



**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 1: Conformance test specification
(3GPP TS 37.571-1 version 11.2.0 Release 11)**



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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
 - 1 presented to TSG for information;
 - 2 presented to TSG for approval;
 - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

The present document is part 1 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: Conformance test specification.

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 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 the present document.

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*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".
- [3] 3GPP TS 36.171: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for Support of Assisted Global Navigation Satellite System (A-GNSS)".
- [4] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".
- [5] 3GPP TS 36.302: "Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer".
- [6] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements".
- [7] ETSI TR 102 273-1-2: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Improvement on Radiated Methods of Measurement (using test site) and evaluation of the corresponding measurement uncertainties; Part 1: Uncertainties in the measurement of mobile radio equipment characteristics; Sub-part 2: Examples and annexes".
- [8] IS-GPS-200, Revision D, Navstar GPS Space Segment/Navigation User Interfaces, March 7th, 2006.
- [9] P. Axelrad, R.G. Brown, "GPS Navigation Algorithms", in Chapter 9 of "Global Positioning System: Theory and Applications", Volume 1, B.W. Parkinson, J.J. Spilker (Ed.), Am. Inst. of Aeronautics and Astronautics Inc., 1996.
- [10] S.K. Gupta, "Test and Evaluation Procedures for the GPS User Equipment", ION-GPS Red Book, Volume 1, p. 119.
- [11] 3GPP TS 36.509: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Special conformance testing functions for User Equipment (UE)".

- [12] IS-GPS-705, Navstar GPS Space Segment/User Segment L5 Interfaces, September 22, 2005.
- [13] IS-GPS-800, Navstar GPS Space Segment/User Segment L1C Interfaces, September 4, 2008.
- [14] IS-QZSS, Quasi Zenith Satellite System Navigation Service Interface Specifications for QZSS, Ver.1.1, July 31, 2009.
- [15] Galileo OS Signal in Space ICD (OS SIS ICD), Draft 0, Galileo Joint Undertaking, May 23rd, 2006.
- [16] Global Navigation Satellite System GLONASS Interface Control Document, Version 5.1, 2008.
- [17] Specification for the Wide Area Augmentation System (WAAS), US Department of Transportation, Federal Aviation Administration, DTFA01-96-C-00025, 2001.
- [18] 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".
- [19] 3GPP TS 25.172: "Requirements for support of Assisted Galileo and Additional Navigation Satellite Systems (A-GANSS); Frequency Division Duplex (FDD)".
- [20] 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
- [21] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".
- [22] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".
- [23] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".
- [24] 3GPP TS 36.521-1: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification Radio transmission and reception Part 1: Conformance Testing".
- [25] 3GPP 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".
- [26] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".
- [27] 3GPP TR 25.990: "Vocabulary for UTRAN".
- [28] 3GPP TS 34.108: "Common test environments for User Equipment (UE) conformance testing".
- [29] 3GPP TS 34.109: "Terminal logical test interface; Special conformance testing functions".
- [30] 3GPP TS 25.331: "Radio Resource Control (RRC) protocol specification".
- [31] 3GPP TS 25.171: "Requirements for support of Assisted Global Positioning System (A-GPS); Frequency Division Duplex (FDD)".
- [32] 3GPP TS 25.302: "Services provided by the physical layer".
- [33] 3GPP TS 25.215: "Physical layer; Measurements (FDD)".
- [34] 3GPP TS 36.321: "Medium Access Control (MAC) protocol specification".
- [35] 3GPP TS 36.423: "X2 application protocol (X2AP) ".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1], 3GPP TR 25.990 [27], TS 36.101 [2], 3GPP TS 36.104 [21] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

Horizontal Dilution Of Precision (HDOP): measure of position determination accuracy that is a function of the geometrical layout of the satellites used for the fix, relative to the receiver antenna

3.2 Symbols

For the purposes of the present document, the abbreviations given in TR 21.905 [1], 3GPP TR 25.990 [27] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

| | |
|----------------------------------|--|
| E1 | Galileo E1 navigation signal with carrier frequency of 1575.420 MHz. |
| E5 | Galileo E5 navigation signal with carrier frequency of 1191.795 MHz. |
| E6 | Galileo E6 navigation signal with carrier frequency of 1278.750 MHz. |
| G1 | GLONASS navigation signal in the L1 sub-bands with carrier frequencies $1602 \text{ MHz} \pm k \times 562.5 \text{ kHz}$. |
| G2 | GLONASS navigation signal in the L2 sub-bands with carrier frequencies $1246 \text{ MHz} \pm k \times 437.5 \text{ kHz}$. |
| k | GLONASS channel number, $k = -7 \dots 13$. |
| L1 C/A | GPS or QZSS L1 navigation signal carrying the Coarse/Acquisition code with carrier frequency of 1575.420 MHz. |
| L1C | GPS or QZSS L1 Civil navigation signal with carrier frequency of 1575.420 MHz. |
| L2C | GPS or QZSS L2 Civil navigation signal with carrier frequency of 1227.600 MHz. |
| L5 | GPS or QZSS L5 navigation signal with carrier frequency of 1176.450 MHz. |
| PRP | Received (linear) average power of the resource elements that carry E-UTRA PRS, measured at the UE antenna connector. |
| G | Geometry Matrix. |
| $\rho_{GNSS_m,i}$ | Measured pseudo-range of satellite i of GNSS _m . |
| W | Weighting Matrix. |
| $\mathbf{1}_{GNSS_m,i}$ | Line of sight unit vector from the user to the satellite i of GNSS _m . |
| x | State vector of user position and clock bias. |
| T_s | Basic time unit, defined in TS 36.211 [26], clause 4. |
| \hat{E}_s | Received energy per RE (power normalized to the subcarrier spacing) during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector. |
| I_o | The total received power density, including signal and interference, as measured at the UE antenna connector. |
| I_{ot} | The received power spectral density of the total noise and interference for a certain RE (power integrated over the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector. |
| N_{oc} | The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector. |
| $\text{PRS } \hat{E}_s / I_{ot}$ | The ratio of the average received energy per PRS RE during the useful part of the symbol to the average received power spectral density of the total noise and interference for this RE, where the ratio is measured over all REs which carry PRS. |

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

| | |
|---------|--|
| A-GNSS | Assisted Global Navigation Satellite System |
| A-GPS | Assisted - Global Positioning System |
| AWGN | Additive White Gaussian Noise |
| C/A | Coarse/Acquisition |
| DRX | Discontinuous Reception |
| DUT | Device Under Test |
| ECEF | Earth Centred, Earth Fixed |
| ECID | Enhanced Cell Identification |
| EPRE | Energy Per Resource Element |
| E-UTRA | Evolved UMTS Terrestrial Radio Access |
| E-UTRAN | Evolved UMTS Terrestrial Radio Access Network |
| FDD | Frequency Division Duplex |
| GLONASS | Global'naya Navigatsionnaya Sputnikovaya Sistema (English: Global Navigation Satellite System) |
| GNSS | Global Navigation Satellite System |
| GPS | Global Positioning System |
| GSS | GNSS System Simulator |
| HDOP | Horizontal Dilution Of Precision |
| ICD | Interface Control Document |
| IS | Interface Specification |
| LOS | Line Of Sight |
| LPP | LTE Positioning Protocol |
| OCNG | OFDMA Channel Noise Generator |
| OCNS | Orthogonal Channel Noise Simulator |
| OTDOA | Observed Time Difference Of Arrival |
| PBCH | Physical Broadcast Channel |
| PCC | Primary Component Carrier |
| PCell | Primary Cell |
| PCFICH | Physical Control Format Indicator Channel |
| PDCCH | Physical Downlink Control Channel |
| PDSCH | Physical Downlink Shared Channel |
| PHICH | Physical Hybrid ARQ Indicator Channel |
| PPM | Parts per million |
| PRS | Positioning Reference Signal |
| PSS | Primary Synchronization Signal |
| QZSS | Quasi-Zenith Satellite System |
| RB | Resource Block |
| RE | Resource Element |
| RRC | Radio Resource Control |
| RSTD | Reference Signal Time Difference |
| SBAS | Space Based Augmentation System |
| SCC | Secondary Component Carrier |
| SCell | Secondary Cell |
| SS | System simulator |
| SSS | Secondary Synchronization Signal |
| SV | Space Vehicle |
| SV ID | Space Vehicle Identity |
| TDD | Time Division Duplex |
| TTFF | Time To First Fix |
| UE | User Equipment |
| WLS | Weighted Least Square |
| WGS-84 | World Geodetic System 1984 |

4 General test conditions

4.1 Introduction

This clause defines the various common test conditions required for the various measurement requirements in the remainder of the document.

In this clause the terms GNSS and A-GNSS also include the cases where the only satellite system used is GPS unless otherwise stated.

4.2 GNSS test conditions

4.2.1 GNSS signals

The GNSS signal is defined at the A-GNSS antenna connector of the UE. For UE with integral antenna only, a reference antenna with a gain of 0 dBi is assumed.

4.2.2 GNSS frequency

The GNSS signals shall be transmitted with a frequency accuracy of ± 0.025 PPM.

4.2.3 GNSS static propagation conditions

The propagation for the static performance measurement is an Additive White Gaussian Noise (AWGN) environment. No fading and multi-paths exist for this propagation model.

4.2.4 GNSS multi-path conditions

Doppler frequency difference between direct and reflected signal paths is applied to the carrier and code frequencies. The Carrier and Code Doppler frequencies of LOS and multi-path for GNSS signals are defined in table 4.2.1.

Table 4.2.1: Multi-path Conditions for GNSS Signals

| Initial relative Delay [GNSS chip] | Carrier Doppler frequency of tap [Hz] | Code Doppler frequency of tap [Hz] | Relative mean Power [dB] |
|--|--|---------------------------------------|-----------------------------|
| 0 | F_d | F_d / N | 0 |
| X | $F_d - 0.1$ | $(F_d - 0.1) / N$ | Y |
| NOTE: Discrete Doppler frequency is used for each tap. | | | |

Where the X and Y depends on the GNSS signal type and is shown in Table 4.2.2, and N is the ratio between the transmitted carrier frequency of the signals and the transmitted chip rate as shown in Table 4.2.3 (where k in Table 4.2.3 is the GLONASS frequency channel number).

Table 4.2.2

| System | Signals | X [m] | Y [dB] |
|-----------------------|---------|--------------------|--------|
| Galileo | E1 | 125 | -4.5 |
| | E5a | 15 | -6 |
| | E5b | 15 | -6 |
| GPS/Modernized GPS | L1 C/A | 0.5 chip / 150m | -6 |
| | L1C | 125 | -4.5 |
| | L2C | 150 | -6 |
| | L5 | 15 | -6 |
| GLONASS | G1 | 275 | -12.5 |
| | G2 | 275 | -12.5 |

Table 4.2.3

| System | Signals | N |
|--------------------|---------|--------------------------|
| Galileo | E1 | 1540 |
| | E5a | 115 |
| | E5b | 118 |
| GPS/Modernized GPS | L1 C/A | 1540 |
| | L1C | 1540 |
| | L2C | 1200 |
| | L5 | 115 |
| GLONASS | G1 | $3135.03 + k \cdot 1.10$ |
| | G2 | $2438.36 + k \cdot 0.86$ |

The initial carrier phase difference between taps shall be randomly selected between 0 and 2π radians. The initial value shall have uniform random distribution.

4.2.5 UEs supporting multiple satellite signals

For UEs supporting multiple satellite signals, different minimum performance requirements may be associated with different signals. The satellite simulator shall generate all signals supported by the UE. Signals not supported by the UE do not need to be simulated. The relative power levels of each signal type for each GNSS are defined in Table 4.2.4. The individual test scenarios in clauses 6 and 7 define the reference signal power level for each satellite. The power level of each simulated satellite signal type shall be set to the reference signal power level defined in each test scenario in clauses 6 and 7 plus the relative power level defined in Table 4.2.4.

Table 4.2.4: Relative signal power levels for each signal type for each GNSS

| | Galileo | | GPS/Modernized GPS | | GLONASS | | QZSS | | SBAS | |
|--|---------|-------|--------------------|---------|---------|-------|--------|---------|------|------|
| Signal power levels relative to reference power levels | E1 | 0 dB | L1 C/A | 0 dB | G1 | 0 dB | L1 C/A | 0 dB | L1 | 0 dB |
| | E6 | +2 dB | L1C | +1.5 dB | G2 | -6 dB | L1C | +1.5 dB | | |
| | E5 | +2 dB | L2C | -1.5 dB | | | L2C | -1.5 dB | | |
| | | | L5 | +3.6 dB | | | L5 | +3.6 dB | | |

NOTE 1: For test cases which involve “Modernized GPS”, the satellite simulator shall also generate the GPS L1 C/A signal if the UE supports “GPS” in addition to “Modernized GPS”.

NOTE 2: The signal power levels in the Test Parameter Tables represent the total signal power of the satellite per channel not e.g. pilot and data channels separately.

4.2.6 GNSS multi System Time Offsets

If more than one GNSS is used in a test, the accuracy of the GNSS-GNSS Time Offsets used at the system simulator shall be better than 3 ns.

4.3 UTRA test conditions

4.3.1 UTRA frequency band and frequency range

The UTRA tests in clauses 5 and 6 in the present document are performed at mid range of the UTRA operating frequency band of the UE. The UARFCNs to be used for mid range are defined in 3GPP TS 34.108 [28], clause 5.1.1.

If the UE supports multiple frequency bands then the Sensitivity tests in clauses 5.2 and 6.2 shall be repeated in each supported frequency band.

4.3.2 UTRA frequency

For the UTRA tests in clause 5 the UTRA frequency shall be offset with respect to the nominal frequency by an amount equal to the sum of +0.025 PPM and the offset in PPM of the actual transmitted GPS carrier frequency with respect to the nominal GPS frequency.

4.3.3 Sensors

The UTRA tests in clause 6 shall be met without the use of any data coming from sensors that can aid the positioning. A dedicated test message 'RESET UE POSITIONING STORED INFORMATION' has been defined in TS 34.109 [29] for the purpose of disabling any such sensors.

4.4 E-UTRA test conditions

4.4.1 E-UTRA frequency band and frequency range

The E-UTRA A-GNSS tests in clause 7 are performed on the mid range EARFCN of the E-UTRA operating frequency band of the UE as defined in TS 36.508 [18] clause 4.3.1.

If the UE supports multiple frequency bands then the A-GNSS Sensitivity tests in clause 7.1 shall be repeated in each supported frequency band.

4.4.2 Groups of bands

The E-UTRA tests in clauses 8, 9 and 10 use the band groupings below in order to increase the readability of the specification.

Table 4.4.2-1: E-UTRA band groups

| Group | E-UTRA FDD | | E-UTRA TDD | |
|--|---------------------|--|---------------------|--------------------------------|
| | Band group notation | Operating bands | Band group notation | Operating bands |
| A | FDD_A | 1, 4, 6, 10, 11, 18, 19, 21, 23, 24 | TDD_A | 33, 34, 35, 36, 37, 38, 39, 40 |
| B | FDD_B | - | TDD_B | - |
| C | FDD_C | 9, 30 | TDD_C | 42, 43 |
| D | FDD_D | 28 | TDD_D | - |
| E | FDD_E | 2, 5, 7, 27 | TDD_E | 41, 44 |
| F | FDD_F | 26 ^{Note 3} | TDD_F | - |
| G | FDD_G | 3, 8, 12, 13, 14, 17, 20, 22, 29 ^{Note 2} | TDD_G | - |
| H | FDD_H | 25 | TDD_H | - |
| I | FDD_I | - | TDD_I | - |
| J | FDD_J | - | TDD_J | - |
| K | FDD_K | - | TDD_K | - |
| L | FDD_L | - | TDD_L | - |
| M | FDD_M | - | TDD_M | - |
| N | FDD_N | 31 | TDD_N | - |
| NOTE 1: The bands within the same group have the same Io conditions in a corresponding requirement in this specification. | | | | |
| NOTE 2: Band 29 is used only for E-UTRA carrier aggregation with other E-UTRA bands. | | | | |
| NOTE 3: The minimum Io condition for Band 26 is reduced by 0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz. | | | | |

4.4.3 Sensors

All the minimum performance requirements in clause 7 shall be met without the use of any data coming from sensors that can aid the positioning. A dedicated test message 'RESET UE POSITIONING STORED INFORMATION' has been defined in TS 36.509 [11] for the purpose of disabling any such sensors.

4.5 A-GNSS test conditions

4.5.1 General

Clauses 5, 6 and 7 define the minimum performance requirements for both UE based and UE assisted A-GNSS terminals. If a terminal supports both modes then it shall be tested in both modes.

4.5.2 UTRAN measurement parameters

4.5.2.1 UE based A-GNSS measurement parameters

In case of UE-based A-GNSS, the measurement parameters are contained in the RRC UE POSITIONING POSITION ESTIMATE INFO IE. The measurement parameter is the horizontal position estimate reported by the UE and expressed in latitude/longitude.

4.5.2.2 UE assisted A-GNSS measurement parameters

In case of UE-assisted A-GNSS, the measurement parameters are contained in the RRC UE POSITIONING GANSS MEASURED RESULTS IE and/or the RRC UE POSITIONING GPS MEASURED RESULTS IE. The measurement parameters are the UE GANSS Code Phase measurements and/or the UE GPS Code Phase measurements, as specified in 3GPP TS 25.302 [32] and 3GPP TS 25.215 [33]. The UE GANSS Code Phase measurements and/or the UE GPS Code Phase measurements are converted into a horizontal position estimate using the procedure detailed in Annex B.

4.5.2.3 2D position error

The 2D position error is defined by the horizontal difference in meters between the ellipsoid point reported or calculated from the UE Measurement Report and the actual simulated position of the UE in the test case considered.

4.5.2.4 Response time

Max Response Time is defined as the time starting from the moment that the UE has received the final RRC measurement control message containing reporting criteria different from "No Reporting" sent before the UE sends the measurement report containing the position estimate or the GANSS and/or GPS measured result, and ending when the UE starts sending the measurement report containing the position estimate or the GANSS and/or GPS measured result on the Uu interface. The response times specified for all test cases are Time-to-First-Fix (TTFF) unless otherwise stated, i.e. the UE shall not re-use any information on GNSS time, location or other aiding data that was previously acquired or calculated and stored internally in the UE. A dedicated test message 'RESET UE POSITIONING STORED INFORMATION' specified in 3GPP TS 34.109 [29], clause 5.4, has been defined for the purpose of deleting this information.

4.5.3 E-UTRAN measurement parameters

4.5.3.1 UE based A-GNSS measurement parameters

In case of UE-based A-GNSS, the measurement parameters are contained in the LPP *GNSS-LocationInformation* IE which is included in the *A-GNSS-ProvideLocationInformation* IE provided in the LPP message of type PROVIDE LOCATION INFORMATION. The measurement parameter in case of UE-based A-GNSS is the horizontal position estimate reported by the UE and expressed in latitude/longitude.

4.5.3.2 UE assisted A-GNSS measurement parameters

In case of UE-assisted A-GNSS, the measurement parameters are contained in the LPP *GNSS-SignalMeasurementInformation* IE which is included in the *A-GNSS-ProvideLocationInformation* IE provided in the LPP message of type PROVIDE LOCATION INFORMATION. The measurement parameters in case of UE-assisted A-GNSS are the UE GNSS code phase measurements, as specified in 3GPP TS 36.302 [5] and 3GPP TS 36.214 [6]. The UE GNSS code phase measurements are converted into a horizontal position estimate using the procedure detailed in Annex B.

4.5.3.3 2D Error definition

The 2D position error is defined by the horizontal difference in meters between the ellipsoid point reported or calculated from the LPP message of type PROVIDE LOCATION INFORMATION and the actual position of the UE in the test case considered.

4.5.3.4 Response time

Max Response Time is defined as the time starting from the moment that the UE has received the LPP message of type REQUEST LOCATION INFORMATION, and ending when the UE starts sending the LPP message of type PROVIDE LOCATION INFORMATION on the Uu interface. The response times specified for all test cases are Time-to-First-Fix (TTFF) unless otherwise stated, i.e. the UE shall not re-use any information on GNSS time, location or other aiding data that was previously acquired or calculated and stored internally in the UE. A dedicated test message 'RESET UE POSITIONING STORED INFORMATION' has been defined in TS 36.509 [11] clause 6.9 for the purpose of deleting this information.

