

ETSI TS 137 571-4 V17.6.0 (2024-08)



**Universal Mobile Telecommunications System (UMTS);
LTE;
5G;
User Equipment (UE)
conformance specification for UE positioning;
Part 4: Test suites
(3GPP TS 37.571-4 version 17.6.0 Release 17)**



Reference

RTS/TSGR-0537571-4vh60

Keywords

5G,LTE,UMTS

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Foreword

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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: User Equipment (UE) conformance specification for UE positioning; Part 1: Terminal conformance.
- 3GPP TS 37.571-2: User Equipment (UE) conformance specification for UE positioning; Part 2: Protocol conformance.
- 3GPP TS 37.571-3: User Equipment (UE) conformance specification for UE positioning; Part 3: Implementation Conformance Statement (ICS).
- **3GPP TS 37.571-4: User Equipment (UE) conformance specification for UE positioning; Part 4: Test suites.**
- 3GPP TS 37.571-5: 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.
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- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 37.571-1: " User Equipment (UE) conformance specification for UE positioning; Part 1: Conformance test specification".
- [3] 3GPP TS 37.571-2: " User Equipment (UE) conformance specification for UE positioning; Part 2: Protocol conformance".
- [4] 3GPP TS 37.571-3: " User Equipment (UE) conformance specification for UE positioning; Part 3: Implementation Conformance Statement (ICS)".

- [5] 3GPP TS 37.571-5: " 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 37.355: " 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".
- [25] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".
- [26] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".
- [27] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".
- [28] 3GPP TS 38.508-1: "5GS; User Equipment (UE) conformance specification; Part 1: Common test environment".
- [29] 3GPP TS 38.211: "NR; Physical channels and modulation".

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.

