



**Universal Mobile Telecommunications System (UMTS);
LTE;**

**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
(3GPP TS 37.571-4 version 15.3.0 Release 15)**



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Foreword

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

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Introduction

The present document is part 4 of a multi-part conformance test specification. The specification contains a TTCN design frame work and the detailed test specifications in TTCN for the UE:

- A-GPS at the UTRA Uu interface in TTCN-2;
- A-GNSS at the UTRA Uu interface in TTCN-3;
- LTE positioning at the LTE-Uu interface in TTCN-3.
- NR positioning at the NR-Uu interface in TTCN-3.

The present document is part 4 of a multi-parts TS:

- 3GPP 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: Terminal conformance.
- 3GPP 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.
- 3GPP 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).
- **3GPP 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.**
- 3GPP 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.

1 Scope

The present 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.
- NR positioning at the NR-Uu interface.

The following TTCN test specification and design considerations can be found in the present 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 the present document are based on the test specifications in prose in 3GPP TS 37.571-2 [3];
- The applicability of the individual test cases is specified in the test ICS proforma specification in 3GPP TS 37.571-3 [4].

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document in the same Release as the present document unless the context in which the reference is made suggests a different Release is relevant (information on the applicable release in a particular context can be found in e.g. test case title, description or applicability, message description or content).

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP 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".
- [3] 3GPP 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".

- [4] 3GPP 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)".
- [5] 3GPP TS 37.571-5: "Universal Terrestrial Radio Access (UTRA); Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 5: Test scenarios and assistance data".
- [6] 3GPP TS 36.523-3: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification; Part 3: Test suites".
- [7] 3GPP TS 36.508: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing".
- [8] 3GPP TS 34.123-3: "User Equipment (UE) conformance specification; Part 3: Abstract test suite (ATS)".
- [9] 3GPP TS 34.108: "Common test environments for User Equipment (UE); Conformance testing".
- [10] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".
- [11] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".
- [12] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol specification".
- [13] 3GPP TS 24.080: "Mobile radio interface layer 3 supplementary services specification; Formats and coding".
- [14] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".
- [15] ITU-T Recommendation X.880: "Information technology - Remote Operations: Concepts, model and notation".
- [16] ITU-T Recommendation Q.773: "Transaction capabilities formats and encoding".
- [17] ETSI ES 201 873-1: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".
- [18] 3GPP TS 34.109: "Terminal logical test interface; Special conformance testing functions".
- [19] 3GPP TS 23.038: "Alphabets and language-specific information".
- [20] ETSI TR 101 666 (V1.0.0): "Information technology; Open Systems Interconnection Conformance testing methodology and framework; The Tree and Tabular Combined Notation (TTCN) (Ed. 2++)".
- [21] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".
- [22] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [23] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation".
- [24] 3GPP TS 38.523-3: "5GS; User Equipment (UE) conformance specification; Part 3: Protocol Test Suites".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

3.2 Symbols

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

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply:

ASP Abstract Service Primitive

4 A-GPS system architecture and test model

A-GPS signalling conformance tests are specified in TTCN-2. The system architecture and the test model are based on 3GPP TS 34.123-3 [8].

4.1 ATS and module structure

Refer to 3GPP TS 34.123-3 [8], clause 5.

4.2 Upper tester

Refer to 3GPP TS 34.123-3 [8], clause 7.3.5.1.

4.3 SV PCO

Refer to 3GPP TS 34.123-3 [8], clause 7.3.5.2.

4.4 A-GPS Primitives

Refer to 3GPP TS 34.123-3 [8], clause 7.3.5.3.

4.5 Specific test suite operation for A-GPS testing

Refer to 3GPP TS 34.123-3 [8], clause 8.7.7.

5 A-GNSS and LTE positioning system architecture and test models

5.1 Test system architecture

5.1.1 General system architecture

Refer to 3GPP TS 36.523-3 [6], clause 4.1.1.

5.1.2 Component architecture

Each access technology (RAT) is hosted by a separate TTCN-3 parallel component (PTC):

- E-UTRA PTC;

- UTRA PTC.

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

- Is an extension of the MTC as defined in 3GPP TS 36.523-3 [6], clause 4.1.2.
- Controls the SS Positioning Simulator.

Figure 5.1.2-1 shows this component architecture for an E-UTRA and UTRA scenario.