4.5.4 Converting A-GNSS UE-assisted measurement reports into position estimates

To convert the A-GNSS UE measurement reports in case of UE-assisted mode of A-GNSS into position errors, a transformation between the "measurement domain" (code-phases, etc.) into the "state" domain (position estimate) is necessary. Such a transformation procedure is outlined in Annex B.

4.6 ECID test conditions

4.6.1 Simulated cells

For the ECID performance test cases in clause 8.1, a cell environment as defined in 3GPP TS 36.508 [18] with Cell 1 is used. The default parameters for simulated cells are the same as specified in 3GPP TS 36.508 [18], with the following exceptions:

[FFS]

4.6.2 Propagation conditions

4.6.2.1 Static

See TS 36.521-1 [24] clause B.1.

4.6.2.2 Multi-path fading

See TS 36.521-1[24] clauses B.2, B.2.1 and B.2.2.

4.6.3 UE Rx - Tx time difference reporting range

The reporting range of UE Rx - Tx time difference is defined from 0 to $20472T_s$ with $2T_s$ resolution for UE Rx - Tx time difference less than $4096T_s$ and $8T_s$ for UE Rx - Tx time difference equal to or greater than $4096T_s$.

The mapping of measured quantity is defined in Table 4.6.3-1.

Table 4.6.3-1: UE Rx - Tx time difference measurement report mapping

| Reported value | Measured quantity value | Unit |
|----------------------------|------------------------------------|-------|
| RX-TX_TIME_DIFFERENCE_0000 | $T_{UE\ Rx-Tx} < 2$ | T_s |
| RX-TX_TIME_DIFFERENCE_0001 | $2 \leq T_{UE\ Rx-Tx} < 4$ | T_s |
| RX-TX_TIME_DIFFERENCE_0002 | $4 \leq T_{UE\ Rx-Tx} < 6$ | T_s |
| ... | ... | ... |
| RX-TX_TIME_DIFFERENCE_2046 | $4092 \leq T_{UE\ Rx-Tx} < 4094$ | T_s |
| RX-TX_TIME_DIFFERENCE_2047 | $4094 \leq T_{UE\ Rx-Tx} < 4096$ | T_s |
| RX-TX_TIME_DIFFERENCE_2048 | $4096 \leq T_{UE\ Rx-Tx} < 4104$ | T_s |
| RX-TX_TIME_DIFFERENCE_2049 | $4104 \leq T_{UE\ Rx-Tx} < 4112$ | T_s |
| ... | ... | ... |
| RX-TX_TIME_DIFFERENCE_4093 | $20456 \leq T_{UE\ Rx-Tx} < 20464$ | T_s |
| RX-TX_TIME_DIFFERENCE_4094 | $20464 \leq T_{UE\ Rx-Tx} < 20472$ | T_s |
| RX-TX_TIME_DIFFERENCE_4095 | $20472 \leq T_{UE\ Rx-Tx}$ | T_s |

4.7 OTDOA test conditions

4.7.1 Simulated cells

For the intra-frequency OTDOA measurement test cases in clause 9.1, a multi cell environment as defined in 3GPP TS 36.508 [18] with Cell 1, Cell 2, and Cell 4 (if needed in the test) is used.

For the inter-frequency OTDOA measurement test cases in clause 9.2, a multi cell environment as defined in 3GPP TS 36.508 [18] with Cell 1 (called Cell 1 in the tests), Cell 3 (called Cell 2 in the tests), and Cell 6 (called Cell 3 in the tests) (if needed in the test) is used.

For the OTDOA measurement test cases for Carrier Aggregation in clause 10, a multi cell environment is used with Cell 1 as the PCell on the PCC, Cell 2 is an active SCell on the SCC, and Cell 3 is a neighbour cell on the SCC.

The default parameters for simulated cells are the same as specified in 3GPP TS 36.508 [18], with the following exceptions:

- All cells transmit PRS according to the PRS configuration provided in the OTDOA assistance data defined for each test. The positioning subframes are low-interference subframes, i.e. contain no PDSCH transmissions.
- The physical layer cell identities are selected such that the relative shifts of PRS patterns among cells used in the tests are as given by the test parameters of the individual test cases.
- The cells shall be synchronized and the timing offset (the RSTD) between the cells referenced to the UE's antenna input is given in the individual test cases.

4.7.2 Propagation conditions

4.7.2.1 Static

See TS 36.521-1 [24] clause B.1.

4.7.2.2 Multi-path fading

See TS 36.521-1[24] clauses B.2, B.2.1 and B.2.2.

4.7.3 Response time

The response time is defined as the time starting from the moment that the UE has received the LPP message of type REQUEST LOCATION INFORMATION, and ending when the UE starts sending the LPP message of type PROVIDE LOCATION INFORMATION on the Uu interface. The response time specified for the Measurement Reporting Delay test cases assumes that the UE shall not re-use any RSTD information or other aiding data that was previously acquired

and stored internally in the UE. A dedicated test message 'RESET UE POSITIONING STORED INFORMATION' has been defined in TS 36.509 [11] clause 6.9 for the purpose of deleting this information.

4.7.4 RSTD reporting range

The reporting range of RSTD is defined from $-15391T_s$ to $15391T_s$ with $1T_s$ resolution for absolute value of RSTD less or equal to $4096T_s$ and $5T_s$ for absolute value of RSTD greater than $4096T_s$.

The mapping of measured quantity is defined in Table 4.7.4-1.

Table 4.7.4-1: RSTD report mapping

| Reported Value | Measured Quantity Value | Unit |
|----------------|------------------------------------|-------|
| RSTD_0000 | $-15391 > \text{RSTD}$ | T_s |
| RSTD_0001 | $-15391 \leq \text{RSTD} < -15386$ | T_s |
| ... | ... | ... |
| RSTD_2258 | $-4106 \leq \text{RSTD} < -4101$ | T_s |
| RSTD_2259 | $-4101 \leq \text{RSTD} < -4096$ | T_s |
| RSTD_2260 | $-4096 \leq \text{RSTD} < -4095$ | T_s |
| RSTD_2261 | $-4095 \leq \text{RSTD} < -4094$ | T_s |
| ... | ... | ... |
| RSTD_6353 | $-3 \leq \text{RSTD} < -2$ | T_s |
| RSTD_6354 | $-2 \leq \text{RSTD} < -1$ | T_s |
| RSTD_6355 | $-1 \leq \text{RSTD} \leq 0$ | T_s |
| RSTD_6356 | $0 < \text{RSTD} \leq 1$ | T_s |
| RSTD_6357 | $1 < \text{RSTD} \leq 2$ | T_s |
| RSTD_6358 | $2 < \text{RSTD} \leq 3$ | T_s |
| ... | ... | ... |
| RSTD_10450 | $4094 < \text{RSTD} \leq 4095$ | T_s |
| RSTD_10451 | $4095 < \text{RSTD} \leq 4096$ | T_s |
| RSTD_10452 | $4096 < \text{RSTD} \leq 4101$ | T_s |
| RSTD_10453 | $4101 < \text{RSTD} \leq 4106$ | T_s |
| ... | ... | ... |
| RSTD_12709 | $15381 < \text{RSTD} \leq 15386$ | T_s |
| RSTD_12710 | $15386 < \text{RSTD} \leq 15391$ | T_s |
| RSTD_12711 | $15391 < \text{RSTD}$ | T_s |

4.7.5 RSTD Carrier Aggregation Test Cases with Different Channel Bandwidth Combinations

RSTD carrier aggregation test cases may be defined with different channel bandwidth combinations to verify the same requirement.

If multiple carrier aggregation test cases with different channel bandwidth combinations are defined to verify the same requirement that is channel bandwidth independent, then the UE needs to be tested only with one bandwidth combination out of the bandwidth combination sets supported by that UE.

5 UTRA A-GPS Minimum Performance requirements

5.1 General

This clause defines the minimum performance requirements for FDD UTRA terminals where the only Assisted Global Navigation Satellite System (A-GNSS) supported is Assisted Global Positioning System (A-GPS) L1 C/A. The procedures for UEs that support other or additional A-GNSSs are specified in clause 6. This clause defines requirements for both UE based and UE assisted modes; if a terminal supports both modes then it shall be tested in both modes

The requirements in this clause are defined for CELL_DCH and CELL_FACH states. All tests shall be performed in CELL_DCH state and the Nominal Accuracy Performance test case shall be also performed in CELL_FACH state.

5.2 Sensitivity

5.2.1 Sensitivity Coarse Time Assistance

5.2.1.1 Definition and applicability

Sensitivity with coarse time assistance is the minimum level of GPS satellite signals required for the UE to make an A-GPS position estimate to a specific accuracy and within a specific response time when the network only provides coarse time assistance.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GPS.

5.2.1.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 5.2.1.2 for the parameters specified in table 5.2.1.1.

Table 5.2.1.1: Test parameters for Sensitivity Coarse Time Assistance

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ± 2 |
| GPS Signal for one satellite | dBm | -142 |
| GPS Signal for remaining satellites | dBm | -147 |

Table 5.2.1.2: Minimum requirements for Sensitivity Coarse Time Assistance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.171 [31], clause 5.1.1.1.

5.2.1.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GPS satellite signal conditions that represent weak signal conditions and with only Coarse Time Assistance provided by the SS.

5.2.1.4 Method of test

5.2.1.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GPS test parameters as specified in table 5.2.1.3 for GPS scenario #1. Select the first satellite PRN defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5 for the one satellite with the higher level.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

5.2.1.4.2 Procedure

1. Start GPS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 5.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 5.2.1.2.4
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 5.2.2 and 5.2.6 for UE based testing; or clauses 5.2.4 and 5.2.6 for UE assisted testing with the value of GPS TOW msec offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 5.2.6.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.1 or 7.5.4.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 5.2.1.4 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 5.2.1.4 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.2.1.4 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GPS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE, used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.2.1.4 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GPS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Select the first satellite PRN defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5 for the one satellite with the higher level. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 5.2.1.5 are met. Each time scenario #1 or #2 is used, the start time of the GPS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used select the next satellite PRN from the one used previously, defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5, for the one satellite with the higher level.
7. Release the connection using the procedure in clause F.3.

5.2.1.5 Test Requirements

For the parameters specified in table 5.2.1.3 the UE shall meet the requirements and the success rate specified in table 5.2.1.4 with a confidence level of 95% according to annex D.

Table 5.2.1.3: Test parameters for Sensitivity Coarse Time Assistance

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ± 1.8 |
| GPS Signal for one satellite | dBm | -141 |
| GPS Signal for remaining satellites | dBm | -146 |

Table 5.2.1.4: Test requirements for Sensitivity Coarse Time Assistance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

5.2.2 Sensitivity Fine Time Assistance

5.2.2.1 Definition and applicability

Sensitivity with fine time assistance is the minimum level of GPS satellite signals required for the UE to make an A-GPS position estimate to a specific accuracy and within a specific response time when the network provides fine time assistance in addition to coarse time assistance.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GPS and that is capable of providing an enhanced performance when the network provides Fine Time Assistance.

5.2.2.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 5.2.2.2 for the parameters specified in table 5.2.2.1.

Table 5.2.2.1: Test parameters for Sensitivity Fine Time Assistance

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse time assistance error range | seconds | ± 2 |
| GPS Fine Time assistance error range | μ s | ± 10 |
| GPS Signal for all satellites | dBm | -147 |

Table 5.2.2.2: Minimum requirements for Sensitivity Fine Time Assistance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.171 [31], clause 5.1.2.1.

5.2.2.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GPS satellite signal conditions that represent weak signal conditions and with Fine Time Assistance provided by the SS.

5.2.2.4 Method of test

5.2.2.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GPS test parameters as specified in table 5.2.2.3 for GPS scenario #1.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

5.2.2.4.2 Procedure

1. Start GPS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 5.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 5.2.1.2.4
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 5.2.2 and 5.2.6 for UE based testing; or clauses 5.2.4 and 5.2.6 for UE assisted testing with the values of GPS TOW msec and UTRAN GPS timing of cell frames offset by random values as specified in 3GPP TS 37.571-5 [20] clause 5.2.6.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.1 or 7.5.4.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 5.2.2.4 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 5.2.2.4 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.2.2.4 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GPS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.2.2.4 and record one Good Result or Bad Result as appropriate.
5. Repeat steps 1 to 4 using GPS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec and UTRAN GPS timing of cell frames offsets in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 5.2.2.5 are met. Each time scenario #1 or #2 is used, the start time of the GPS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again.
7. Release the connection using the procedure in clause F.3.

5.2.2.5 Test Requirements

For the parameters specified in table 5.2.2.3 the UE shall meet the requirements and the success rate specified in table 5.2.2.4 with a confidence level of 95% according to annex D.

Table 5.2.2.3: Test parameters for Sensitivity Fine Time Assistance

| Parameters | Unit | Value |
|--|---------------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse time assistance error range | seconds | ± 1.8 |
| GPS Fine Time assistance error range | μs | ± 9 |
| GPS Signal for all satellites | dBm | -146 |

Table 5.2.2.4: Test requirements for Sensitivity Fine Time Assistance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

5.3 Nominal Accuracy

5.3.1 Definition and applicability

Nominal accuracy is the accuracy of the UE's A-GPS position estimate under ideal GPS signal conditions.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GPS.

5.3.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 5.3.2 for the parameters specified in table 5.3.1.

Table 5.3.1: Test parameters for Nominal Accuracy

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ± 2 |
| GPS Signal for all satellites | dBm | -130 |

Table 5.3.2: Minimum requirements for Nominal Accuracy

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 30 m | 20 s |

The reference for this requirement is 3GPP TS 25.171 [31], clause 5.2.1.

5.3.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GPS satellite signal conditions that represent ideal conditions.

5.3.4 Method of test

5.3.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GPS test parameters as specified in table 5.3.3 for GPS scenario #1.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

5.3.4.2 Procedure

1. Start GPS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 5.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 5.2.1.2.4
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 5.2.2 and 5.2.6 for UE based testing; or clauses 5.2.4 and 5.2.6 for UE assisted testing with the value of GPS TOW msec offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 5.2.6.2; using the exception to the RRC MEASUREMENT CONTROL message listed in table 5.3.2A; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.1 or 7.5.4.

Table 5.3.2A: Contents of RRC MEASUREMENT CONTROL message

| Information Element | Value/Remark |
|--|--------------|
| - UE positioning reporting quantity - Horizontal accuracy | 10 (15.9 m) |

3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 5.3.4 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 5.3.4 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.3.4 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GPS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.3.4 and record one Good Result or Bad Result as appropriate.
5. Repeat steps 1 to 4 using GPS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 5.3.5 are met. Each time scenario #1 or #2 is used, the start time of the GPS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again.
7. Release the connection using the procedure in clause F.3.

5.3.5 Test Requirements

For the parameters specified in table 5.3.3 the UE shall meet the requirements and the success rate specified in table 5.3.4 with a confidence level of 95% according to annex D.

Table 5.3.3: Test parameters for Nominal Accuracy

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ± 1.8 |
| GPS Signal for all satellites | dBm | -130 |

Table 5.3.4: Test requirements for Nominal Accuracy

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 31.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

5.4 Dynamic Range

5.4.1 Definition and applicability

Dynamic Range is the maximum difference in level of the GPS signals from a number of satellites that allows the UE to make an A-GPS position estimate with a specific accuracy and a specific response time.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GPS.

5.4.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 5.4.2 for the parameters specified in table 5.4.1.

Table 5.4.1: Test parameters for Dynamic Range

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 6 |
| HDOP Range | - | 1.4 to 2.1 |
| GPS Coarse Time assistance error range | seconds | ± 2 |
| Propagation conditions | - | AWGN |
| GPS Signal for 1 st satellite | dBm | -129 |
| GPS Signal for 2 nd satellite | dBm | -135 |
| GPS Signal for 3 rd satellite | dBm | -141 |
| GPS Signal for 4 th satellite | dBm | -147 |
| GPS Signal for 5 th satellite | dBm | -147 |
| GPS Signal for 6 th satellite | dBm | -147 |

Table 5.4.2: Minimum requirements for Dynamic Range

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.171 [31], clause 5.3.1.

5.4.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GPS satellite signal conditions that have a wide dynamic range. Strong satellites are likely to degrade the acquisition of weaker satellites due to their cross-correlation products.

5.4.4 Method of test

5.4.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GPS test parameters as specified in table 5.4.3 for GPS scenario #1. Select the first three satellite PRNs defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5 for the three satellites with the higher levels.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

5.4.4.2 Procedure

1. Start GPS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 5.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 5.2.1.2.4
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 5.2.2 and 5.2.6 for UE based testing; or clauses 5.2.4 and 5.2.6 for UE assisted testing with the value of GPS TOW msec offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 5.2.6.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.1 or 7.5.4.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 5.4.4 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 5.4.4 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.4.4 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GPS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.4.4 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GPS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Select the first three satellite PRNs defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5 for the three satellites with the higher levels. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 5.4.5 are met. Each time scenario #1 or #2 is used, the start time of the GPS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, increment the set of three satellite PRNs by one from the ones used previously, defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5, for the three satellites with the higher

levels (i.e. if the set of satellites is a, b, c, d, e, f and the first set used was a, b, c, the second set shall be b, c, d and so on).

7. Release the connection using the procedure in clause F.3.

5.4.5 Test Requirements

For the parameters specified in table 5.4.3 the UE shall meet the requirements and the success rate specified in table 5.4.4 with a confidence level of 95% according to annex D.

Table 5.4.3: Test parameters for Dynamic Range

| Parameters | Unit | Value |
|--|---------|--------------|
| Number of generated satellites | - | 6 |
| HDOP Range | - | 1.4 to 2.1 |
| GPS Coarse Time assistance error range | seconds | $\pm 2 + TT$ |
| Propagation conditions | - | AWGN |
| GPS Signal for 1 st satellite | dBm | -128.2 |
| GPS Signal for 2 nd satellite | dBm | -134 |
| GPS Signal for 3 rd satellite | dBm | -140 |
| GPS Signal for 4 th satellite | dBm | -146 |
| GPS Signal for 5 th satellite | dBm | -146 |
| GPS Signal for 6 th satellite | dBm | -146 |

Table 5.4.4: Test requirements for Dynamic Range

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

5.5 Multi-path Performance

5.5.1 Definition and applicability

Multi-path performance measures the accuracy and response time of the UE's A-GPS position estimate in a specific GPS signal multi-path environment.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GPS.

5.5.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 5.5.2 for the parameters specified in table 5.5.1.

Table 5.5.1: Test parameters for Multi-path Performance

| Parameters | Unit | Value |
|---|---------|---|
| Number of generated satellites (see note) | - | 5 |
| GPS Coarse Time assistance error range | seconds | ± 2 |
| HDOP Range | - | 1.8 to 2.5 |
| GPS signal for Satellite 1, 2 (see note) | dBm | -130 |
| GPS signal for Satellite 3, 4, 5 (see note) | dBm | LOS signal of -130 dBm, multi-path signal of -136 dBm |
| NOTE: Satellites 1, 2 no multi-path. Satellites 3, 4, 5 multi-path defined in clause 4.2.4. | | |

Table 5.5.2: Minimum requirements for Multi-path Performance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.171 [31], clause 5.4.1.

5.5.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GPS satellite signal conditions that represent simple multi-path conditions.

5.5.4 Method of test

5.5.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GPS test parameters as specified in table 5.5.3 for GPS scenario #1. Select the first two satellite PRNs defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5 for the two satellites with the higher levels.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

5.5.4.2 Procedure

1. Start GPS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 5.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 5.2.1.2.4. The initial carrier phase difference between taps of the multi-path model shall be randomly selected between 0 and 2π radians by selecting the next random number from a standard uniform random number generator, in the range 0 to 2π , representing radians with a resolution of 0.1, representing 0.1 radians.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 5.2.2 and 5.2.6 for UE based testing; or clauses 5.2.4 and 5.2.6 for UE assisted testing with the value of GPS TOW msec offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 5.2.6.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.1 or 7.5.4.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 5.5.4 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 5.5.4 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.5.4 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GPS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.5.4 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GPS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Select the first two satellite PRNs defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5 for the two satellites with the higher levels. Use new random values for

the UE location and altitude, and the initial carrier phase difference between taps of the multi-path model in step 1 and for the GPS TOW msec offset in step 3.

