root term to encompass both IMT-2000 and IMT-Advanced.

- 450 MHz band
- UHF band (698-960 MHz)
- 2.3 GHz band
- C-band(3400-4200 MHz)

In 3GPP, E-UTRA should be further evolved for the future releases in accordance with:

- 3GPP operator requirements for the evolution of E-UTRA
- The need to meet/exceed the IMT-Advanced capabilities.

Considering the above, 3GPP TSG-RAN should study further advancements for E-UTRA (LTE-Advanced) toward meeting:

- Requirements for IMT-Advanced and provide ITU-R with proposals of RITs or SRITs according to the defined ITU-R time schedule provided in the Circular Letter and its Addendums.
- 3GPP operators requirements for the evolution of E-UTRA

5 Objective

The objective of Further Advancements for E-UTRA is as follows;

- A) Define a framework for further advancements of E-UTRA and E-UTRAN (to be referred to as Advanced E-UTRA and Advanced EUTRAN considering:
- The time schedule of ITU-R
 - That the work on Advanced E-UTRA and Advanced E-UTRAN must not introduce any delay to the completion of the Release 8 specification of E-UTRA and E-UTRAN
 - That the general enhancements of specifications for Release 8 E-UTRA and E-UTRAN are maintained and progressed in a focused and efficient manner.
- B) Define requirements for Advanced E-UTRA and Advanced E-UTRAN based on the ITU-R requirements for IMT-Advanced as well as 3GPP operators own requirements for advancing Release 8 E-UTRA AND E-UTRAN considering:
- E-UTRA radio technology and architecture improvements
 - Support for all radio modes of operation
 - Interworking with legacy RATs (scenarios and performance requirements)

- Backward compatibility of Advanced E-UTRA and Advanced E-UTRAN with Release 8 E-UTRA and E-UTRAN i.e.
 - an Release 8 E-UTRA terminal can work in an Advanced E-UTRAN,
 - an Advanced E-UTRA terminal can work in an Release 8 E-UTRAN and
 - non-backward compatible elements could be considered based on RAN decision
 - Newly identified frequency bands and existing frequency bands, and their advantages and limitations, in particular, the consideration of the WRC-07 conclusions, to ensure that Advanced E-UTRA can accommodate radio channel bandwidths commensurate with the availability in parts of the world of wideband channels in the spectrum allocations (above 20 MHz) and at the same time being mindful on the need to accommodate those parts of the world where the spectrum allocations will not have availability of wideband channels
- C) Identify potential solutions, technologies for the Advanced E-UTRA and Advanced E-UTRAN. The study areas include:
- Physical layer
 - Radio interface layer 2 and RRC
 - E-UTRAN architecture
 - RF, including Aspects of wider channel bandwidth than 20 MHz
 - Advanced system concepts
- D) To develop documents that will serve as a basis for the documentation to be submitted to ITU-R to provide the 3GPP proposals for IMT-Advanced:
- 1) An "Early Proposal" submission that would be sent to ITU-R, to be agreed at RAN #41 (9-12 September 2008), for submission to WP 5D #3 (8-15 October 2008).
 - 2) A "Complete Technology" submission that would be sent to ITU-R, to be agreed at RAN #44 (26-29 May 2009), for submission to WP 5D #5 (planned for 10-17 June 2009).
 - 3) A "Final" submission to incorporate updates, additional specific details or feature additions, *and* the required self-evaluation that would be sent to ITU-R, to be agreed at RAN #45 (22-25 September 2009), for submission to WP 5D #6 (planned for 13-20 Oct 2009).
- 3GPP should take note, that by ITU-R convention, the formal submission deadline for ITU-R meetings has been established as 16:00 hours UTC, seven calendar days prior to the start of the meeting.
- E) Make recommendations for future WIs
- F) For reference, the Circular Letter as received from the ITU-R (and future Addendums to the same) are annexed to this Work Item and should become an integral part of the WI.

6 General requirements

The following general requirements are valid for Advanced E-UTRA and Advanced E-UTRAN

- Advanced E-UTRA and Advanced E-UTRAN shall be an evolution of Release 8 E-UTRA and E-UTRAN
- All relevant requirement in [3] are valid also for Advanced E-UTRA and Advanced E-UTRAN
- Advanced E-UTRA and Advanced E-UTRAN shall meet or exceed IMT-Advanced requirements within the ITU-R time plan

The expectancy is that Advanced E-UTRA should provide substantially higher performance compared to what is expected to be the IMT-Advanced requirements in ITU-R. The values provided in clauses 7 and 8 have been expressed as preferred performance of Advanced E-UTRA. These values are recognised as being very ambitious, especially in

light of the ITU-R time plan, and the performance evaluation results generated for LTE R8, but are adopted as long term target for Advanced E-UTRA"

7 Capability-related requirements

7.1 Peak Data Rate

The peak data rate is the maximum data rate to be supported from a system requirement viewpoint (i.e. not from radio performance requirement viewpoint) regardless of radio interface parameters such as the transmission bandwidth and antenna configuration.

Advanced E-UTRA should support significantly increased instantaneous peak data rates.

At a minimum, Advanced E-UTRA should support the key feature of IMT-Advanced which is stated in the Circular Letter from the ITU-R as "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)"

The system should target a downlink peak data rate of 1 Gbps and an uplink peak data rate of 500 Mbps.

7.2 Latency

7.2.1 C-plane latency

The overall C-Plane latency shall be significantly decreased compared to EPS Rel-8. The C-Plane latency takes into account RAN and CN latencies (excluding the transfer latency on the S1 interface) in unloaded conditions.

The target for transition time from Idle mode (with IP address allocated) to Connected mode is less than 50 ms including the establishment of the user plane (excluding the S1 transfer delay).

The target for the transition from a "dormant state" in Connected Mode (i.e. DRX substate in Connected Mode in E-UTRAN) is less than 10 ms (excluding the DRX delay).

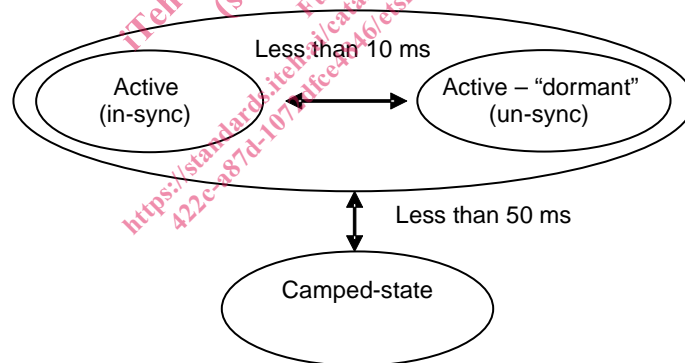


Figure 7.1: Requirements for state transitions

7.2.1.1 C-plane capacity

The system should be able to support at least 300 active users without DRX in a 5 MHz bandwidth. The same number of RRC connections with DRX as in Release 8 E-UTRA and E-UTRAN (16k) is expected.

7.2.2 U-Plane latency

Advanced E-UTRA and Advanced E-UTRAN should allow for reduced U-plane latency compared to Release 8 E-UTRA and E-UTRAN, specifically in situations where:

- The UE does not have a valid scheduling assignment
- The UE needs to synchronise and obtain a scheduling assignment

The U-Plane latency is defined as the minimum achievable user plane latency with the system configurations optimized for latency