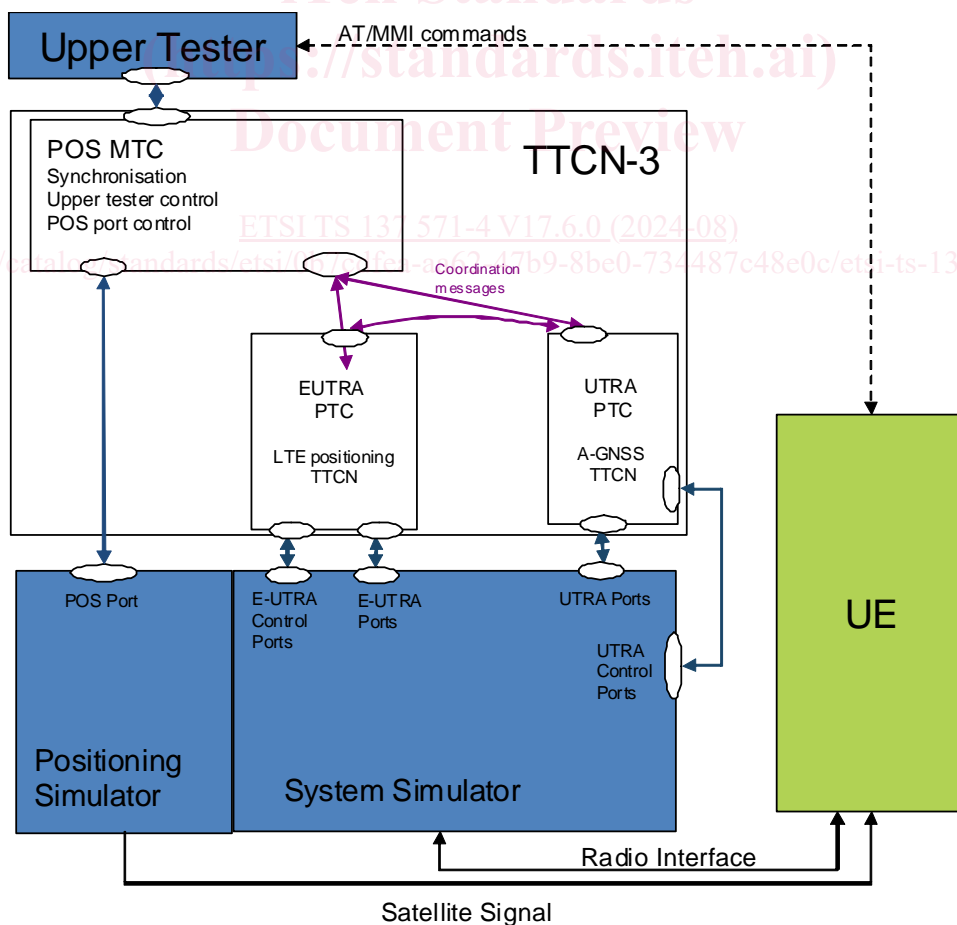


Figure 5.1.2-1: Component architecture for an E-UTRA and UTRA scenario

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

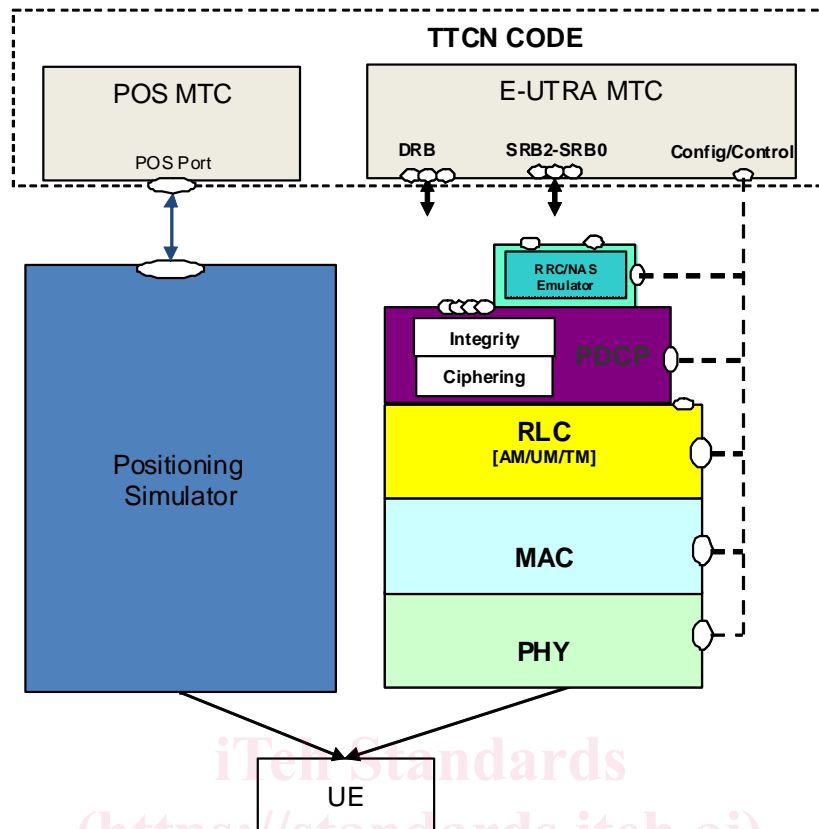


Figure 5.2.1-1: E-UTRA Test model for LTE positioning GNSS testing

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 37.355 [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

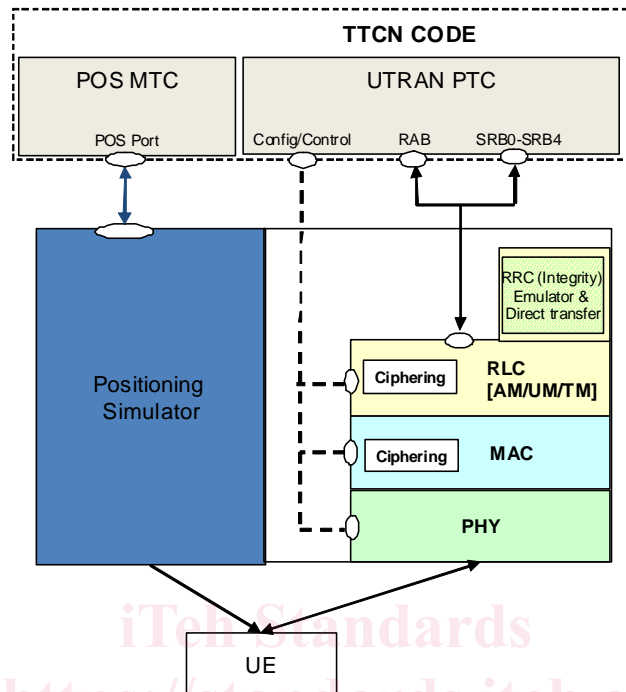


Figure 5.2.2-1: UTRA Test model for A-GNSS testing

The A-GNSS test model consists of an SS UTRAN protocol stack and a positioning simulator. The SS UTRA emulation part is the same as the model defined in 3GPP TS 36.523-3 [6], clause 4.4.1.

The UE is configured in normal mode. Cipherring and Integrity (RRC) are 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 GPS and GNSS assistance data from assistance data source.

Under the ASP commands, the upper tester loads or re-loads pre-defined GPS or GNSS test scenario to the positioning simulator. The generated satellite signals shall simulate the A-GPS and A-GNSS environment as specified in 3GPP TS 37.571-2 [3], clause 4.2.

The SS also sends the GPS or GNSS assistance data to the UE through RRC signalling 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 4.2).

The assistance data source shall provide the assistance data consistent to $\pm 1/0$ second with the GPS or 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.

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