6. Repeat steps 1 to 5 until the statistical requirements of clause 5.5.5 are met. Each time scenario #1 or #2 is used, the start time of the GPS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, increment the set of two satellite PRNs by one from the ones used previously, defined in the table in 3GPP TS 37.571-5 [20] clause 5.2.1.2.5, for the two satellites with the higher level (i.e. if the set of satellites is a, b, c, d, e and the first set used was a, b the second set shall be b, c and so on).
7. Release the connection using the procedure in clause F.3.

5.5.5 Test Requirements

For the parameters specified in table 5.5.3 the UE shall meet the requirements and the success rate specified in table 5.5.4 with a confidence level of 95% according to annex D.

Table 5.5.3: Test parameters for Multi-path Performance

| Parameters | Unit | Value |
|---|---------|---|
| Number of generated satellites (see note) | - | 5 |
| GPS Coarse Time assistance error range | seconds | $\pm 2 + TT$ |
| HDOP Range | - | 1.8 to 2.5 |
| GPS signal for Satellite 1, 2 (see note) | dBm | -130 |
| GPS signal for Satellite 3, 4, 5 (see note) | dBm | LOS signal of -130 dBm, multi-path signal of -136.2 dBm |
| NOTE: Satellites 1, 2 no multi-path. Satellites 3, 4, 5 multi-path defined in clause 4.2.4. | | |

Table 5.5.4: Test requirements for Multi-path Performance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

5.6 Moving Scenario and Periodic Update Performance

5.6.1 Definition and applicability

Moving scenario and periodic update performance measures the accuracy of the UE's A-GPS position estimates and the periodic update capability of the UE in a moving scenario.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GPS.

5.6.2 Minimum requirements

The position estimates, after the first reported position estimate, shall meet the accuracy requirement in table 5.6.2 with the periodical reporting interval of 2 seconds for the parameters specified in table 5.6.1.

NOTE: In the actual testing the UE may report error messages until it has been able to acquire GPS measured results or a position estimate. The SS shall only consider the first measurement report different from an error message as the first position estimate in the requirement in table 5.6.2.

Table 5.6.1: Test parameters for Moving Scenario and Periodic Update Performance

| Parameters | Unit | Value |
|--------------------------------|------|------------|
| Number of generated satellites | - | 5 |
| HDOP Range | - | 1.8 to 2.5 |
| Propagation condition | - | AWGN |
| GPS signal for all satellites | dBm | -130 |

Table 5.6.2: Minimum requirements for Moving Scenario and Periodic Update Performance

| Success Rate | 2-D position error |
|--------------|--------------------|
| 95 % | 100 m |

The reference for this requirement is 3GPP TS 25.171 [31], clause 5.5.1.

5.6.3 Test purpose

To verify the UE's position estimates, after the first reported position estimate, meet the minimum requirements under GPS satellite signal conditions that simulate a moving scenario. A good tracking performance, with regular position estimate reporting is essential for certain location services.

5.6.4 Method of test

5.6.4.1 Initial conditions

Test environment: normal; see Annex G.

The UE is requested to use periodical reporting with a reporting interval of 2 seconds.

The GPS signals simulate the UE moving on a rectangular trajectory of 940 m by 1 440 m with rounded corners defined in figure 5.6.1 and table 5.6.3. The initial reference is first defined followed by acceleration to final speed of 100 km/h in 250 m. The UE then maintains the speed for 400 m. This is followed by deceleration to final speed of 25 km/h in 250 m. The UE then turn 90 degrees with turning radius of 20 m at 25 km/h. This is followed by acceleration to final speed of 100 km/h in 250 m. The sequence is repeated to complete the rectangle.

Table 5.6.3: Trajectory Parameters for Moving Scenario and Periodic Update Performance test case

| Parameter | Distance (m) | Speed (km/h) |
|----------------------------------|--------------|-------------------------|
| $l_{11}, l_{15}, l_{21}, l_{25}$ | 20 | 25 |
| $l_{12}, l_{14}, l_{22}, l_{24}$ | 250 | 25 to 100 and 100 to 25 |
| l_{13} | 400 | 100 |
| l_{23} | 900 | 100 |

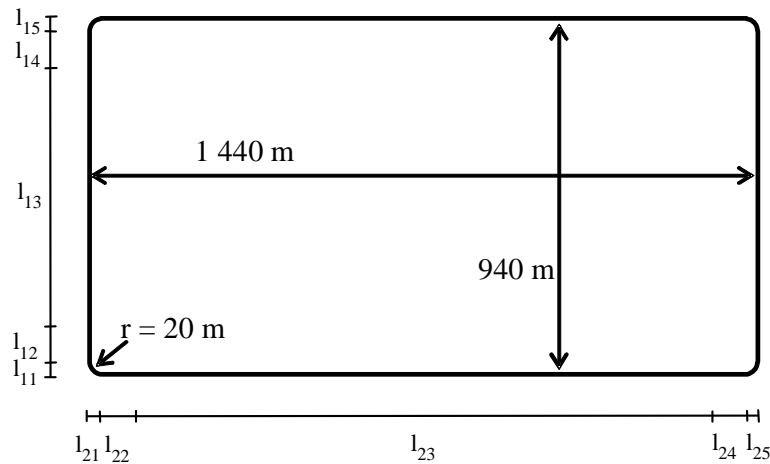


Figure 5.6.1: Rectangular Trajectory for Moving Scenario and Periodic Update Performance test case

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GPS test parameters as specified in table 5.6.4 for GPS scenario #3.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

5.6.4.2 Procedure

1. Start GPS scenario #3 as specified in 3GPP TS 37.571-5 [20], clause 5.2.1.2
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 5.2.2 and 5.2.6 for UE based testing; or clauses 5.2.4 and 5.2.6 for UE assisted testing; as required to obtain fixes using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.2 or 7.5.5.
3. Ignore any error messages that the UE may report in MEASUREMENT REPORT messages until it has been able to acquire the GPS signals and reports the first GPS measured result or position estimate.
4. Discard the first GPS measured result or position estimate.
5. Record the time of reception of the next MEASUREMENT REPORT message after reception of the first GPS measured result or position estimate.
6. After the reception of the first GPS measured result or position estimate reported in a MEASUREMENT REPORT message, every time the UE returns a GPS measured result or position estimate in the MEASUREMENT REPORT message record the time of reception and the result. If the difference between the time of reception and the time of reception of the previous result is less than 1.5 seconds or greater than 2.5 seconds, or if the UE reports a UE positioning error in any MEASUREMENT REPORT messages, then record one Bad Result. Otherwise process the result as specified in step 7.
7. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE at the time of applicability reported in the position estimate and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.6.5 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GPS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE at the time of applicability reported in the GPS measured results and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 5.6.5 and record one Good Result or Bad Result as appropriate.

8. If the UE sends the first MEASUREMENT REPORT that contains a measured result or position estimate later than 240s after the start of the GPS scenario, fail the UE and stop the test early. Otherwise collect MEASUREMENT REPORTs during 900s, starting from the time recorded in step 5. If at any time the difference between the times of reception of two consecutive results is greater than 240s, fail the UE and stop the test early. Use the collected Good Results and Bad Results to determine the PASS/FAIL according to clause 5.6.5.
9. Release the connection using the procedure in clause F.3.

5.6.5 Test Requirements

For the parameters specified in table 5.6.4, after the first reported position estimate, the UE shall meet the accuracy requirement and the success rate specified in table 5.6.5 with a periodical reporting interval of 2 seconds +/- 20% plus measurement system uncertainty of 100ms.

NOTE: Due to the statistical nature of the results it is not possible to design a test with predefined confidence level for the success rate in Table 5.6.5, therefore a simple PASS/FAIL of the results gathered against this success rate is used.

Table 5.6.4: Test parameters for Moving Scenario and Periodic Update Performance

| Parameters | Unit | Value |
|--------------------------------|------|------------|
| Number of generated satellites | - | 5 |
| HDOP Range | - | 1.8 to 2.5 |
| Propagation condition | - | AWGN |
| GPS signal for all satellites | dBm | -130 |

Table 5.6.5: Test requirements for Moving Scenario and Periodic Update Performance

| Success Rate | 2-D position error |
|--------------|--------------------|
| 95 % | 101.3 m |

NOTE 1: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

NOTE 2: In the actual testing the UE may report error messages until it has been able to acquire GPS measured results or a position estimate. The test equipment shall only consider the first measurement report different from an error message as the first position estimate in the requirement in table 5.6.5.

6 UTRA A-GNSS Minimum Performance requirements

6.1 General

This clause defines the minimum performance requirements for both UE based and UE assisted FDD A-GNSS UTRA terminals. If a terminal supports both modes then it shall be tested in both modes. It excludes performance requirements for UEs where the only A-GNSS supported is A-GPS L1C/A which are specified in clause 5.

The requirements are defined for CELL_DCH and CELL_FACH states. All tests shall be performed in CELL_DCH state and the Nominal Accuracy Performance test case shall be also performed in CELL_FACH state.

6.2 Sensitivity

6.2.1 Sensitivity Coarse Time Assistance

6.2.1.1 Definition and applicability

Sensitivity with coarse time assistance is the minimum level of GNSS satellite signals required for the UE to make an A-GNSS position estimate to a specific accuracy and within a specific response time when the network only provides coarse time assistance.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GNSS.

This test case includes sub-test cases dependent on the GNSS supported by the UE. Each sub-test case is identified by a Sub-Test Case Number as defined in Table 6.2.1.1.

Table 6.2.1.1: Sub-Test Case Number Definition

| Sub-Test Case Number | Supported GNSS |
|----------------------|---|
| 1 | UE supporting A-GLONASS only |
| 2 | UE supporting A-Galileo only |
| 3 | UE supporting A-GPS and Modernized GPS only |
| 4 | UE supporting A-GPS and A-GLONASS only |

6.2.1.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 6.2.1.2-3 for the parameters specified in table 6.2.1.2-1.

Table 6.2.1.2-1: Test parameters for Sensitivity Coarse Time Assistance

| System | Parameters | Unit | Value |
|---|---|---------|---------------------|
| | Number of generated satellites per system | - | See Table 6.2.1.2-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference high signal power level | dBm | -142 |
| | Reference low signal power level | dBm | -147 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -142 |
| | Reference low signal power level | dBm | -147 |
| GLONASS | Reference high signal power level | dBm | -142 |
| | Reference low signal power level | dBm | -147 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.2.1.2-2: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|---|-------------------|---|--------|--------|
| | | GNSS-1 ⁽¹⁾ | GNSS-2 | GNSS-3 |
| Single constellation | High signal level | 1 | - | - |
| | Low signal level | 5 | - | - |
| Dual constellation | High signal level | 1 | - | - |
| | Low signal level | 2 | 3 | - |
| Triple constellation | High signal level | 1 | - | - |
| | Low signal level | 1 | 2 | 2 |
| Note: For GPS capable receivers, GNSS-1, i.e. the system having the satellite with high signal level, shall be GPS. | | | | |

Table 6.2.1.2-3: Minimum requirements for Sensitivity Coarse Time Assistance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.172 [19], clause 5.1.1.1.

6.2.1.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GNSS satellite signal conditions that represent weak signal conditions and with only Coarse Time Assistance provided by the SS.

6.2.1.4 Method of test

6.2.1.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GNSS test parameters as specified in table 6.2.1.5-1 for GNSS scenario #1. For GNSS-1, select the first satellite SV ID defined in the relevant table in 3GPP TS 37.571-5 [20] clause 6.2.1.2 for the one satellite with the higher level.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

6.2.1.4.2 Procedure

1. Start GNSS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 6.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 6.2.1.2.6.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 6.2.2 and 6.2.7 for UE based testing; or clauses 6.2.4 and 6.2.7 for UE assisted testing with the value of GPS TOW msec or GANSS TOD offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 6.2.7.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.6 or 7.5.8.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 6.2.1.5-3 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 6.2.1.5-3 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.

4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 6.2.1.5-3 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE, used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 6.2.1.5-3 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. For GNSS-1, select the first satellite SV ID defined in the relevant table in 3GPP TS 37.571-5 [20] clause 6.2.1.2 for the one satellite with the higher level. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec or GANSS TOD offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 6.2.1.5 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used for GNSS-1, select the next satellite SV ID from the one used previously, defined in the relevant table in 3GPP TS 37.571-5 [20] clause 6.2.1.2, for the one satellite with the higher level.
7. Release the connection using the procedure in clause F.3.

6.2.1.5 Test Requirements

For the parameters specified in table 6.2.1.5-1 the UE shall meet the requirements and the success rate specified in table 6.2.1.5-3 with a confidence level of 95% according to Annex D.

Table 6.2.1.5-1: Test parameters for Sensitivity Coarse Time Assistance

| System | Parameters | Unit | Value |
|--------------------|---|---------|---------------------|
| | Number of generated satellites per system | - | See Table 6.2.1.5-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 1.8 |
| Galileo | Reference high signal power level | dBm | -141 |
| | Reference low signal power level | dBm | -146 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -141 |
| | Reference low signal power level | dBm | -146 |
| GLONASS | Reference high signal power level | dBm | -141 |
| | Reference low signal power level | dBm | -146 |

Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities.

Table 6.2.1.5-2: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|----------------------|-------------------|---|--------|--------|
| | | GNSS-1 ⁽¹⁾ | GNSS-2 | GNSS-3 |
| Single constellation | High signal level | 1 | - | - |
| | Low signal level | 5 | - | - |
| Dual constellation | High signal level | 1 | - | - |
| | Low signal level | 2 | 3 | - |
| Triple constellation | High signal level | 1 | - | - |
| | Low signal level | 1 | 2 | 2 |

Note: For GPS capable receivers, GNSS-1, i.e. the system having the satellite with high signal level, shall be GPS.

Table 6.2.1.5-3: Test requirements for Sensitivity Coarse Time Assistance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

6.2.2 Sensitivity Fine Time Assistance

6.2.2.1 Definition and applicability

Sensitivity with fine time assistance is the minimum level of GNSS satellite signals required for the UE to make an A-GNSS position estimate to a specific accuracy and within a specific response time when the network provides fine time assistance in addition to coarse time assistance.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GNSS and that is capable of providing an enhanced performance when the network provides Fine Time Assistance.

This test case includes sub-test cases dependent on the GNSS supported by the UE. Each sub-test case is identified by a Sub-Test Case Number as defined in Table 6.2.2.1.

Table 6.2.2.1: Sub-Test Case Number Definition

| Sub-Test Case Number | Supported GNSS |
|----------------------|---|
| 1 | UE supporting A-GLONASS only |
| 2 | UE supporting A-Galileo only |
| 3 | UE supporting A-GPS and Modernized GPS only |
| 4 | UE supporting A-GPS and A-GLONASS only |

6.2.2.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 6.2.2.2-3 for the parameters specified in table 6.2.2.2-1.

Table 6.2.2.2-1: Test parameters for Sensitivity Fine Time Assistance

| System | Parameters | Unit | Value |
|---|---|---------|---------------------|
| | Number of generated satellites per system | - | See Table 6.2.2.2-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| | GNSS fine time assistance error range | µs | ±10 |
| Galileo | Reference signal power level | dBm | -147 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -147 |
| GLONASS | Reference signal power level | dBm | -147 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.2.2.2-2: Satellite allocation

| | Satellite allocation for each constellation | | |
|----------------------|---|--------|--------|
| | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | 6 | - | - |
| Dual constellation | 3 | 3 | - |
| Triple constellation | 2 | 2 | 2 |

Table 6.2.2.2-3: Minimum requirements for Sensitivity Fine Time Assistance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.172 [19], clause 5.1.2.1.

6.2.2.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GNSS satellite signal conditions that represent weak signal conditions and with Fine Time Assistance provided by the SS.

6.2.2.4 Method of test

6.2.2.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GNSS test parameters as specified in table 6.2.2.5-1 for GNSS scenario #1.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

6.2.2.4.2 Procedure

1. Start GNSS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 6.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 6.2.1.2.6.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 6.2.2 and 6.2.7 for UE based testing; or clauses 6.2.4 and 6.2.7 for UE assisted testing with the values of GPS TOW msec or GANSS TOD, and UTRAN GPS timing of cell frames or UTRAN GANSS timing of cell frames offset by random values as specified in 3GPP TS 37.571-5 [20] clause 6.2.7.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.6 or 7.5.8.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 6.2.2.5-3 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 6.2.2.5-3 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.2.2.5-3 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the

simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.2.2.5-3 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec or GANSS TOD, and UTRAN GPS timing of cell frames or UTRAN GANSS timing of cell frames offsets in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 6.2.2.5 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again.
7. Release the connection using the procedure in clause F.3.

6.2.2.5 Test Requirements

For the parameters specified in table 6.2.2.5-1 the UE shall meet the requirements and the success rate specified in table 6.2.2.5-3 with a confidence level of 95% according to Annex D.

Table 6.2.2.5-1: Test parameters for Sensitivity Fine Time Assistance

| System | Parameters | Unit | Value |
|--------------------|---|---------------|---------------------|
| | Number of generated satellites per system | - | See Table 6.2.2.5-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 1.8 |
| | GNSS fine time assistance error range | μs | ± 9 |
| Galileo | Reference signal power level | dBm | -146 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -146 |
| GLONASS | Reference signal power level | dBm | -146 |

Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities.

Table 6.2.2.5-2: Satellite allocation

| | Satellite allocation for each constellation | | |
|----------------------|---|--------|--------|
| | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | 6 | - | - |
| Dual constellation | 3 | 3 | - |
| Triple constellation | 2 | 2 | 2 |

Table 6.2.2.5-3: Test requirements for Sensitivity Fine Time Assistance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

6.3 Nominal Accuracy

6.3.1 Definition and applicability

Nominal accuracy is the accuracy of the UE's A-GNSS position estimate under ideal GNSS signal conditions.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GNSS.

This test case includes sub-test cases dependent on the GNSS supported by the UE. Each sub-test case is identified by a Sub-Test Case Number as defined in Table 6.3.1.

Table 6.3.1: Sub-Test Case Number Definition

| Sub-Test Case Number | Supported GNSS |
|----------------------|---|
| 1 | UE supporting A-GLONASS only |
| 2 | UE supporting A-Galileo only |
| 3 | UE supporting A-GPS and Modernized GPS only |
| 4 | UE supporting A-GPS and A-GLONASS only |

6.3.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 6.3.2-3 for the parameters specified in table 6.3.2-1.

Table 6.3.2-1: Test parameters for Nominal Accuracy

| System | Parameters | Unit | Value |
|---|---|---------|-----------------------|
| | Number of generated satellites per system | - | See Table 6.3.2-2 |
| | Total number of generated satellites | - | 6 or 7 ⁽²⁾ |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| QZSS | Reference signal power level for all satellites | dBm | -128.5 |
| SBAS | Reference signal power level for all satellites | dBm | -131 |
| Note 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |
| Note 2: 7 satellites apply only for SBAS case. | | | |

If QZSS is supported, one of the GPS satellites will be replaced by a QZSS satellite with respective signal support.

If SBAS is supported, the SBAS satellite with the highest elevation will be added to the scenario.

Table 6.3.2-2: Satellite allocation

| | Satellite allocation for each constellation | | | |
|--|---|-----------------------|-----------------------|------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ | SBAS |
| Single constellation | 6 | -- | -- | 1 |
| Dual constellation | 3 | 3 | -- | 1 |
| Triple constellation | 2 | 2 | 2 | 1 |
| Note: GNSS refers to global systems i.e., GPS, Galileo, GLONASS. | | | | |

Table 6.3.2-3: Minimum requirements for Nominal Accuracy

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 15 m | 20 s |

The reference for this requirement is 3GPP TS 25.172 [19], clause 5.2.1.

6.3.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GNSS satellite signal conditions that represent ideal conditions.

6.3.4 Method of test

6.3.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GNSS test parameters as specified in table 6.3.4.2 for GNSS scenario #3.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

6.3.4.2 Procedure

1. Start GNSS scenario #3 as specified in 3GPP TS 37.571-5 [20] clause 6.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 6.2.1.2.6.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 6.2.2 and 6.2.7 for UE based testing; or clauses 6.2.4 and 6.2.7 for UE assisted testing with the value of GPS TOW msec or GANSS TOD offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 6.2.7.2; using the exception to the RRC MEASUREMENT CONTROL message listed in table 6.3.5-1; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.6 or 7.5.8.

Table 6.3.4.2: Contents of RRC MEASUREMENT CONTROL message

| Information Element | Value/Remark |
|--|--------------|
| - UE positioning reporting quantity - Horizontal accuracy | '6' (7.7m) |

3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 6.3.5-3 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 6.3.5-3 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.3.5-3 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.3.5-3 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GNSS scenario #4 instead of #3 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec or GANSS TOD offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 6.3.5 are met. Each time scenario #3 or #4 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again.
7. Release the connection using the procedure in clause F.3.