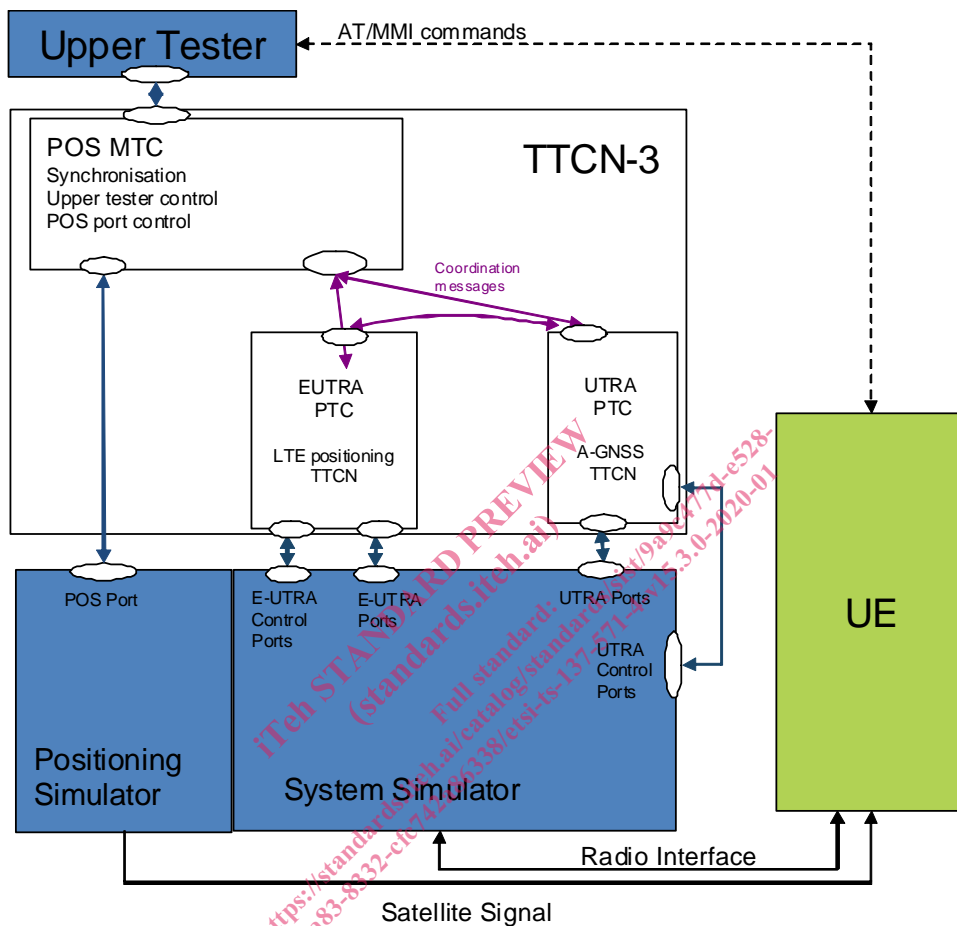


Figure 5.1.2-1: Component architecture for an E-UTRA and UTRA scenario

The PTCs are allocated according to the following principles:

- For LTE positioning tests cases, the E-UTRA PTC is created.
- For LTE positioning CS fallback test cases, E-UTRA and UTRA PTCs are created.
- For UTRA A-GNSS test cases, the UTRA PTC is created.

5.1.2.1 Interfaces

A number of interfaces are taken into consideration.

POS MTC - PTC:

Common synchronisation of PTCs.

Positioning simulator command/data coordination messages.

Upper tester primitives.

POS MTC - System Interface:

Upper tester primitives.

POS MTC- Positioning Simulator:

Positioning simulator command and data primitives.

PTC - PTC:

Primitives containing information for IRAT handover.

PTC - System Interface:

Primitives containing peer-to-peer message.

Configuration primitives.

5.2 Test model

In order to perform the LTE positioning and A-GNSS tests, the Positioning Simulator shall have two basic functional unites:

- Satellite simulator generating and broadcasting satellite signals.
- Assistance data source storing the data associated with the pre-defined GPS and GNSS test scenarios (see 3GPP TS 37.571-5 [5]).

This specification supports the following GNSS: GPS, Galileo, GLONASS and BDS.