6.3.5 Test Requirements

For the parameters specified in table 6.3.5-1 the UE shall meet the requirements and the success rate specified in table 6.3.5-3 with a confidence level of 95% according to Annex D.

Table 6.3.5-1: Test parameters for Nominal Accuracy

| System | Parameters | Unit | Value |
|---|---|---------|-----------------------|
| | Number of generated satellites per system | - | See Table 6.3.5-3 |
| | Total number of generated satellites | - | 6 or 7 ⁽²⁾ |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±1.8 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| QZSS | Reference signal power level for all satellites | dBm | -128.5 |
| SBAS | Reference signal power level for all satellites | dBm | -131 |
| Note 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |
| Note 2: 7 satellites apply only for SBAS case. | | | |

If QZSS is supported, one of the GPS satellites will be replaced by a QZSS satellite with respective signal support.

If SBAS is supported, the SBAS satellite with the highest elevation will be added to the scenario.

Table 6.3.5-2: Satellite allocation

| | Satellite allocation for each constellation | | | |
|--|---|-----------------------|-----------------------|------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ | SBAS |
| Single constellation | 6 | -- | -- | 1 |
| Dual constellation | 3 | 3 | -- | 1 |
| Triple constellation | 2 | 2 | 2 | 1 |
| Note: GNSS refers to global systems i.e., GPS, Galileo, GLONASS. | | | | |

Table 6.3.5-3: Test requirements for Nominal Accuracy

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 16.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

6.4 Dynamic Range

6.4.1 Definition and applicability

Dynamic Range is the maximum difference in level of the GNSS signals from a number of satellites that allows the UE to make an A-GNSS position estimate with a specific accuracy and a specific response time.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GNSS.

This test case includes sub-test cases dependent on the GNSS supported by the UE. Each sub-test case is identified by a Sub-Test Case Number as defined in Table 6.4.1.

Table 6.4.1: Sub-Test Case Number Definition

| Sub-Test Case Number | Supported GNSS |
|----------------------|---|
| 1 | UE supporting A-GLONASS only |
| 2 | UE supporting A-Galileo only |
| 3 | UE supporting A-GPS and Modernized GPS only |
| 4 | UE supporting A-GPS and A-GLONASS only |

6.4.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 6.4.2-3 for the parameters specified in table 6.4.2-1.

Table 6.4.2-1: Test parameters for Dynamic Range

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 6.4.2-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference high signal power level | dBm | -127.5 |
| | Reference low signal power level | dBm | -147 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -129 |
| | Reference low signal power level | dBm | -147 |
| GLONASS | Reference high signal power level | dBm | -131.5 |
| | Reference low signal power level | dBm | -147 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.4.2-2: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|--|-------------------|---|-----------------------|-----------------------|
| | | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | High signal level | 2 | -- | -- |
| | Low signal level | 4 | -- | -- |
| Dual constellation | High signal level | 1 | 1 | -- |
| | Low signal level | 2 | 2 | -- |
| Triple constellation | High signal level | 1 | 1 | 1 |
| | Low signal level | 1 | 1 | 1 |
| Note: GNSS refers to global systems i.e., GPS, Galileo, GLONASS. | | | | |

Table 6.4.2-3: Minimum requirements for Dynamic Range

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.172 [19], clause 5.3.1.

6.4.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GNSS satellite signal conditions that have a wide dynamic range. Strong satellites are likely to degrade the acquisition of weaker satellites due to their cross-correlation products.

6.4.4 Method of test

6.4.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GNSS test parameters as specified in table 6.4.5-1 for GNSS scenario #1. Randomly select from the satellite SV IDs defined in the table in 3GPP TS 37.571-5 [20] clause 6.2.1.2 for the satellites with the higher levels.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

6.4.4.2 Procedure

1. Start GNSS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 6.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 6.2.1.2.6.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 6.2.2 and 6.2.7 for UE based testing; or clauses 6.2.4 and 6.2.7 for UE assisted testing with the value of GPS TOW msec or GANSS TOD offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 6.2.7.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.6 or 7.5.8.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 6.4.5-3 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 6.4.5-3 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.4.5-3 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.4.5-3 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Randomly select from the satellite SV IDs defined in the table in 3GPP TS 37.571-5 [20] clause 6.2.1.2 for the satellites with the higher levels. Use new random values for the UE location and altitude in step 1 and for the GPS TOW msec or GANSS TOD offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 6.4.5 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, randomly select from the set of satellite SV IDs defined in the table in 3GPP TS 37.571-5 [20] clause 6.2.1.2, for the satellites with the higher levels.
7. Release the connection using the procedure in clause F.3.

6.4.5 Test Requirements

For the parameters specified in table 6.4.5-1 the UE shall meet the requirements and the success rate specified in table 6.4.5-3 with a confidence level of 95% according to Annex D.

Table 6.4.5-1: Test parameters for Dynamic Range

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 6.4.5-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference high signal power level | dBm | -126.7 |
| | Reference low signal power level | dBm | -146 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -128.2 |
| | Reference low signal power level | dBm | -146 |
| GLONASS | Reference high signal power level | dBm | -130.7 |
| | Reference low signal power level | dBm | -146 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.4.5-2: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|--|-------------------|---|-----------------------|-----------------------|
| | | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | High signal level | 2 | -- | -- |
| | Low signal level | 4 | -- | -- |
| Dual constellation | High signal level | 1 | 1 | -- |
| | Low signal level | 2 | 2 | -- |
| Triple constellation | High signal level | 1 | 1 | 1 |
| | Low signal level | 1 | 1 | 1 |
| Note: GNSS refers to global systems i.e., GPS, Galileo, GLONASS. | | | | |

Table 6.4.5-3: Test requirements for Dynamic Range

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

6.5 Multi-path Performance

6.5.1 Definition and applicability

Multi-path performance measures the accuracy and response time of the UE's A-GNSS position estimate in a specific GNSS signal multi-path environment.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GNSS.

This test case includes sub-test cases dependent on the GNSS supported by the UE. Each sub-test case is identified by a Sub-Test Case Number as defined in Table 6.5.1.

Table 6.5.1: Sub-Test Case Number Definition

| Sub-Test Case Number | Supported GNSS |
|----------------------|---|
| 1 | UE supporting A-GLONASS only |
| 2 | UE supporting A-Galileo only |
| 3 | UE supporting A-GPS and Modernized GPS only |
| 4 | UE supporting A-GPS and A-GLONASS only |

6.5.2 Minimum requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 6.5.2-3 for the parameters specified in table 6.5.2-1.

Table 6.5.2-1: Test parameters for Multi-path Performance

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 6.5.2-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference signal power level | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -128.5 |
| GLONASS | Reference signal power level | dBm | -131 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.5.2-2: Channel model allocation

| | | Channel model allocation for each constellation | | |
|---|-----------------|---|--------|--------|
| | | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | One-tap channel | 2 | -- | -- |
| | Two-tap channel | 4 | -- | -- |
| Dual constellation | One-tap channel | 1 | 1 | -- |
| | Two-tap channel | 2 | 2 | -- |
| Triple constellation | One-tap channel | 1 | 1 | 1 |
| | Two-tap channel | 1 | 1 | 1 |
| Note: One-tap channel: no multi-path. Two-tap channel: multi-path defined in clause 4.2.4 | | | | |

Table 6.5.2-3: Minimum requirements for Multi-path Performance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 100 m | 20 s |

The reference for this requirement is 3GPP TS 25.172 [19], clause 5.4.1.

6.5.3 Test purpose

To verify the UE's first position estimate meets the minimum requirements under GNSS satellite signal conditions that represent simple multi-path conditions.

6.5.4 Method of test

6.5.4.1 Initial conditions

Test environment: normal; see Annex G.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GNSS test parameters as specified in table 6.5.5-1 for GNSS scenario #1. Randomly select from the satellite SV IDs defined in the table in 3GPP TS 37.571-5 [20] clause 6.2.1.2 for the satellites with one-tap channel.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

6.5.4.2 Procedure

1. Start GNSS scenario #1 as specified in 3GPP TS 37.571-5 [20] clause 6.2.1.2 with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in 3GPP TS 37.571-5 [20] clause 6.2.1.2.6. The initial carrier phase difference between taps of the multi-path model shall be randomly selected between 0 and 2π radians by selecting the next random number from a standard uniform random number generator, in the range 0 to 2π , representing radians with a resolution of 0.1, representing 0.1 radians.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 6.2.2 and 6.2.7 for UE based testing; or clauses 6.2.4 and 6.2.7 for UE assisted testing with the value of GPS TOW msec or GANSS TOD offset by a random value as specified in 3GPP TS 37.571-5 [20] clause 6.2.7.2; as required to obtain a fix using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.6 or 7.5.8.
3. If the UE returns a valid result in the MEASUREMENT REPORT message within the Max response time specified in table 6.5.5-4 then record the result and process it as specified in step 5. If the UE does not return a valid result within the Max response time specified in table 6.5.5-4 or reports a UE positioning error in the MEASUREMENT REPORT message then record one Bad Result.
4. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.5.5-4 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.5.5-4 and record one Good Result or Bad Result as appropriate.

5. Repeat steps 1 to 4 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Randomly select from the satellite SV IDs defined in the table in 3GPP TS 37.571-5 [20] clause 6.2.1.2 for the satellites with one-tap channel. Use new random values for the UE location and altitude, and the initial carrier phase difference between taps of the multi-path model in step 1 and for the GPS TOW msec or GANSS TOD offset in step 3.
6. Repeat steps 1 to 5 until the statistical requirements of clause 6.5.5 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, randomly select from the satellite SV IDs defined in the table in 3GPP TS 37.571-5 [20] clause 6.2.1.2, for the satellites with one-tap channel.
7. Release the connection using the procedure in clause F.3.

6.5.5 Test Requirements

For the parameters specified in table 6.5.5-1 the UE shall meet the requirements and the success rate specified in table 6.5.5-4 with a confidence level of 95% according to Annex D.

Table 6.5.5-1: Test parameters for Multi-path Performance

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 6.5.5-1 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±1.8 |
| Galileo | Reference signal power level | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -128.5 |
| GLONASS | Reference signal power level | dBm | -131 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.5.5-2: Channel model allocation

| | | Channel model allocation for each constellation | | |
|--|-----------------|---|--------|--------|
| | | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | One-tap channel | 2 | -- | -- |
| | Two-tap channel | 4 | -- | -- |
| Dual constellation | One-tap channel | 1 | 1 | -- |
| | Two-tap channel | 2 | 2 | -- |
| Triple constellation | One-tap channel | 1 | 1 | 1 |
| | Two-tap channel | 1 | 1 | 1 |
| Note: One-tap channel: no multi-path. Two-tap channel: multi-path defined in clause 4.2.4 with Relative mean Power (Y) defined in Table 6.5.7. | | | | |

Table 6.5.5-3: Relative mean Power (Y) for use in Table 6.5.6

| System | Signals | Y [dB] |
|--------------------|---------|--------|
| Galileo | E1 | -4.7 |
| | E5a | -6.2 |
| | E5b | -6.2 |
| GPS/Modernized GPS | L1 C/A | -6.2 |
| | L1C | -4.7 |
| | L2C | -6.2 |
| | L5 | -6.2 |
| GLONASS | G1 | -12.7 |
| | G2 | -12.7 |

Table 6.5.5-4: Test requirements for Multi-path Performance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

6.6 Moving Scenario and Periodic Update Performance

6.6.1 Definition and applicability

Moving scenario and periodic update performance measures the accuracy of the UE's A-GNSS position estimates and the periodic update capability of the UE in a moving scenario.

The requirements and this test apply to all types of UTRA for the FDD UE that supports A-GNSS.

This test case includes sub-test cases dependent on the GNSS supported by the UE. Each sub-test case is identified by a Sub-Test Case Number as defined in Table 6.6.1.

Table 6.6.1: Sub-Test Case Number Definition

| Sub-Test Case Number | Supported GNSS |
|----------------------|---|
| 1 | UE supporting A-GLONASS only |
| 2 | UE supporting A-Galileo only |
| 3 | UE supporting A-GPS and Modernized GPS only |
| 4 | UE supporting A-GPS and A-GLONASS only |

6.6.2 Minimum requirements

The position estimates, after the first reported position estimate, shall meet the accuracy requirement in table 6.6.2-3 with the periodical reporting interval of 2 seconds for the parameters specified in table 6.6.2-1.

NOTE: In the actual testing the UE may report error messages until it has been able to acquire GNSS measured results or a position estimate. The SS shall only consider the first measurement report different from an error message as the first position estimate in the requirement in table 6.6.2-1.

Table 6.6.2-1: Test parameters for Moving Scenario and Periodic Update Performance

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 6.6.2-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range per system | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 2 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.6.2-2: Satellite allocation

| | Satellite allocation for each constellation | | |
|--|---|-----------------------|-----------------------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | 6 | -- | -- |
| Dual constellation | 3 | 3 | -- |
| Triple constellation | 2 | 2 | 2 |
| Note: GNSS refers to global systems i.e., GPS, Galileo, GLONASS. | | | |

Table 6.6.2-3: Minimum requirements for Moving Scenario and Periodic Update Performance

| System | Success rate | 2-D position error | Periodical reporting interval |
|--------|--------------|--------------------|-------------------------------|
| All | 95 % | 50 m | 2 s |

The reference for this requirement is 3GPP TS 25.172 [19], clause 5.5.1.

6.6.3 Test purpose

To verify the UE's position estimates, after the first reported position estimate, meet the minimum requirements under GNSS satellite signal conditions that simulate a moving scenario. A good tracking performance, with regular position estimate reporting is essential for certain location services.

6.6.4 Method of test

6.6.4.1 Initial conditions

Test environment: normal; see Annex G.

The UE is requested to use periodical reporting with a reporting interval of 2 seconds.

The GNSS signals simulate the UE moving on a rectangular trajectory of 940 m by 1 440 m with rounded corners defined in figure 6.6.1 and table 6.6.4.1. The initial reference is first defined followed by acceleration to final speed of 100 km/h in 250 m. The UE then maintains the speed for 400 m. This is followed by deceleration to final speed of 25 km/h in 250 m. The UE then turn 90 degrees with turning radius of 20 m at 25 km/h. This is followed by acceleration to final speed of 100 km/h in 250 m. The sequence is repeated to complete the rectangle.

Table 6.6.4.1: Trajectory Parameters for Moving Scenario and Periodic Update Performance test case

| Parameter | Distance (m) | Speed (km/h) |
|----------------------------------|--------------|-------------------------|
| $l_{11}, l_{15}, l_{21}, l_{25}$ | 20 | 25 |
| $l_{12}, l_{14}, l_{22}, l_{24}$ | 250 | 25 to 100 and 100 to 25 |
| l_{13} | 400 | 100 |
| l_{23} | 900 | 100 |

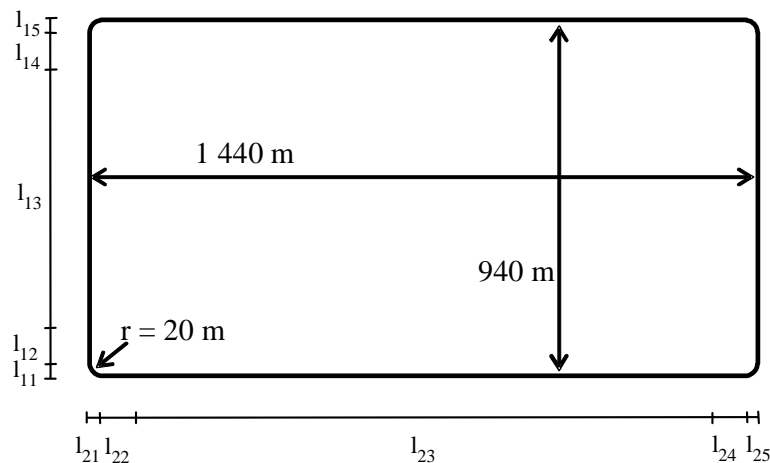


Figure 6.6.1: Rectangular Trajectory for Moving Scenario and Periodic Update Performance test case

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in figures A.1 or A.2.
2. Set the GNSS test parameters as specified in table 6.6.5-1 for GNSS scenario #5.
3. Switch on the UE.
4. Set up a connection using the procedure in clause F.2.

6.6.4.2 Procedure

1. Start GNSS scenario #5 as specified in 3GPP TS 37.571-5 [20], clause 6.2.1.2.
2. Send a RESET UE POSITIONING STORED INFORMATION message followed by RRC MEASUREMENT CONTROL messages containing appropriate assistance data; as specified in 3GPP TS 37.571-5 [20], clauses 6.2.2 and 6.2.7 for UE based testing; or clauses 6.2.4 and 6.2.7 for UE assisted testing; using the exception to the RRC MEASUREMENT CONTROL message listed in table 6.6.4.2; as required to obtain fixes using the procedure specified in 3GPP TS 34.108 [28], clauses 7.5.7 or 7.5.9.

Table 6.6.4.2: Contents of RRC MEASUREMENT CONTROL message

| Information Element | Value/Remark |
|--|--------------|
| - UE positioning reporting quantity - Horizontal accuracy | '13' (24.5m) |

3. Ignore any error messages that the UE may report in MEASUREMENT REPORT messages until it has been able to acquire the GNSS signals and reports the first GNSS measured result or position estimate.
4. Discard the first GNSS measured result or position estimate.
5. Record the time of reception of the next MEASUREMENT REPORT message after reception of the first GNSS measured result or position estimate.
6. After the reception of the first GNSS measured result or position estimate reported in a MEASUREMENT REPORT message, every time the UE returns a GNSS measured result or position estimate in the MEASUREMENT REPORT message record the time of reception and the result. If the difference between the time of reception and the time of reception of the previous result is less than 1.5 seconds or greater than 2.5 seconds, or if the UE reports a UE positioning error in any MEASUREMENT REPORT messages, then record one Bad Result. Otherwise process the result as specified in step 7.
7. For UE based testing compare the reported position estimate in the MEASUREMENT REPORT message against the simulated position of the UE at the time of applicability reported in the position estimate and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.6.9 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS measured results reported in the MEASUREMENT REPORT message to a 2D position using the method described in Annex B and then compare the result against the simulated position of the UE at the time of applicability reported in the GNSS measured results and calculate the 2D position error as specified in clause 6.1.1.3. Compare the 2D position error against the value in table 6.6.9 and record one Good Result or Bad Result as appropriate.
8. If the UE sends the first MEASUREMENT REPORT that contains a measured result or position estimate later than 240s after the start of the GNSS scenario, fail the UE and stop the test early. Otherwise collect MEASUREMENT REPORTs during 900s, starting from the time recorded in step 5. If at any time the difference between the times of reception of two consecutive results is greater than 240s, fail the UE and stop the test early. Use the collected Good Results and Bad Results to determine the PASS/FAIL according to clause 6.6.5.
9. Release the connection using the procedure in clause F.3.

6.6.5 Test Requirements

For the parameters specified in table 6.6.5-1, after the first reported position estimate, the UE shall meet the accuracy requirement and the success rate specified in table 6.6.5-3 with a periodical reporting interval of 2 seconds +/- 20% plus measurement system uncertainty of 100ms.

NOTE: Due to the statistical nature of the results it is not possible to design a test with predefined confidence level for the success rate in Table 6.6.5-3; therefore a simple PASS/FAIL of the results gathered against this success rate is used.

Table 6.6.5-1: Test parameters for Moving Scenario and Periodic Update Performance

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 6.6.5-2 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range per system | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±1.8 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| Note: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.6.5-2: Satellite allocation

| | Satellite allocation for each constellation | | |
|--|---|-----------------------|-----------------------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | 6 | -- | -- |
| Dual constellation | 3 | 3 | -- |
| Triple constellation | 2 | 2 | 2 |
| Note: GNSS refers to global systems i.e., GPS, Galileo, GLONASS. | | | |

Table 6.6.5-3: Test requirements for Moving Scenario and Periodic Update Performance

| System | Success rate | 2-D position error |
|--------|--------------|--------------------|
| All | 95 % | 51.3 m |

NOTE 1: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test is defined in clause C.2 and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in clause C.4.

NOTE 2: In the actual testing the UE may report error messages until it has been able to acquire GNSS measured results or a position estimate. The test equipment shall only consider the first measurement report different from an error message as the first position estimate in the requirement in table 6.6.5-3.

7 E-UTRA A-GNSS minimum performance requirements

7.1 Sensitivity

7.1.1 Sensitivity Coarse time assistance

7.1.1.1 Sub-tests

This test includes sub-tests dependent on the GNSS supported by the UE. Each sub-test is identified by a Sub-Test Number as defined in Table 7.1.1.1

Table 7.1.1.1: Sub-Test Number Definition

| Sub-Test Number | Supported GNSS |
|-----------------|---|
| 1 | UE supporting A-GPS L1C/A only |
| 2 | UE supporting A-GLONASS only |
| 3 | UE supporting A-Galileo only |
| 4 | UE supporting A-GPS and Modernized GPS only |
| 5 | UE supporting A-GPS and A-GLONASS only |

7.1.1.2 Test purpose

To verify the performance of the first position estimate, when the UE is provided with only coarse time assistance.

7.1.1.3 Test applicability

This test applies to all types of E-UTRA UE release 9 and forward that supports A-GNSS.

7.1.1.4 Minimum conformance requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 7.1.1.2 for the parameters specified in table 7.1.1.3 or 7.1.1.4.

Table 7.1.1.2: Requirements Sensitivity Coarse time assistance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

Table 7.1.1.3: Parameters Sensitivity Coarse time assistance - Sub-Test 1

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse time assistance error range | seconds | ± 2 |
| GPS L1 C/A Signal for one satellites | dBm | -142 |
| GPS L1 C/A Signal for remaining satellites | dBm | -147 |

Table 7.1.1.4: Parameters Sensitivity Coarse time assistance - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 7.1.1.5 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference high signal power level | dBm | -142 |
| | Reference low signal power level | dBm | -147 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -142 |
| | Reference low signal power level | dBm | -147 |
| GLONASS | Reference high signal power level | dBm | -142 |
| | Reference low signal power level | dBm | -147 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.1.1.5: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|---|-------------------|---|--------|--------|
| | | GNSS-1 ⁽¹⁾ | GNSS-2 | GNSS-3 |
| Single constellation | High signal level | 1 | - | - |
| | Low signal level | 5 | - | - |
| Dual constellation | High signal level | 1 | - | - |
| | Low signal level | 2 | 3 | - |
| Triple constellation | High signal level | 1 | - | - |
| | Low signal level | 1 | 2 | 2 |
| Note 1: For GPS capable receivers, GNSS-1, i.e. the system having the satellite with high signal level, shall be GPS. | | | | |

The normative reference for this requirement is TS 36.171 [3] clause 5.1.1 and 6.1.1.

7.1.1.5 Test description

7.1.1.5.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal, as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.

Channel Bandwidth to be tested: as defined in TS 36.508 [18] clause 4.3.1.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in Annex A.
2. Set the GNSS test parameters as specified in table 7.1.1.6 or 7.1.1.7 for GNSS scenario #1 in TS 37.571-5 [20]. For GNSS-1, select the first satellite SV ID defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20] for the one satellite with the higher level.
3. The parameter settings for the cell are set up according to TS 36.508 [18] clause 4.4.3, single cell scenario.
4. Switch on the UE.
5. Establish a signalling connection according to the generic procedure in TS 36.508 [18] clause 4.5.3 (State 3, Generic RB established) on a channel in the Mid EARFCN range.

7.1.1.5.2 Test procedure

1. Start GNSS scenario #1 as specified in clause 6.2.1.2 of TS 37.571-5 [20] with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in clause 6.2.1.2.6 of TS 37.571-5 [20]
2. Send a RESET UE POSITIONING STORED INFORMATION message.
3. Send an LPP REQUEST CAPABILITIES message.
4. The UE returns an LPP PROVIDE CAPABILITIES message indicating the assistance data supported by the UE in the Assistance Data Support List in the A GNSS Provide Capabilities IE.
5. Send an LPP PROVIDE ASSISTANCE DATA message to provide the assistance data that is supported by the UE as indicated in step 4 and in accordance with clause 6.2.6 of TS 37.571-5 [20], and with the values defined in clause 6.2.7 of TS 37.571-5 [20] with the value of GNSS Reference Time offset by a random value as specified in clause 6.2.7.2 of TS 37.571-5 [20]. If the UE message at step 4 includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
6. Send an LPP REQUEST LOCATION INFORMATION message to obtain a fix.
7. If the UE returns a valid result in the LPP PROVIDE LOCATION INFORMATION message within the Max response time specified in table 7.1.1.9 then record the result and process it as specified in step 8. If the UE does not return a valid result within the Max response time specified in table 7.1.1.9 or reports an Error in the LPP PROVIDE LOCATION INFORMATION message then record one Bad Result.
- 7a. If the UE message at step 7 includes the ackRequested IE set to TRUE, then the SS shall send a LPP acknowledgment message.
8. For UE based testing compare the reported Location Information in the LPP PROVIDE LOCATION INFORMATION message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.1.1.9 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS Signal Measurement Information reported in the LPP PROVIDE LOCATION INFORMATION message to a 2D position using the method described in clause 4.4.3 and then compare the result against the simulated position of the UE, used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.1.1.9 and record one Good Result or Bad Result as appropriate.
9. Repeat steps 1 to 8 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. For GNSS-1, select the first satellite SV ID defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20] for the one satellite with the higher level. Use new random values for the UE location and altitude in step 1 and for the GNSS Reference Time offset in step 5.
10. Repeat steps 1 to 9 until the statistical requirements of clause 7.1.1.6 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, for GNSS-1 select the next satellite SV ID from the one used previously, defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20], for the one satellite with the higher level.
11. Release the signalling connection.

7.1.1.5.3 Message contents

Message contents are according to TS 36.508 [18] clauses 4.6 and 4.7 and as follows:

RESET UE POSITIONING STORED INFORMATION

| Information Element | Value/remark |
|---------------------------|--------------|
| UE POSITIONING TECHNOLOGY | AGNSS |

LPP REQUEST CAPABILITIES

| Information Element | Value/remark |
|-----------------------------------|--------------|
| <i>a-gnss-RequestCapabilities</i> | TRUE |

LPP REQUEST LOCATION INFORMATION

| Information Element | Value/remark | Comment |
|-------------------------------------|---|--|
| commonIEsRequestLocationInformation | | |
| > locationInformationType | 'locationEstimateRequired' or 'locationMeasurementsRequired' | Depending on test case and UE capabilities, i.e. support for UE-based or UE-assisted |
| > additionalInformation | 'onlyReturnInformationRequested' | |
| > qos | | |
| >> horizontalAccuracy | '19' (51.2m) | |
| >> verticalCoordinateRequest | FALSE | |
| >> responseTime | '20' | |
| a-gnss-RequestLocationInformation | | |
| > gnss-PositioningInstructions | | |
| >> gnssMethods | | |
| >>> gnss-ids | Sub-test 1: 'gps' Sub-test 2: 'glonass' Sub-test 3: 'galileo' Sub-test 4: 'gps' Sub-test 5: 'gps' and 'glonass' | |
| >> fineTimeAssistanceMeasReq | FALSE | |
| >> adrMeasReq | FALSE | |
| >> multiFreqMeasReq | TRUE or FALSE | Depending on UE capabilities |
| >> assistanceAvailability | FALSE | |

7.1.1.6 Test requirement

For the parameters specified in table 7.1.1.6 or 7.1.1.7 the UE shall meet the requirements and the success rate specified in table 7.1.1.9 with a confidence level of 95% according to Annex D.

Table 7.1.1.6: Test parameters Sensitivity Coarse time assistance - Sub-Test 1

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ± 1.8 |
| GPS L1 C/A Signal for one satellite | dBm | -141 |
| GPS L1 C/A Signal for remaining satellites | dBm | -146 |

Table 7.1.1.7: Test parameters Sensitivity Coarse time assistance - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-------------------|
| | Number of generated satellites per system | - | See Table 7.1.1.8 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 1.8 |
| Galileo | Reference high signal power level | dBm | -141 |
| | Reference low signal power level | dBm | -146 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -141 |
| | Reference low signal power level | dBm | -146 |
| GLONASS | Reference high signal power level | dBm | -141 |
| | Reference low signal power level | dBm | -146 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.1.1.8: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|---|-------------------|---|--------|--------|
| | | GNSS-1 ⁽¹⁾ | GNSS-2 | GNSS-3 |
| Single constellation | High signal level | 1 | - | - |
| | Low signal level | 5 | - | - |
| Dual constellation | High signal level | 1 | - | - |
| | Low signal level | 2 | 3 | - |
| Triple constellation | High signal level | 1 | - | - |
| | Low signal level | 1 | 2 | 2 |
| Note 1: For GPS capable receivers, GNSS-1, i.e. the system having the satellite with high signal level, shall be GPS. | | | | |

Table 7.1.1.9: Test requirements for Sensitivity Coarse Time Assistance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

7.1.2 Sensitivity Fine time assistance

7.1.2.1 Sub-tests

This test includes sub-tests dependent on the GNSS supported by the UE. Each sub-test is identified by a Sub-Test Number as defined in Table 7.1.2.1

Table 7.1.2.1: Sub-Test Number Definition

| Sub-Test Number | Supported GNSS |
|-----------------|---|
| 1 | UE supporting A-GPS L1C/A only |
| 2 | UE supporting A-GLONASS only |
| 3 | UE supporting A-Galileo only |
| 4 | UE supporting A-GPS and Modernized GPS only |
| 5 | UE supporting A-GPS and A-GLONASS only |

7.1.2.2 Test purpose

To verify the performance of the first position estimate, when the UE is additionally provided with fine time assistance.

7.1.2.3 Test applicability

This test applies to all types of E-UTRA UE release 9 and forward that supports A-GNSS and that is capable of providing an enhanced performance when the network provides Fine Time Assistance.

7.1.2.4 Minimum conformance requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 7.1.2.2 for the parameters specified in table 7.1.2.3 or 7.1.2.4.

Table 7.1.2.2: Requirements Sensitivity Fine time assistance

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

Table 7.1.2.3: Parameters Sensitivity Fine time assistance - Sub-Test 1

| Parameters | Unit | Value |
|---|---------------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse time assistance error range | seconds | ± 2 |
| GPS L1 C/A Fine time assistance error range | μs | ± 10 |
| GPS L1 C/A Signal for all satellites | dBm | -147 |

Table 7.1.2.4: Parameters Sensitivity Fine time assistance - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------------|-------------------|
| | Number of generated satellites per system | - | See Table 7.1.2.5 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 2 |
| | GNSS fine time assistance error range | μs | ± 10 |
| Galileo | Reference signal power level | dBm | -147 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -147 |
| GLONASS | Reference signal power level | dBm | -147 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.1.2.5: Satellite allocation

| | Satellite allocation for each constellation | | |
|----------------------|---|--------|--------|
| | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | 6 | - | - |
| Dual constellation | 3 | 3 | - |
| Triple constellation | 2 | 2 | 2 |

The normative reference for this requirement is TS 36.171 [3] clause 5.1.2 and 6.1.2.

7.1.2.5 Test description

7.1.2.5.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal, as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.

Channel Bandwidth to be tested: as defined in TS 36.508 [18] clause 4.3.1.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in Annex A.
2. Set the GNSS test parameters as specified in table 7.1.2.6 or 7.1.2.7 for GNSS scenario #1 in TS 37.571-5 [20].
3. The parameter settings for the cell are set up according to TS 36.508 [18] clause 4.4.3, single cell scenario.
4. Switch on the UE.
5. Establish a signalling connection according to the generic procedure in TS 36.508 [18] clause 4.5.3 (State 3, Generic RB established) on a channel in the Mid EARFCN range.

7.1.2.5.2 Test procedure

1. Start GNSS scenario #1 as specified in clause 6.2.1.2 of TS 37.571-5 [20] with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in clause 6.2.1.2.6 of TS 37.571-5 [20]
2. Send a RESET UE POSITIONING STORED INFORMATION message.
3. Send an LPP REQUEST CAPABILITIES message.
4. The UE returns an LPP PROVIDE CAPABILITIES message indicating the assistance data supported by the UE in the Assistance Data Support List in the A GNSS Provide Capabilities IE.
5. Send an LPP PROVIDE ASSISTANCE DATA message to provide the assistance data that is supported by the UE as indicated in step 4 and in accordance with clause 6.2.6 of TS 37.571-5 [20], and with the values defined in clause 6.2.7 of TS 37.571-5 [20] with the value of GNSS Reference Time and GNSS Reference Time for one cell offset by a random value as specified in clause 6.2.7.2 of TS 37.571-5 [20]. If the UE message at step 4 includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
6. Send an LPP REQUEST LOCATION INFORMATION message to obtain a fix.
7. If the UE returns a valid result in the LPP PROVIDE LOCATION INFORMATION message within the Max response time specified in table 7.1.2.9 then record the result and process it as specified in step 8. If the UE does not return a valid result within the Max response time specified in table 7.1.2.9 or reports an Error in the LPP PROVIDE LOCATION INFORMATION message then record one Bad Result.
- 7a. If the UE message at step 7 includes the ackRequested IE set to TRUE, then the SS shall send a LPP acknowledgment message.

8. For UE based testing compare the reported Location Information in the LPP PROVIDE LOCATION INFORMATION message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.1.2.9 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS Measurement Information reported in the LPP PROVIDE LOCATION INFORMATION message to a 2D position using the method described in clause 4.4.3 and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.1.2.9 and record one Good Result or Bad Result as appropriate.

9. Repeat steps 1 to 8 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Use new random values for the UE location and altitude in step 1 and for the GNSS Reference Time GNSS Reference Time for one cell offsets in step 5.
10. Repeat steps 1 to 9 until the statistical requirements of clause 7.1.2.6 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again.
11. Release the signalling connection.

7.1.2.5.3 Message contents

Message contents are according to TS 36.508 [18] clauses 4.6 and 4.7 and as follows:

RESET UE POSITIONING STORED INFORMATION

| Information Element | Value/remark |
|---------------------------|--------------|
| UE POSITIONING TECHNOLOGY | AGNSS |

LPP REQUEST CAPABILITIES

| Information Element | Value/remark |
|-----------------------------------|--------------|
| <i>a-gnss-RequestCapabilities</i> | TRUE |

LPP REQUEST LOCATION INFORMATION

| Information Element | Value/remark | Comment |
|-------------------------------------|---|--|
| commonIEsRequestLocationInformation | | |
| > locationInformationType | 'locationEstimateRequired' or 'locationMeasurementsRequired' | Depending on test case and UE capabilities, i.e. support for UE-based or UE-assisted |
| > additionalInformation | 'onlyReturnInformationRequested' | |
| > qos | | |
| >> horizontalAccuracy | '19' (51.2m) | |
| >> verticalCoordinateRequest | FALSE | |
| >> responseTime | '20' | |
| a-gnss-RequestLocationInformation | | |
| > gnss-PositioningInstructions | | |
| >> gnssMethods | | |
| >>> gnss-ids | Sub-test 1: 'gps' Sub-test 2: 'glonass' Sub-test 3: 'galileo' Sub-test 4: 'gps' Sub-test 4: 'gps' and 'glonass' | |
| >> fineTimeAssistanceMeasReq | FALSE | |
| >> adrMeasReq | FALSE | |
| >> multiFreqMeasReq | TRUE or FALSE | Depending on UE capabilities |
| >> assistanceAvailability | FALSE | |

7.1.2.6 Test requirement

For the parameters specified in table 7.1.2.6 or 7.1.2.7 the UE shall meet the requirements and the success rate specified in table 7.1.2.9 with a confidence level of 95% according to Annex D.

Table 7.1.2.6: Test parameters Sensitivity Fine time assistance - Sub-Test 1

| Parameters | Unit | Value |
|--|---------------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse time assistance error range | seconds | ± 1.8 |
| GPS Fine Time assistance error range | μs | ± 9 |
| GPS L1 C/A Signal for all satellites | dBm | -146 |

Table 7.1.2.7: Test parameters Sensitivity Fine time assistance - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------------|-------------------|
| | Number of generated satellites per system | - | See Table 7.1.2.8 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 1.8 |
| | GNSS fine time assistance error range | μs | ± 9 |
| Galileo | Reference signal power level | dBm | -146 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -146 |
| GLONASS | Reference signal power level | dBm | -146 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.1.2.8: Satellite allocation

| | Satellite allocation for each constellation | | |
|----------------------|---|--------|--------|
| | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | 6 | - | - |
| Dual constellation | 3 | 3 | - |
| Triple constellation | 2 | 2 | 2 |

Table 7.1.2.9: Test requirements for Sensitivity Fine Time Assistance

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

7.2 Nominal Accuracy

7.2.1 Sub-tests

This test includes sub-tests dependent on the GNSS supported by the UE. Each sub-test is identified by a Sub-Test Number as defined in Table 7.2.1

Table 7.2.1: Sub-Test Number Definition

| Sub-Test Number | Supported GNSS |
|-----------------|---|
| 1 | UE supporting A-GPS L1C/A only |
| 2 | UE supporting A-GLONASS only |
| 3 | UE supporting A-Galileo only |
| 4 | UE supporting A-GPS and Modernized GPS only |
| 5 | UE supporting A-GPS and A-GLONASS only |

7.2.2 Test purpose

To verify the performance of the first position estimate, when the UE is provided with ideal GNSS signal conditions.

7.2.3 Test applicability

This test applies to all types of E-UTRA UE release 9 and forward that supports A-GNSS.

7.2.4 Minimum conformance requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 7.2.2 or 7.2.3 for the parameters specified in table 7.2.4 or 7.2.5.

Table 7.2.2: Requirements Nominal Accuracy - Sub-Test 1

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 30 m | 20 s |

Table 7.2.3: Requirements Nominal Accuracy - Sub-Tests 2 to 5

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 15 m | 20 s |

Table 7.2.4: Parameters Nominal Accuracy - Sub-Test 1

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ± 2 |
| GPS L1 C/A Signal for all satellites | dBm | -130 |

Table 7.2.5: Parameters Nominal Accuracy - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-----------------------|
| | Number of generated satellites per system | - | See Table 7.2.6 |
| | Total number of generated satellites | - | 6 or 7 ⁽²⁾ |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 2 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| QZSS | Reference signal power level for all satellites | dBm | -128.5 |
| SBAS | Reference signal power level for all satellites | dBm | -131 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |
| NOTE 2: 7 satellites apply only for SBAS case. | | | |

If QZSS is supported, one of the GPS satellites will be replaced by a QZSS satellite with respective signal support.

If SBAS is supported, the SBAS satellite with the highest elevation will be added to the scenario.

Table 7.2.6: Satellite allocation

| | Satellite allocation for each constellation | | | |
|---|---|-----------------------|-----------------------|------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ | SBAS |
| Single constellation | 6 | -- | -- | 1 |
| Dual constellation | 3 | 3 | -- | 1 |
| Triple constellation | 2 | 2 | 2 | 1 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | | |

The normative reference for this requirement is TS 36.171 [3] clause 5.2 and 6.2.

7.2.5 Test description

7.2.5.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal, as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.

Channel Bandwidth to be tested: as defined in TS 36.508 [18] clause 4.3.1.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in Annex A.
2. Set the GNSS test parameters as specified in table 7.2.7 or 7.2.8 for GNSS scenario #3 in TS 37.571-5 [20].
3. The parameter settings for the cell are set up according to TS 36.508 [18] clause 4.4.3, single cell scenario.
4. Switch on the UE.

5. Establish a signalling connection according to the generic procedure in TS 36.508 [18] clause 4.5.3 (State 3, Generic RB established) on a channel in the Mid EARFCN range.