5.2.1 LTE GNSS test model

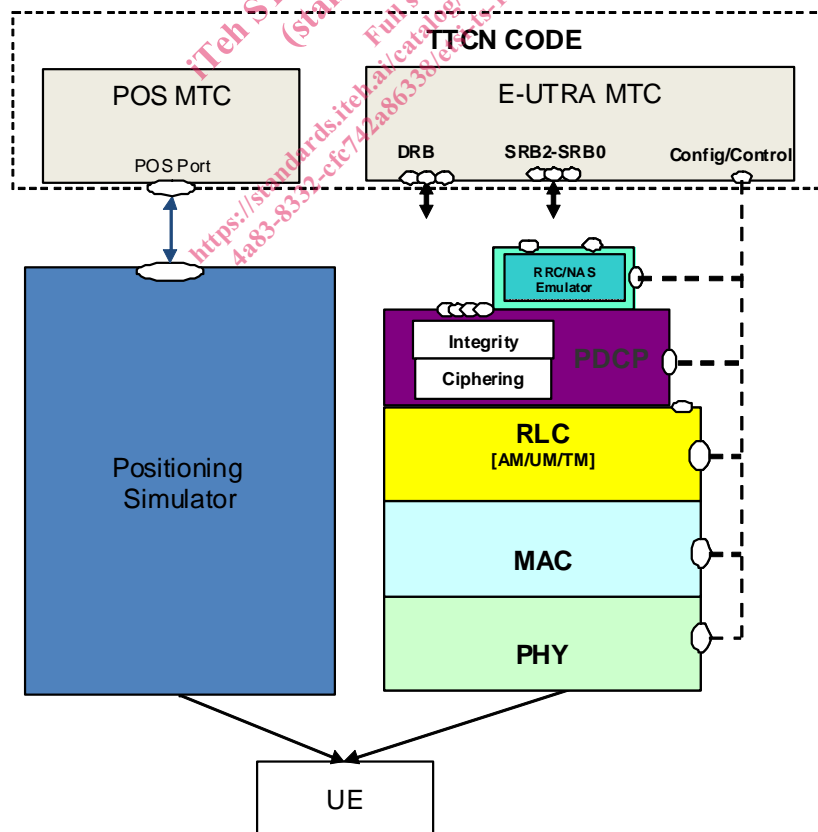


Figure 5.2.1-1: E-UTRA Test model for LTE positioning GNSS testing

The LTE positioning test model consists of an SS E-UTRAN protocol stack and a positioning simulator. The SS E-UTRA emulation part is the same as the model defined in 3GPP TS 36.523-3 [6].

The UE is configured in normal mode. On UE side Ciphering/Integrity (PDCP and NAS) is enabled. The tests are performed on C-Plane.

The ASPs at POS Port are used to:

- Load a pre-defined test scenario into the positioning simulator.
- Start or stop generating and broadcasting satellite signals from the positioning simulator.
- Retrieve the GNSS assistance data from assistance data source.

Under the ASP commands, the upper tester loads or re-loads pre-defined GNSS test scenario to the positioning simulator. The generated satellite signals shall simulate the GNSS environment as specified in 3GPP TS 37.571-2 [3], clause 5.

The SS also sends the GNSS assistance data to the UE through LPP signalling (see 3GPP TS 36.355 [10]) to facilitate the UE acquiring and tracking satellites. Such assistance data shall be consistent to within ± 2 seconds with the satellite signals generated (see 3GPP TS 37.571-2 [3], clause 5.2.1).

The assistance data source shall provide the assistance data consistent to $\pm 1/0$ second with the GNSS test scenario currently running in the satellite simulator (i.e. the data shall be up to 1 second in advance of the scenario); this allows for a further 2 seconds of latency in the SS. In case multiple satellite systems are configured in a test, the assistance data are requested or retrieved in a single ASP command for all satellite systems.

The UE positioning services are encoded in a TCAP [16] ROSE component [15] of the facility information element [14] in the Supplement Service [13] conveyed in the NAS messages. The facility information element is encoded in BER in TTCN referred to 3GPP TS 24.080 [13], clause 3.6.1 and 3GPP TS 29.002 [14], clause 17.1.1.

5.2.2 UTRA A-GNSS test model

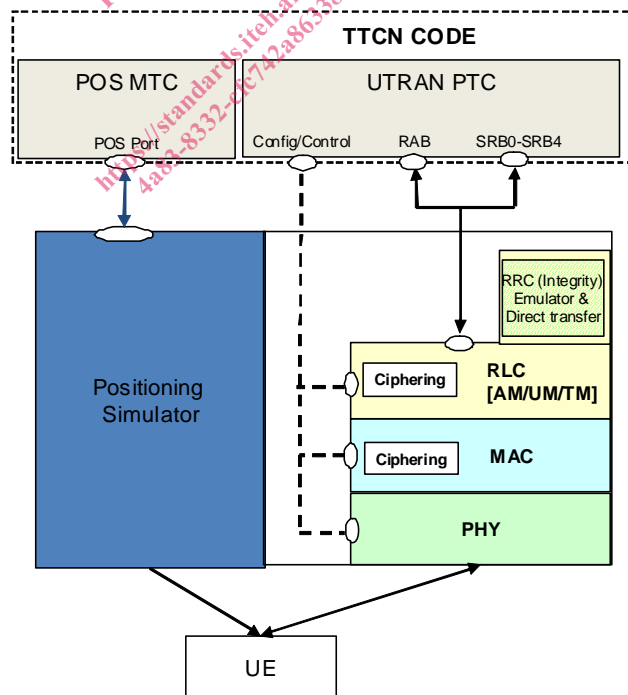


Figure 5.2.2-1: UTRA Test model for A-GNSS testing