7.2.5.2 Test procedure

1. Start GNSS scenario #3 as specified in clause 6.2.1.2 of TS 37.571-5 [20] with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in clause 6.2.1.2.6 of TS 37.571-5 [20]
2. Send a RESET UE POSITIONING STORED INFORMATION message.
3. Send an LPP REQUEST CAPABILITIES message.
4. The UE returns an LPP PROVIDE CAPABILITIES message indicating the assistance data supported by the UE in the Assistance Data Support List in the A GNSS Provide Capabilities IE.
5. Send an LPP PROVIDE ASSISTANCE DATA message to provide the assistance data that is supported by the UE as indicated in the step 4 and in accordance with clause 6.2.6 of TS 37.571-5 [20], and with the values defined in clause 6.2.7 of TS 37.571-5 [20] with the value of GNSS Reference Time offset by a random value as specified in clause 6.2.7.2 of TS 37.571-5 [20]. If the UE message at step 4 includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the (first) LPP PROVIDE ASSISTANCE DATA message.
6. Send an LPP REQUEST LOCATION INFORMATION message to obtain a fix.
7. If the UE returns a valid result in the LPP PROVIDE LOCATION INFORMATION message within the Max response time specified in table 7.2.10 then record the result and process it as specified in step 8. If the UE does not return a valid result within the Max response time specified in table 7.2.10 or reports an Error in the LPP PROVIDE LOCATION INFORMATION message then record one Bad Result.
- 7a. If the UE message at step 7 includes the ackRequested IE set to TRUE, then the SS shall send a LPP acknowledgment message.
8. For UE based testing compare the reported Location Information in the LPP PROVIDE LOCATION INFORMATION message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.2.10 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS Measurement Information reported in the LPP PROVIDE LOCATION INFORMATION message to a 2D position using the method described in clause 4.4.3 and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.2.10 and record one Good Result or Bad Result as appropriate.
9. Repeat steps 1 to 8 using GNSS scenario #4 instead of #3 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Use new random values for the UE location and altitude in step 1 and for the GNSS Reference Time offset in step 5.
10. Repeat steps 1 to 9 until the statistical requirements of clause 7.2.6 are met. Each time scenario #3 or #4 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again.
11. Release the signalling connection.

7.2.5.3 Message contents

Message contents are according to TS 36.508 [18] clauses 4.6 and 4.7 and as follows:

RESET UE POSITIONING STORED INFORMATION

| Information Element | Value/remark |
|---------------------------|--------------|
| UE POSITIONING TECHNOLOGY | AGNSS |

LPP REQUEST CAPABILITIES

| Information Element | Value/remark |
|-----------------------------------|--------------|
| <i>a-gnss-RequestCapabilities</i> | TRUE |

LPP REQUEST LOCATION INFORMATION

| Information Element | Value/remark | Comment |
|--|---|--|
| commonIEsRequestLocationInformation | | |
| > locationInformationType | 'locationEstimateRequired' or 'locationMeasurementsRequired' | Depending on test case and UE capabilities, i.e. support for UE-based or UE-assisted |
| > additionalInformation | 'onlyReturnInformationRequested' | |
| > qos | | |
| >> horizontalAccuracy (Sub Test 1) | '10' (15.9m) | |
| >> horizontalAccuracy (Sub Tests 2 to 5) | '6' (7.7m) | |
| >> verticalCoordinateRequest | FALSE | |
| >> responseTime | '20' | |
| a-gnss-RequestLocationInformation | | |
| > gnss-PositioningInstructions | | |
| >> gnssMethods | | |
| >>> gnss-ids | Sub-test 1: 'gps' and possibly 'sbas' and/or 'qzss' Sub-test 2: 'glonass' and possibly 'sbas' and/or 'qzss' Sub-test 3: 'galileo' and possibly 'sbas' and/or 'qzss' Sub-test 4: 'gps' and possibly 'sbas' and/or 'qzss' Sub-test 5: 'gps' and 'glonass' and possibly 'sbas' and/or 'qzss' | Depending on UE capabilities |
| >> fineTimeAssistanceMeasReq | FALSE | |
| >> adrMeasReq | FALSE | |
| >> multiFreqMeasReq | TRUE or FALSE | Depending on UE capabilities |
| >> assistanceAvailability | FALSE | |

7.2.6 Test requirement

For the parameters specified in table 7.2.7 or 7.2.8 the UE shall meet the requirements and the success rate specified in table 7.2.10 or 7.2.11 with a confidence level of 95% according to Annex D.

Table 7.2.7: Test parameters Nominal Accuracy - Sub-Test 1

| Parameters | Unit | Value |
|--|---------|------------|
| Number of generated satellites | - | 8 |
| HDOP Range | - | 1.1 to 1.6 |
| Propagation conditions | - | AWGN |
| GPS Coarse Time assistance error range | seconds | ±1.8 |
| GPS L1 C/A Signal for all satellites | dBm | -130 |

Table 7.2.8: Test parameters Nominal Accuracy - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-----------------------|
| | Number of generated satellites per system | - | See Table 7.2.9 |
| | Total number of generated satellites | - | 6 or 7 ⁽²⁾ |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±1.8 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| QZSS | Reference signal power level for all satellites | dBm | -128.5 |
| SBAS | Reference signal power level for all satellites | dBm | -131 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |
| NOTE 2: 7 satellites apply only for SBAS case. | | | |

If QZSS is supported, one of the GPS satellites will be replaced by a QZSS satellite with respective signal support.

If SBAS is supported, the SBAS satellite with the highest elevation will be added to the scenario.

Table 7.2.9: Satellite allocation

| | Satellite allocation for each constellation | | | |
|---|---|-----------------------|-----------------------|------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ | SBAS |
| Single constellation | 6 | -- | -- | 1 |
| Dual constellation | 3 | 3 | -- | 1 |
| Triple constellation | 2 | 2 | 2 | 1 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | | |

Table 7.2.10: Test requirements for Nominal Accuracy – Sub Test 1

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 31.3 m | 20.3 s |

Table 7.2.11: Test requirements for Nominal Accuracy – Sub Tests 2 to 5

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 16.3 m | 20.3 s |

7.3 Dynamic Range

7.3.1 Sub-tests

This test includes sub-tests dependent on the GNSS supported by the UE. Each sub-test is identified by a Sub-Test Number as defined in Table 7.3.1

Table 7.3.1: Sub-Test Number Definition

| Sub-Test Number | Supported GNSS |
|-----------------|---|
| 1 | UE supporting A-GPS L1C/A only |
| 2 | UE supporting A-GLONASS only |
| 3 | UE supporting A-Galileo only |
| 4 | UE supporting A-GPS and Modernized GPS only |
| 5 | UE supporting A-GPS and A-GLONASS only |

7.3.2 Test purpose

To verify the performance of the first position estimate, when the UE is provided with GNSS signals with large dynamic ranges.

7.3.3 Test applicability

This test applies to all types of E-UTRA UE release 9 and forward that supports A-GNSS.

7.3.4 Minimum conformance requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 7.3.2 for the parameters specified in table 7.3.3 or 7.3.4.

Table 7.3.2: Requirements Dynamic Range

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

Table 7.3.3: Parameters Dynamic Range - Sub-Test 1

| Parameters | Unit | Value |
|---|---------|------------|
| Number of generated satellites | - | 6 |
| HDOP Range | - | 1.4 to 2.1 |
| GPS Coarse Time assistance error range | seconds | ±2 |
| Propagation conditions | - | AWGN |
| GPS L1 C/A Signal for 1 st satellite | dBm | -129 |
| GPS L1 C/A Signal for 2 nd satellite | dBm | -135 |
| GPS L1 C/A Signal for 3 rd satellite | dBm | -141 |
| GPS L1 C/A Signal for 4 th satellite | dBm | -147 |
| GPS L1 C/A Signal for 5 th satellite | dBm | -147 |
| GPS L1 C/A Signal for 6 th satellite | dBm | -147 |

Table 7.3.4: Parameters Dynamic Range - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-----------------|
| | Number of generated satellites per system | - | See Table 7.3.5 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference high signal power level | dBm | -127.5 |
| | Reference low signal power level | dBm | -147 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -129 |
| | Reference low signal power level | dBm | -147 |
| GLONASS | Reference high signal power level | dBm | -131.5 |
| | Reference low signal power level | dBm | -147 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.3.5: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|---|-------------------|---|-----------------------|-----------------------|
| | | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | High signal level | 2 | -- | -- |
| | Low signal level | 4 | -- | -- |
| Dual constellation | High signal level | 1 | 1 | -- |
| | Low signal level | 2 | 2 | -- |
| Triple constellation | High signal level | 1 | 1 | 1 |
| | Low signal level | 1 | 1 | 1 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | | |

The normative reference for this requirement is TS 36.171 [3] clause 5.3 and 6.3.

7.3.5 Test description

7.3.5.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal, as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.

Channel Bandwidth to be tested: as defined in TS 36.508 [18] clause 4.3.1.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in Annex A.
2. Set the GNSS test parameters as specified in table 7.3.6 or 7.3.7 for GNSS scenario #1 in TS 37.571-5 [20]. Randomly select from the satellite SV IDs defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20] for the satellites with the higher levels.
3. The parameter settings for the cell are set up according to TS 36.508 [18] clause 4.4.3, single cell scenario.
4. Switch on the UE.
5. Establish a signalling connection according to the generic procedure in TS 36.508 [18] clause 4.5.3 (State 3, Generic RB established) on a channel in the Mid EARFCN range.

7.3.5.2 Test procedure

1. Start GNSS scenario #1 as specified in clause 6.2.1.2 of TS 37.571-5 [20] with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in clause 6.2.1.2.6 of TS 37.571-5 [20]
2. Send a RESET UE POSITIONING STORED INFORMATION message.
3. Send an LPP REQUEST CAPABILITIES message.
4. The UE returns an LPP PROVIDE CAPABILITIES message indicating the assistance data supported by the UE in the Assistance Data Support List in the A GNSS Provide Capabilities IE.
5. Send an LPP PROVIDE ASSISTANCE DATA message to provide the assistance data that is supported by the UE as indicated in the step 4 and in accordance with clause 6.2.6 of TS 37.571-5 [20], and with the values defined in clause 6.2.7 of TS 37.571-5 [20] with the value of GNSS Reference Time offset by a random value as specified in clause 6.2.7.2 of TS 37.571-5 [20]. If the UE message at step 4 includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the (first) LPP PROVIDE ASSISTANCE DATA message.
6. Send an LPP REQUEST LOCATION INFORMATION message to obtain a fix.
7. If the UE returns a valid result in the LPP PROVIDE LOCATION INFORMATION message within the Max response time specified in table 7.3.9 then record the result and process it as specified in step 8. If the UE does

not return a valid result within the Max response time specified in table 7.3.9 or reports an Error in the LPP PROVIDE LOCATION INFORMATION message then record one Bad Result.

- 7a. If the UE message at step 7 includes the ackRequested IE set to TRUE, then the SS shall send a LPP acknowledgment message.
8. For UE based testing compare the reported Location Information in the LPP PROVIDE LOCATION INFORMATION message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.3.9 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS Measurement Information reported in the LPP PROVIDE LOCATION INFORMATION message to a 2D position using the method described in clause 4.4.3 and then compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.3.9 and record one Good Result or Bad Result as appropriate.

9. Repeat steps 1 to 8 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Randomly select from the satellite SV IDs defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20] for the satellites with the higher levels. Use new random values for the UE location and altitude in step 1 and for the GNSS Reference Time offset in step 5.
10. Repeat steps 1 to 9 until the statistical requirements of clause 7.3.6 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, randomly select from the satellite SV IDs defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20], for the satellites with the higher levels.
11. Release the signalling connection.

7.3.5.3 Message contents

Message contents are according to TS 36.508 [18] clauses 4.6 and 4.7 and as follows:

RESET UE POSITIONING STORED INFORMATION

| Information Element | Value/remark |
|---------------------------|--------------|
| UE POSITIONING TECHNOLOGY | AGNSS |

LPP REQUEST CAPABILITIES

| Information Element | Value/remark |
|-----------------------------------|--------------|
| <i>a-gnss-RequestCapabilities</i> | TRUE |

LPP REQUEST LOCATION INFORMATION

| Information Element | Value/remark | Comment |
|-------------------------------------|---|--|
| commonIEsRequestLocationInformation | | |
| > locationInformationType | 'locationEstimateRequired' or 'locationMeasurementsRequired' | Depending on test case and UE capabilities, i.e. support for UE-based or UE-assisted |
| > additionalInformation | 'onlyReturnInformationRequested' | |
| > qos | | |
| >> horizontalAccuracy | '19' (51.2m) | |
| >> verticalCoordinateRequest | FALSE | |
| >> responseTime | '20' | |
| a-gnss-RequestLocationInformation | | |
| > gnss-PositioningInstructions | | |
| >> gnssMethods | | |
| >>> gnss-ids | Sub-test 1: 'gps' Sub-test 2: 'glonass' Sub-test 3: 'galileo' Sub-test 4: 'gps' Sub-test 5: 'gps' and 'glonass' | |
| >> fineTimeAssistanceMeasReq | FALSE | |
| >> adrMeasReq | FALSE | |
| >> multiFreqMeasReq | TRUE or FALSE | Depending on UE capabilities |
| >> assistanceAvailability | FALSE | |

7.3.6 Test requirement

For the parameters specified in table 7.3.6 or 7.3.7 the UE shall meet the requirements and the success rate specified in table 7.3.9 with a confidence level of 95% according to Annex D.

Table 7.3.6: Test parameters Dynamic Range - Sub-Test 1

| Parameters | Unit | Value |
|---|---------|------------|
| Number of generated satellites | - | 6 |
| HDOP Range | - | 1.4 to 2.1 |
| GPS Coarse Time assistance error range | seconds | ±1.8 |
| Propagation conditions | - | AWGN |
| GPS L1 C/A Signal for 1 st satellite | dBm | -128.2 |
| GPS L1 C/A Signal for 2 nd satellite | dBm | -134 |
| GPS L1 C/A Signal for 3 rd satellite | dBm | -140 |
| GPS L1 C/A Signal for 4 th satellite | dBm | -146 |
| GPS L1 C/A Signal for 5 th satellite | dBm | -146 |
| GPS L1 C/A Signal for 6 th satellite | dBm | -146 |

Table 7.3.7: Test parameters Dynamic Range - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-----------------|
| | Number of generated satellites per system | - | See Table 7.3.8 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±1.8 |
| Galileo | Reference high signal power level | dBm | -126.7 |
| | Reference low signal power level | dBm | -146 |
| GPS ⁽¹⁾ | Reference high signal power level | dBm | -128.2 |
| | Reference low signal power level | dBm | -146 |
| GLONASS | Reference high signal power level | dBm | -130.7 |
| | Reference low signal power level | dBm | -146 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.3.8: Power level and satellite allocation

| | | Satellite allocation for each constellation | | |
|---|-------------------|---|-----------------------|-----------------------|
| | | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | High signal level | 2 | -- | -- |
| | Low signal level | 4 | -- | -- |
| Dual constellation | High signal level | 1 | 1 | -- |
| | Low signal level | 2 | 2 | -- |
| Triple constellation | High signal level | 1 | 1 | 1 |
| | Low signal level | 1 | 1 | 1 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | | |

Table 7.3.9: Test requirements for Dynamic Range

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

7.4 Multi-Path scenario

7.4.1 Sub-tests

This test includes sub-tests dependent on the GNSS supported by the UE. Each sub-test is identified by a Sub-Test Number as defined in Table 7.4.1

Table 7.4.1: Sub-Test Number Definition

| Sub-Test Number | Supported GNSS |
|-----------------|---|
| 1 | UE supporting A-GPS L1C/A only |
| 2 | UE supporting A-GLONASS only |
| 3 | UE supporting A-Galileo only |
| 4 | UE supporting A-GPS and Modernized GPS only |
| 5 | UE supporting A-GPS and A-GLONASS only |

7.4.2 Test purpose

To verify the performance of the first position estimate, when the UE is provided with GNSS signals with multi-path components.

7.4.3 Test applicability

This test applies to all types of E-UTRA UE release 9 and forward that supports A-GNSS.

7.4.4 Minimum conformance requirements

The first fix position estimates shall meet the accuracy and response time requirements in table 7.4.2 for the parameters specified in table 7.4.3 or 7.4.4.

Table 7.4.2: Requirements Multi-Path scenario

| Success rate | 2-D position error | Max response time |
|--------------|--------------------|-------------------|
| 95 % | 100 m | 20 s |

Table 7.4.3: Parameters Multi-Path scenario - Sub-Test 1

| Parameters | Unit | Value |
|--|---------|---|
| Number of generated satellites (Satellites 1, 2 unaffected by multi-path) (Satellites 3, 4, 5 affected by multi-path) | - | 5 |
| GPS Coarse time assistance error range | seconds | ±2 |
| HDOP Range | - | 1.8 to 2.5 |
| GPS L1 C/A Signal for satellite 1, 2 | dBm | -130 |
| GPS L1 C/A Signal for satellite 3, 4, 5 | dBm | LOS signal of -130 dBm, multi-path signal of -136 dBm |

Table 7.4.4: Parameters Multi-Path scenario - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|-----------------|
| | Number of generated satellites per system | - | See Table 7.4.5 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ±2 |
| Galileo | Reference signal power level | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -128.5 |
| GLONASS | Reference signal power level | dBm | -131 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.4.5: Channel model allocation

| | | Channel model allocation for each constellation | | |
|----------------------|-----------------|---|--------|--------|
| | | GNSS-1 | GNSS-2 | GNSS-3 |
| Single constellation | One-tap channel | 2 | -- | -- |
| | Two-tap channel | 4 | -- | -- |
| Dual constellation | One-tap channel | 1 | 1 | -- |
| | Two-tap channel | 2 | 2 | -- |
| Triple constellation | One-tap channel | 1 | 1 | 1 |
| | Two-tap channel | 1 | 1 | 1 |

The normative reference for this requirement is TS 36.171 [3] clause 5.4 and 6.4.

7.4.5 Test description

7.4.5.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal, as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.

Channel Bandwidth to be tested: as defined in TS 36.508 [18] clause 4.3.1.

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in Annex A.
2. Set the GNSS test parameters as specified in table 7.4.6 or 7.4.7 for GNSS scenario #1 in TS 37.571-5 [20]. Randomly select from the satellite SV IDs defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20] for the satellites with one-tap channels.
3. The parameter settings for the cell are set up according to TS 36.508 [18] clause 4.4.3, single cell scenario.
4. Switch on the UE.
5. Establish a signalling connection according to the generic procedure in TS 36.508 [18] clause 4.5.3 (State 3, Generic RB established) on a channel in the Mid EARFCN range.

7.4.5.2 Test procedure

1. Start GNSS scenario #1 as specified in clause 6.2.1.2 of TS 37.571-5 [20] with the UE location randomly selected to be within 3 km of the Reference Location and the altitude of the UE randomly selected between 0 m to 500 m above WGS-84 reference ellipsoid using the method described in clause 6.2.1.2.6 of TS 37.571-5 [20]. The initial carrier phase difference between taps of the multi-path model shall be randomly selected between 0 and 2π radians by selecting the next random number from a standard uniform random number generator, in the range 0 to 2π , representing radians with a resolution of 0.1, representing 0.1 radians.
2. Send a RESET UE POSITIONING STORED INFORMATION message.
3. Send an LPP REQUEST CAPABILITIES message.
4. The UE returns an LPP PROVIDE CAPABILITIES message indicating the assistance data supported by the UE in the Assistance Data Support List in the A GNSS Provide Capabilities IE.
5. Send an LPP PROVIDE ASSISTANCE DATA message to provide the assistance data that is supported by the UE as indicated in the step 4 and in accordance with clause 6.2.6 of TS 37.571-5 [20], and with the values defined in clause 6.2.7 of TS 37.571-5 [20] with the value of GNSS Reference Time offset by a random value as specified in clause 6.2.7.2 of TS 37.571-5 [20]. If the UE message at step 4 includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
6. Send an LPP REQUEST LOCATION INFORMATION message to obtain a fix.
7. If the UE returns a valid result in the LPP PROVIDE LOCATION INFORMATION message within the Max response time specified in table 7.4.10 then record the result and process it as specified in step 8. If the UE does not return a valid result within the Max response time specified in table 7.4.10 or reports an Error in the LPP PROVIDE LOCATION INFORMATION message then record one Bad Result.
- 7a. If the UE message at step 7 includes the ackRequested IE set to TRUE, then the SS shall send a LPP acknowledgment message.
8. For UE based testing compare the reported Location Information in the LPP PROVIDE LOCATION INFORMATION message against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.4.10 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS Measurement Information reported in the LPP PROVIDE LOCATION INFORMATION message to a 2D position using the method described in clause 4.4.3 and then

compare the result against the simulated position of the UE used in step 1, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.4.10 and record one Good Result or Bad Result as appropriate.

9. Repeat steps 1 to 8 using GNSS scenario #2 instead of #1 so that the reference location changes sufficiently such that the UE shall have to use the new assistance data. Randomly select from the satellite SV IDs defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20] for the satellites with the one-tap channels. Use new random values for the UE location and altitude, and the initial carrier phase difference between taps of the multi-path model in step 1 and for the GNSS Reference Time offset in step 5.
10. Repeat steps 1 to 9 until the statistical requirements of clause 7.4.6 are met. Each time scenario #1 or #2 is used, the start time of the GNSS scenario shall be advanced by 2 minutes from the time used previously for that scenario. Once a scenario reaches the end of its viable running time, restart it from its nominal start time again. Each time scenario #1 or #2 is used, randomly select from the satellite SV IDs defined in the relevant table of Satellites to be simulated in clause 6.2.1.2 in TS 37.571-5 [20], for the satellites with the one-tap channels.
11. Release the signalling connection

7.4.5.3 Message contents

Message contents are according to TS 36.508 [18] clauses 4.6 and 4.7 and as follows:

RESET UE POSITIONING STORED INFORMATION

| Information Element | Value/remark |
|---------------------------|--------------|
| UE POSITIONING TECHNOLOGY | AGNSS |

LPP REQUEST CAPABILITIES

| Information Element | Value/remark |
|-----------------------------------|--------------|
| <i>a-gnss-RequestCapabilities</i> | TRUE |

LPP REQUEST LOCATION INFORMATION

| Information Element | Value/remark | Comment |
|------------------------------------|---|--|
| commonEsRequestLocationInformation | | |
| > locationInformationType | 'locationEstimateRequired' or 'locationMeasurementsRequired' | Depending on test case and UE capabilities, i.e. support for UE-based or UE-assisted |
| > additionalInformation | 'onlyReturnInformationRequested' | |
| > qos | | |
| >> horizontalAccuracy | '19' (51.2m) | |
| >> verticalCoordinateRequest | FALSE | |
| >> responseTime | '20' | |
| a-gnss-RequestLocationInformation | | |
| > gnss-PositioningInstructions | | |
| >> gnssMethods | | |
| >>> gnss-ids | Sub-test 1: 'gps' Sub-test 2: 'glonass' Sub-test 3: 'galileo' Sub-test 4: 'gps' Sub-test 5: 'gps' and 'glonass' | |
| >> fineTimeAssistanceMeasReq | FALSE | |
| >> adrMeasReq | FALSE | |
| >> multiFreqMeasReq | TRUE or FALSE | Depending on UE capabilities |
| >> assistanceAvailability | FALSE | |

7.4.6 Test requirement

For the parameters specified in table 7.4.6 or 7.4.7 the UE shall meet the requirements and the success rate specified in table 7.4.10 with a confidence level of 95% according to Annex D.

Table 7.4.6: Test parameters Multi-Path scenario - Sub-Test 1

| Parameters | Unit | Value |
|---|---------|---|
| Number of generated satellites (see note) | - | 5 |
| GPS Coarse Time assistance error range | seconds | ± 1.8 |
| HDOP Range | - | 1.8 to 2.5 |
| GPS L1 C/A Signal for Satellite 1, 2 (see note) | dBm | -130 |
| GPS L1 C/A Signal for Satellite 3, 4, 5 (see note) | dBm | LOS signal of -130 dBm, multi-path signal of -136.2 dBm |
| NOTE: Satellites 1, 2 no multi-path. Satellites 3, 4, 5 multi-path defined in clause 4.2.4. | | |

Table 7.4.7: Test parameters Multi-Path scenario - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|---------|----------------|
| | Number of generated satellites per system | - | See Table 6.18 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range per system | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| | GNSS coarse time assistance error range | seconds | ± 2 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 6.18: Satellite allocation

| | Satellite allocation for each constellation | | |
|---|---|-----------------------|-----------------------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | 6 | -- | -- |
| Dual constellation | 3 | 3 | -- |
| Triple constellation | 2 | 2 | 2 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | |

Table 7.4.10: Test requirements for Multi-Path scenario

| System | Success rate | 2-D position error | Max response time |
|--------|--------------|--------------------|-------------------|
| All | 95 % | 101.3 m | 20.3 s |

7.5 Moving scenario and periodic update

7.5.1 Sub-tests

This test includes sub-tests dependent on the GNSS supported by the UE. Each sub-test is identified by a Sub-Test Number as defined in Table 7.5.1

Table 7.5.1: Sub-Test Number Definition

| Sub-Test Number | Supported GNSS |
|-----------------|---|
| 1 | UE supporting A-GPS L1C/A only |
| 2 | UE supporting A-GLONASS only |
| 3 | UE supporting A-Galileo only |
| 4 | UE supporting A-GPS and Modernized GPS only |
| 5 | UE supporting A-GPS and A-GLONASS only |

7.5.2 Test purpose

To verify the performance when the UE is requested to use periodical reporting with a reporting interval of 2 seconds.

7.5.3 Test applicability

This test applies to all types of E-UTRA UE release 9 and forward that supports A-GNSS.

7.5.4 Minimum conformance requirements

The position estimates, after the first reported position estimate, shall meet the accuracy requirement in table 7.5.2 or 7.5.3 with the periodical reporting interval of 2 seconds for the parameters specified in table 7.5.4 or 7.5.5.

NOTE: In the actual testing the UE may report error messages until it has been able to acquire GNSS measured results or a position estimate. The SS shall only consider the first measurement report different from an error message as the first position estimate in the requirement in table 7.5.2 or 7.5.3.

Table 7.5.2: Requirements Moving scenario and periodic update - Sub-Test 1

| Success Rate | 2-D position error | Periodical reporting interval |
|--------------|--------------------|-------------------------------|
| 95 % | 100 m | 2 s |

Table 7.5.3: Requirements Moving scenario and periodic update - Sub-Tests 2 to 5

| Success Rate | 2-D position error | Periodical reporting interval |
|--------------|--------------------|-------------------------------|
| 95 % | 50 m | 2 s |

Table 7.5.4: Parameters Moving scenario and periodic update - Sub-Test 1

| Parameters | Unit | Value |
|--------------------------------------|------|------------|
| Number of generated satellites | - | 5 |
| HDOP Range | - | 1.8 to 2.5 |
| Propagation condition | - | AWGN |
| GPS L1 C/A signal for all satellites | dBm | -130 |

Table 7.5.5: Parameters Moving scenario and periodic update - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|------|-----------------|
| | Number of generated satellites per system | - | See Table 7.5.6 |
| | Total number of generated satellites | - | 6 |
| | HDOP range | | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| Galileo | Reference signal power level | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level | dBm | -128.5 |
| GLONASS | Reference signal power level | dBm | -131 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.5.6: Satellite allocation

| | Satellite allocation for each constellation | | |
|---|---|-----------------------|-----------------------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | 6 | -- | -- |
| Dual constellation | 3 | 3 | -- |
| Triple constellation | 2 | 2 | 2 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | |

The normative reference for this requirement is TS 36.171 [3] clause 5.5 and 6.5.

7.5.5 Test description

7.5.5.1 Initial conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

Test Environment: Normal, as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.

Channel Bandwidth to be tested: as defined in TS 36.508 [18] clause 4.3.1

The UE moves on a rectangular trajectory of 940 m by 1 440 m with rounded corner defined in Figure 7.1. The initial reference is first defined followed by acceleration to final speed of 100 km/h in 250 m. The UE then maintains the speed for 400 m. This is followed by deceleration to final speed of 25 km/h in 250 m. The UE then turn 90 degrees with turning radius of 20 m at 25 km/h. This is followed by acceleration to final speed of 100 km/h in 250 m. The sequence is repeated to complete the rectangle.

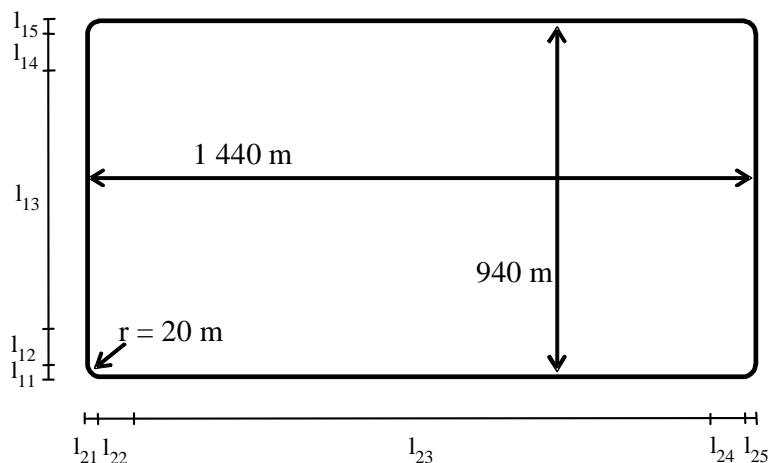


Figure 7.1: Rectangular trajectory of the moving scenario and periodic update test case

Trajectory Parameters

| Parameter | Distance (m) | Speed (km/h) |
|----------------------------------|--------------|-------------------------|
| $l_{11}, l_{15}, l_{21}, l_{25}$ | 20 | 25 |
| $l_{12}, l_{14}, l_{22}, l_{24}$ | 250 | 25 to 100 and 100 to 25 |
| l_{13} | 400 | 100 |
| l_{23} | 900 | 100 |

1. Connect SS and GSS to the UE antenna connector or antenna connectors as shown in Annex A.

2. Set the GPS test parameters as specified in table 7.5.7 or 7.5.8 for GPS scenario #5 in TS 37.571-5 [20].
3. The parameter settings for the cell are set up according to TS 36.508 [18] clause 4.4.3, single cell scenario.
4. Switch on the UE.
5. Establish a signalling connection according to the generic procedure in TS 36.508 [18] clause 4.5.3 (State 3, Generic RB established) on a channel in the Mid EARFCN range.

7.5.5.2 Test procedure

1. Start GNSS scenario #5 as specified in clause 6.2.1.2 of TS 37.571-5 [20]
2. Send a RESET UE POSITIONING STORED INFORMATION message.
3. Send an LPP REQUEST CAPABILITIES message.
4. The UE returns an LPP PROVIDE CAPABILITIES message indicating the assistance data supported by the UE in the Assistance Data Support List in the A GNSS Provide Capabilities IE.
5. Send an LPP PROVIDE ASSISTANCE DATA message to provide the assistance data that is supported by the UE as indicated in the step 4 and in accordance with clause 6.2.6 of TS 37.571-5 [20], and with the values defined in clause 6.2.7 of TS 37.571-5 [20]. If the UE message at step 4 includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
6. Send an LPP REQUEST LOCATION INFORMATION message to obtain a fix.
7. Ignore any Error messages that the UE may report in LPP PROVIDE LOCATION INFORMATION messages until it has been able to acquire the GNSS signals and reports the first GNSS Measurement Information or Location Information.
8. Discard the first GNSS Measurement Information or Location Information.
9. Record the time of reception of the next LPP PROVIDE LOCATION INFORMATION message after reception of the first GNSS Measurement Information or Location Information.
10. After the reception of the first GNSS Measurement Information or Location Information reported in a LPP PROVIDE LOCATION INFORMATION message, every time the UE returns a GNSS Measurement Information or Location Information in the LPP PROVIDE LOCATION INFORMATION message record the time of reception and the result. If the difference between the time of reception and the time of reception of the previous result is less than 1.5 seconds or greater than 2.5 seconds, or if the UE reports an Error in any LPP PROVIDE LOCATION INFORMATION messages, then record one Bad Result. Otherwise process the result as specified in step 11.
- 10a. If the UE messages at steps 7 to 10 include the ackRequested IE set to TRUE, then the SS shall send LPP acknowledgment messages as required.
11. For UE based testing compare the reported Location Information in the LPP PROVIDE LOCATION INFORMATION message against the simulated position of the UE at the time of applicability reported in the Location Information, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.5.10 or 7.5.11 and record one Good Result or Bad Result as appropriate; or

For UE assisted testing convert the GNSS Measurement Information reported in the LPP PROVIDE LOCATION INFORMATION message to a 2D position using the method described in clause 4.4.3 and then compare the result against the simulated position of the UE at the time of applicability reported in the GNSS Measurement Information, and calculate the 2D position error as specified in clause 4.5.2.3. Compare the 2D position error against the value in table 7.5.10 or 7.5.11 and record one Good Result or Bad Result as appropriate.
12. If the UE sends the first LPP PROVIDE LOCATION INFORMATION that contains GNSS Measurement Information or Location Information later than 240s after the start of the GNSS scenario, fail the UE and stop the test early. Otherwise collect LPP PROVIDE LOCATION INFORMATION results during 900s, starting from the time recorded in step 9. If at any time the difference between the times of reception of two consecutive results is greater than 240s, fail the UE and stop the test early. Use the collected Good Results and Bad Results to determine the PASS/FAIL according to clause 7.5.6.

13. Release the signalling connection.

7.5.5.3 Message contents

Message contents are according to TS 36.508 [18] clauses 4.6 and 4.7 and as follows:

RESET UE POSITIONING STORED INFORMATION

| Information Element | Value/remark |
|---------------------------|--------------|
| UE POSITIONING TECHNOLOGY | AGNSS |

LPP REQUEST CAPABILITIES

| Information Element | Value/remark |
|-----------------------------------|--------------|
| <i>a-gnss-RequestCapabilities</i> | TRUE |

LPP REQUEST LOCATION INFORMATION

| Information Element | Value/remark | Comment |
|--|---|--|
| commonIEsRequestLocationInformation | | |
| > locationInformationType | 'locationEstimateRequired' or 'locationMeasurementsRequired' | Depending on test case and UE capabilities, i.e. support for UE-based or UE-assisted |
| > periodicalReporting | | |
| >> reportingAmount | 'ra-Infinity ' | Infinite means during the complete test time |
| >>> reportingInterval | 'ri0-5' | 2 seconds |
| > additionalInformation | 'onlyReturnInformationRequested' | |
| > qos | | |
| >> horizontalAccuracy (Sub Test 1) | '19' (51.2m) | |
| >> horizontalAccuracy (Sub Tests 2 to 5) | '13' (24.5m) | |
| >> verticalCoordinateRequest | FALSE | |
| >> responseTime | Not present | |
| a-gnss-RequestLocationInformation | | |
| > gnss-PositioningInstructions | | |
| >> gnssMethods | | |
| >>> gnss-ids | Sub-test 1: 'gps' Sub-test 2: 'glonass' Sub-test 3: 'galileo' Sub-test 4: 'gps' Sub-test 5: 'gps' and 'glonass' | |
| >>> fineTimeAssistanceMeasReq | FALSE | |
| >>> adrMeasReq | FALSE | |
| >>> multiFreqMeasReq | TRUE or FALSE | Depending on UE capabilities |
| >>> assistanceAvailability | FALSE | |

7.5.6 Test requirement

For the parameters specified in table 7.5.7 or 7.5.8 the UE shall meet the requirements and the success rate specified in table 7.5.10 or 7.5.11 after the first reported position estimates.

- NOTES:
1. In the testing the UE may report error messages until it has been able to acquire GNSS measured results or a position estimate. The test equipment shall only consider the first measurement report different from an error message as the first position estimate in the requirement in table 7.5.10 or 7.5.11.
 2. Due to the statistical nature of the results it is not possible to design a test with predefined confidence level for the success rate in table 7.5.10 or 7.5.11, therefore a simple PASS/FAIL of the results gathered against this success rate is used.

Table 7.5.7: Test parameters Moving scenario and periodic update - Sub-Test 1

| Parameters | Unit | Value |
|--------------------------------------|------|------------|
| Number of generated satellites | - | 5 |
| HDOP Range | - | 1.8 to 2.5 |
| Propagation condition | - | AWGN |
| GPS L1 C/A Signal for all satellites | dBm | -130 |

Table 7.5.8: Test parameters Moving scenario and periodic update - Sub-Tests 2 to 5

| System | Parameters | Unit | Value |
|---|---|------|-----------------|
| | Number of generated satellites per system | - | See Table 7.5.9 |
| | Total number of generated satellites | - | 6 |
| | HDOP Range per system | - | 1.4 to 2.1 |
| | Propagation conditions | - | AWGN |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GPS ⁽¹⁾ | Reference signal power level for all satellites | dBm | -128.5 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities. | | | |

Table 7.5.9: Satellite allocation

| | Satellite allocation for each constellation | | |
|---|---|-----------------------|-----------------------|
| | GNSS 1 ⁽¹⁾ | GNSS 2 ⁽¹⁾ | GNSS 3 ⁽¹⁾ |
| Single constellation | 6 | -- | -- |
| Dual constellation | 3 | 3 | -- |
| Triple constellation | 2 | 2 | 2 |
| NOTE 1: GNSS refers to global systems i.e., GPS, Galileo, GLONASS | | | |

Table 7.5.10: Test requirements for Moving scenario and periodic update - Sub-Test 1

| System | Success rate | 2-D position error | Periodical reporting interval |
|--------|--------------|--------------------|-------------------------------|
| All | 95 % | 101.3 m | Between 1.5 s and 2.5s |

Table 7.5.11: Test requirements for Moving scenario and periodic update - Sub-Tests 2 to 5

| System | Success rate | 2-D position error | Periodical reporting interval |
|--------|--------------|--------------------|-------------------------------|
| All | 95 % | 51.3 m | Between 1.5 s and 2.5s |

8 E-UTRA ECID measurement requirements

8.1 UE Rx – Tx Time Difference

8.1.1 E-UTRAN FDD UE Rx – Tx time difference case

8.1.1.1 Test purpose

The purpose of this test is to verify that the E-UTRAN FDD UE Rx – Tx time difference measurement accuracy is within the specified limits in TS 36.133 [23] clause 9.1.9.

8.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that supports ECID positioning.

8.1.1.3 Minimum conformance requirements

NOTE: This measurement is used for UE positioning purposes.

The UE RX-TX time difference is measured from the serving cell.

The accuracy requirements in Table 8.1.1.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in TS 36.101 [2] clause 7.3 for reference sensitivity are fulfilled.

No changes to the uplink transmission timing are applied during the measurement period.

RSRP_{dBm} according to clause E.1 for a corresponding Band.

Table 8.1.1.3-1: UE Rx – Tx time difference measurement accuracy

| Accuracy | Es/lot | Downlink bandwidth | Conditions | | | Minimum Io | Maximum Io |
|-----------|--------|--------------------|------------------------------|----------|-----------|---------------|------------|
| | | | E-UTRA operating band groups | Io range | | | |
| | | | | Note 1 | | | |
| Ts Note 2 | dB | MHz | Note 7 | | dBm/15kHz | dBm/BWChannel | |
| ±20 | ≥-3 dB | ≤ 3 MHz | FDD_A, TDD_A | | -121 | -50 | |
| | | | FDD_C, TDD_C | | -120 | -50 | |
| | | | FDD_D | | -119.5 | -50 | |
| | | | FDD_E, TDD_E | | -119 | -50 | |
| | | | FDD_F | | -118.5 | -50 | |
| | | | FDD_G Note 5 | | -118 | -50 | |
| | | | FDD_H | | -117.5 | -50 | |
| ±10 | ≥-3 dB | ≥ 5 MHz | FDD_N | | -114.5 | -50 | |
| | | | Note 4 | | Note 4 | Note 4 | |

NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe.

NOTE 2: T_s is the basic timing unit defined in TS 36.211 [26].

NOTE 3: Void.

NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with downlink bandwidth ≤ 3 MHz.

NOTE 5: Except Band 29.

NOTE 6: The condition level is increased by $\Delta > 0$, when applicable, as described in TS 36.133 [23] Annexes B.4.2 and B.4.3.

NOTE 7: E-UTRA operating band groups are as defined in clause 4.4.2.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.9 and A.9.7.1.

8.1.1.4 Test description

The test consists of two sub-tests; the difference between the sub-tests is the bandwidth, 1.4MHz and 10MHz. Each sub-test has two test points with time delays starting at $32 T_s$ and $5008 T_s$ respectively. There is only one active cell in the tests. The tested UE is connected with the serving cell, configured to transmit SRS signals periodically, and signalled to report UE Rx – Tx time difference measurement. The test equipment measures the transmit timing of the UE using the transmitted SRS. The test equipment then compares this timing to the UE Rx-Tx measurement reported by the UE.

8.1.1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel Bandwidth to be tested: 1.4 and 10MHz. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test, as defined in TS 36.101 [2] clause 5.6.1, then the corresponding sub-test shall be omitted.

1. Connect the SS (node B emulator) and AWGN noise source to the UE antenna connectors as shown in Annex A figure A.5.
2. Propagation conditions are set according to clause 4.6.2.1.
3. Message contents are defined in clause 8.1.1.4.3.
4. Cell 1 is the serving cell. Cell 1 is the cell used for connection setup with the power levels set according to TS 36.521-3 [25] clauses C.0 and C.1 for this test.

8.1.1.4.2 Test procedure

1. Bring the UE to State 3A or 3A-RF according to TS 36.508 [18] clause 4.5.3A or 5.2A.2, using a value of initial timing advance command $T_A = 2$ in the Random Access Response which indicates an initial timing advance value $N_{TA} = 32 T_s$. Note that in the remainder of the test the timing advance command $T_A = 31$ which indicates a timing advance adjustment value $N_{TA} = 0 T_s$.
2. Set the parameters according to Sub-test 1 in Tables 8.1.1.5-1 and 8.1.1.5-2 as appropriate. Propagation conditions are set according to clause 4.6.2.1.
3. The SS adjusts the downlink timing for Cell 1 to a delay of $+8 T_s$, compared to the current value.
4. Wait for 1.6 s to allow for the possibility that the UE makes autonomous timing adjustments.
- 4a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 4b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the ECID capabilities supported by the UE in the *ECID-ProvideCapabilities* IE.
5. The SS shall transmit an LPP REQUEST LOCATION INFORMATION message, including the *ECID-RequestLocationInformation* IE. If the UE message at step 4b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP REQUEST LOCATION INFORMATION message.
6. The UE shall transmit an LPP PROVIDE LOCATION INFORMATION message including the *ecid-SignalMeasurementInformation* IE.
7. As soon as possible after step 6 the SS shall measure the transmit timing of the UE using the transmitted SRS, relative to the current downlink timing.
8. If the UE message at step 6 includes the *ackRequested* IE set to TRUE, then the SS shall send a LPP acknowledgment message.
9. The SS shall check the reported value of *ue-RxTxTimeDiff* in the *ecid-SignalMeasurementInformation* IE provided by the UE in step 6 and compare it with the value measured in step 7. The SS shall check that the reported value is within the limits specified in table 8.1.1.5-3 for Sub-test 1 compared to the measured value. If the reported value is within the limits the number of successful results for “Sub-test 1 – Test point 1” is increased by one. If the reported value is not within the limits, or the UE reports an error in the LPP PROVIDE LOCATION INFORMATION message in step 6, or does not respond at step 6 within the time given by the *responseTime* IE in the *ECID-RequestLocationInformation* IE in step 5, then the number of unsuccessful results for “Sub-test 1 – Test point 1” is increased by one.
10. Repeat steps 3-9 until the confidence level according to Annex D.4.3 is achieved.
NOTE: To avoid a large divergence between the sent TA and the set downlink timing, the SS may reset the downlink timing for Cell 1 to its initial value after a certain amount of loops. The loop during the reset does not count for the result statistics.
11. Repeat steps 1-10 for “Sub-test 1 – Test point 2”. Set a value of initial timing advance command $T_A = 313$ in the Random Access Response which indicates an initial timing advance value $N_{TA} = 5008 T_s$ in step 1.
12. Repeat steps 1-11 for Sub-test 2 (consisting of Test point 1 and Test point 2) in Tables 8.1.1.5-1 and 8.1.1.5-2 as appropriate. In step 3 the SS adjusts the downlink timing for Cell 1 to a delay of $+4 T_s$ compared to the current value.

If both test points of a sub-test pass, the sub-test passes. If one test point of a sub-test fails, the sub-test fails.

If all (applicable) sub-tests pass, the whole test passes. If one (applicable) sub-test fails, the whole test fails.

8.1.1.4.3 Message contents

Message contents are according to TS 36.508 [18] clause 4.6 with the following exceptions:

Table 8.1.1.4.3-1: *SoundingRS-RL-ConfigCommon-DEFAULT*: UE Rx – Tx time difference for E-UTRAN FDD test requirement

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-21 SoundingRS-UL-ConfigCommon-DEFAULT | | | |
|---|--|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| srs-BandwidthConfig | bw7 for sub-test 1 bw5 for sub-test 2 | Set according to specific sub-test | |
| srs-SubframeConfig | Sc1 | | FDD |
| ackNackSRS-SimultaneousTransmission | FALSE | | |
| srsMaxUpPts | Not present | | FDD |
| } | | | |

Table 8.1.1.4.3-2: *SoundingRS-RL-ConfigDedicated-DEFAULT*: UE Rx – Tx time difference for E-UTRAN FDD test requirement

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-22 SoundingRS-UL-ConfigDedicated-DEFAULT | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-Bandwidth | bw0 | bw0 used with no frequency hopping. bw3 used with frequency hopping | |
| srs-HoppingBandwidth | hbw0 | | |
| freqDomainPosition | 0 | | |
| duration | TRUE | Indefinite duration | |
| srs-ConfigIndex | 0 | | |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | No cyclic shift | |
| } | | | |

Table 8.1.1.4.3-2a: LPP REQUEST CAPABILITIES: UE Rx – Tx time difference for E-UTRAN FDD test requirement

| Information Element | Value/remark |
|---------------------------------|--------------|
| <i>ecid-RequestCapabilities</i> | TRUE |

Table 8.1.1.4.3-3: ECID-RequestLocationInformation: UE Rx – Tx time difference for E-UTRAN FDD test requirement

| Derivation Path: TS 36.355 clause 6.2 | | | |
|--|--------------------------------|-----------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 2 | | |
| velocityRequest | FALSE | | |
| } | | | |
| Environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation | Not present | | |
| ecid-RequestLocationInformation ::= SEQUENCE { | | | |
| requestedMeasurements | 0 0 1 | ueRxTxReq | |
| } | | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.1.4.3-4: ECID-ProvideLocationInformation: UE Rx – Tx time difference for E-UTRAN FDD test requirement

| Derivation Path: 36.355 clause 6.2 | | | |
|--|----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | Not present | | |
| ecid-ProvideLocationInformation ::= | | | |
| SEQUENCE { | | | |
| ecid-SignalMeasurementInformation ::= | | | |
| SEQUENCE { | | | |
| primaryCellMeasuredResults | Not Present | | |
| MeasuredResultsList ::= SEQUENCE | | | |
| (SIZE(1..32)) OF | | | |
| MeasuredResultsElement | | | |
| MeasuredResultsElement ::= SEQUENCE { | | | |
| physCellId | | | |
| cellGlobalId | | | |
| arfcnEUTRA | | | |
| systemFrameNumber | | | |
| rsrp-Result | Not Present | | |
| rsrq-Result | Not Present | | |
| ue-RxTxTimeDiff | | Set according to specific sub-test and test point. | |
| } | | | |
| } | | | |
| } | | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.1.4.3-5: CQI-ReportConfig-DEFAULT: UE Rx – Tx time difference for E-UTRAN FDD test requirement

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | This IE should be omitted for Sub-test 1 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| release | NULL | | |
| } | | | |

8.1.1.5 Test requirement

Table 8.1.1.5-1 defines the primary level settings including test tolerances for all sub-tests.

Table 8.1.1.5-1: FDD UE Rx – Tx time difference test parameters

| Parameter | Unit | Sub-test 1 | Sub-test 2 |
|--|--------------|------------|------------|
| E-UTRAN RF Channel Number | | 1 | 1 |
| BW _{channel} | MHz | 1.4 | 10 |
| DRX | | OFF | |
| PDSCH Reference measurement channel defined in TS 36.521-3 [25] clause A.1.1 | | R.2 FDD | R.0 FDD |
| PDSCH allocation | n_{PRB} | 2—3 | 13—36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in TS 36.521-3 [25] clause A.2.1 | | R.8 FDD | R.6 FDD |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.1 | | OP.3 FDD | OP.1 FDD |
| PBCH_RA | dB | 0 | 0 |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA ^{Note 1} | dB | | |
| OCNG_RB ^{Note 1} | dB | | |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | -98 |
| RSRP ^{Note 3} | dBm/15 kHz | -101 | -101 |
| \hat{E}_s / N_{oc} | dB | 2.7 | 2.7 |
| I _o ^{Note 3} | dBm/1.08 MHz | -76.55 | N/A |
| | dBm/9 MHz | N/A | -67.35 |
| \hat{E}_s / I_{ot} | dB | -2.7 | -2.7 |
| Propagation Condition | | AWGN | |
| Note 1: OCNG shall be used such that the resources in the active cell are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | |
| Note 3: RSRP and I _o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

Table 8.1.1.5-2: Sounding Reference Symbol Configuration to be used in FDD UE Rx – Tx time difference test

| Field | Sub-test 1 | Sub-test 2 | Comment |
|--|------------|------------|---|
| | Value | | |
| srsBandwidthConfiguration | bw7 | bw5 | |
| srsSubframeConfiguration | sc1 | | |
| ackNackSrsSimultaneousTransmission | FALSE | | |
| srsMaxUpPTS | N/A | | Not applicable for FDD |
| srsBandwidth | 0 | | No hopping |
| srsHoppingBandwidth | hbw0 | | |
| frequencyDomainPosition | 0 | | |
| Duration | TRUE | | Indefinite duration |
| Srs-ConfigurationIndex | 0 | | SRS periodicity of 2ms. |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | | No cyclic shift |
| SRS-AntennaPort | an1 | | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in 3GPP TS 36.331 [22]. | | | |

The UE Rx – Tx time difference measurement accuracy shall fulfil the requirements in Table 8.1.1.5-3.

Table 8.1.1.5-3: Test requirements UE Rx – Tx time difference measurement accuracy requirements

| | Sub-test 1 | Sub-test 2 |
|------------------------|---|---|
| Lowest reported value | (Measured value from step 7 - 23) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 | (Measured value from step 7 - 13) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 |
| Highest reported value | (Measured value from step 7 + 23) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 | (Measured value from step 7 + 13) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 |

NOTE: Each sub-test in table 8.1.1.5-3 has two test points starting at 32 T_s and 5008 T_s .

The test tolerances are defined in Annex C.

For the overall test to pass, the ratio of successful reported values in each test point of each sub-test shall be more than 90% with a confidence level of 95%. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test then Sub-test 1 shall be omitted.

8.1.2 E-UTRAN TDD UE Rx – Tx time difference case

8.1.2.1 Test purpose

The purpose of this test is to verify that the E-UTRAN TDD UE Rx – Tx time difference measurement accuracy is within the specified limits in TS 36.133 [23] clause 9.1.9.

8.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward that supports ECID positioning.

8.1.2.3 Minimum conformance requirements

NOTE: This measurement is used for UE positioning purposes.

The UE RX-TX time difference is measured from the serving cell.

The accuracy requirements in Table 8.1.1.3-1 are valid under the following conditions:

Cell specific reference signals are transmitted either from one, two or four antenna ports.

Conditions defined in TS 36.101 [2] clause 7.3 for reference sensitivity are fulfilled.

No changes to the uplink transmission timing are applied during the measurement period.

$RSRP_{dBm}$ according to clause E.1 for a corresponding Band.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.9 and A.9.7.1.

8.1.2.4 Test description

The test consists of two sub-tests; the difference between the sub-tests is the bandwidth, 1.4MHz and 10MHz. Each sub-test has two test points with time delays starting at $32 T_s$ and $5008 T_s$ respectively. There is only one active cell in the tests. The tested UE is connected with the serving cell, configured to transmit SRS signals periodically, and signalled to report UE Rx – Tx time difference measurement. The test equipment measures the transmit timing of the UE using the transmitted SRS. The test equipment then compares this timing to the UE Rx-Tx measurement reported by the UE.

8.1.2.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.2.

Channel Bandwidth to be tested: 1.4 and 10MHz. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test, as defined in TS 36.101 [2] clause 5.6.1, then the corresponding sub-test shall be omitted.

1. Connect the SS (node B emulator) and AWGN noise source to the UE antenna connectors as shown in Annex A figure A.5.
2. Propagation conditions are set according to clause 4.6.2.1.
3. Message contents are defined in clause 8.1.2.4.3.
4. Cell 1 is the serving cell. Cell 1 is the cell used for connection setup with the power levels set according to TS 36.521-3 [25] clauses C.0 and C.1 for this test.

8.1.2.4.2 Test procedure

1. Bring the UE to State 3A or 3A-RF according to TS 36.508 [18] clause 4.5.3A or 5.2A.2, using a value of initial timing advance command $T_A = 2$ in the Random Access Response which indicates an initial timing advance value $N_{TA} = 32 T_s$. Note that in the remainder of the test the timing advance command $T_A = 31$ which indicates a timing advance adjustment value $N_{TA} = 0 T_s$.
2. Set the parameters according to Sub-test 1 in Tables 8.1.2.5-1 and 8.1.5.2-2 as appropriate. Propagation conditions are set according to clause 4.6.2.1.
3. The SS adjusts the downlink timing for Cell 1 to a delay of $+8 T_s$, compared to the current value.
4. Wait for 1.6 s to allow for the possibility that the UE makes autonomous timing adjustments.
- 4a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 4b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the ECID capabilities supported by the UE in the *ECID-ProvideCapabilities* IE.
5. The SS shall transmit a LPP REQUEST LOCATION INFORMATION message, including the *ECID-RequestLocationInformation* IE. If the UE message at step 4b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP REQUEST LOCATION INFORMATION message.
6. The UE shall transmit an LPP PROVIDE LOCATION INFORMATION message including the *ecid-SignalMeasurementInformation* IE.
7. As soon as possible after step 6 the SS shall measure the transmit timing of the UE using the transmitted SRS, relative to the current downlink timing.
8. If the UE message at step 6 includes the *ackRequested* IE set to TRUE, then the SS shall send a LPP acknowledgment message.

9. The SS shall check the reported value of *ue-RxTxTimeDiff* in the *ecid-SignalMeasurementInformation* IE provided by the UE in step 6 and compare it with the value measured in step 7. The SS shall check that the reported values are within the limits specified in table 8.1.2.5-3 for Sub-test 1 compared to the measured value. If the reported value is within the limits the number of successful results for “Sub-test 1 – Test point 1” is increased by one. If the reported value is not within the limits, or the UE reports an error in the LPP PROVIDE LOCATION INFORMATION message in step 6, or does not respond at step 6 within the time given by the *responseTime* IE in the *ECID-RequestLocationInformation* IE in step 5, then the number of unsuccessful results for “Sub-test 1 – Test point 1” is increased by one.
10. Repeat steps 3-9 until the confidence level according to Annex D.4.3 is achieved.
NOTE: To avoid a large divergence between the sent TA and the set downlink timing, the SS may reset the downlink timing for Cell 1 to its initial value after a certain amount of loops. The loop during the reset does not count for the result statistics.
11. Repeat steps 1-10 for “Sub-test 1 – Test point 2”. Set a value of initial timing advance command $T_A = 313$ in the Random Access Response which indicates an initial timing advance value $N_{TA} = 5008 T_s$ in step 1.
12. Repeat steps 1-11 for Sub-test 2 (consisting of Test point 1 and Test point 2) in Tables 8.1.2.5-1 and 8.1.2.5-2 as appropriate. In step 3 the SS adjusts the downlink timing for Cell 1 to a delay of $+4 T_s$ compared to the current value.

If both test points of a sub-test pass, the sub-test passes. If one test point of a sub-test fails, the sub-test fails.

If all (applicable) sub-tests pass, the whole test passes. If one (applicable) sub-test fails, the whole test fails.

8.1.2.4.3 Message contents

Message contents are according to TS 36.508 [18] clause 4.6 with the following exceptions:

Table 8.1.2.4.3-1: *SoundingRS-RL-ConfigCommon-DEFAULT*: UE Rx – Tx time difference for E-UTRAN TDD test requirement

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-21 <i>SoundingRS-UL-ConfigCommon-DEFAULT</i> | | | |
|--|--|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>SoundingRS-UL-ConfigCommon-DEFAULT</i> ::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| <i>srs-BandwidthConfig</i> | bw7 for sub-test 1 bw5 for sub-test 2 | Set according to specific sub-test | |
| <i>srs-SubframeConfig</i> | Sc1 | | TDD |
| <i>ackNackSRS-SimultaneousTransmission</i> | FALSE | | |
| <i>srsMaxUpPts</i> | TRUE | | TDD |
| } | | | |

Table 8.1.2.4.3-2: *SoundingRS-RL-ConfigDedicated-DEFAULT*: UE Rx – Tx time difference for E-UTRAN TDD test requirement

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-22 SoundingRS-UL-ConfigDedicated-DEFAULT | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-Bandwidth | bw0 | bw0 used with no frequency hopping. bw3 used with frequency hopping | |
| srs-HoppingBandwidth | hbw0 | | |
| freqDomainPosition | 0 | | |
| duration | TRUE | Indefinite duration | |
| srs-ConfigIndex | 10 | | |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | No cyclic shift | |
| } | | | |
| } | | | |

Table 8.1.2.4.3-2a: LPP REQUEST CAPABILITIES: UE Rx – Tx time difference for E-UTRAN TDD test requirement

| Information Element | Value/remark |
|---------------------------------|--------------|
| <i>ecid-RequestCapabilities</i> | TRUE |

Table 8.1.2.4.3-3: ECID-RequestLocationInformation: UE Rx – Tx time difference for E-UTRAN TDD test requirement

| Derivation Path: TS 36.355 clause 6.2 | | | |
|--|--------------------------------|-----------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 2 | | |
| velocityRequest | FALSE | | |
| } | | | |
| Environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation | Not present | | |
| ecid-RequestLocationInformation ::= SEQUENCE { | | | |
| requestedMeasurements | 0 0 1 | ueRxTxReq | |
| } | | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.4.3-4: ECID-ProvideLocationInformation: UE Rx – Tx time difference for E-UTRAN TDD test requirement

| Derivation Path: 36.355 clause 6.2 | | | |
|--|----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | Not present | | |
| ecid-ProvideLocationInformation ::= | | | |
| SEQUENCE { | | | |
| ecid-SignalMeasurementInformation ::= | | | |
| SEQUENCE { | | | |
| primaryCellMeasuredResults | Not Present | | |
| MeasuredResultsList ::= SEQUENCE | | | |
| (SIZE(1..32)) OF | | | |
| MeasuredResultsElement | | | |
| MeasuredResultsElement ::= SEQUENCE { | | | |
| physCellId | | | |
| cellGlobalId | | | |
| arfcnEUTRA | | | |
| systemFrameNumber | | | |
| rsrp-Result | Not Present | | |
| rsrq-Result | Not Present | | |
| ue-RxTxTimeDiff | | Set according to specific sub-test and test point. | |
| } | | | |
| } | | | |
| } | | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.4.3-5: CQI-ReportConfig-DEFAULT: UE Rx – Tx time difference for E-UTRAN TDD test requirement

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | This IE should be omitted for Sub-test 1 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| release | NULL | | |
| } | | | |

8.1.2.5 Test requirement

Table 8.1.2.5-1 defines the primary level settings including test tolerances for all sub-tests.

Table 8.1.2.5-1: Cell specific test parameters for UE Rx-Tx time difference measurement

| Parameter | Unit | Sub-test 1 | Sub-test 2 |
|--|--------------|------------|------------|
| E-UTRAN RF Channel Number | - | 1 | 1 |
| BW _{channel} | MHz | 1.4 | 10 |
| Uplink-downlink configuration of cell ^{Note 1} | | 1 | 1 |
| Special subframe configuration of cell ^{Note 1} | | 6 | 6 |
| PDSCH Reference measurement channel defined in TS 36.521-3 [25] clause A.1.2 | - | R.2 TDD | R.0 TDD |
| PDSCH allocation | n_{PRB} | 2-3 | 13-36 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in TS 36.521-3 [25] clause A.2.2 | - | R.8 TDD | R.6 TDD |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.2 | - | OP.3 TDD | OP.1 TDD |
| PBCH_RA | dB | 0 | 0 |
| PBCH_RB | dB | | |
| PSS_RA | dB | | |
| SSS_RA | dB | | |
| PCFICH_RB | dB | | |
| PHICH_RA | dB | | |
| PHICH_RB | dB | | |
| PDCCH_RA | dB | | |
| PDCCH_RB | dB | | |
| PDSCH_RA | dB | | |
| PDSCH_RB | dB | | |
| OCNG_RA ^{Note 2} | dB | | |
| OCNG_RB ^{Note 2} | dB | | |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -98 |
| RSRP ^{Note 4} | dBm/15 kHz | -100.7 | -100.7 |
| \hat{E}_s/N_{oc} | dB | -2.7 | -2.7 |
| I _o ^{Note 4} | dBm/1.08 MHz | -77.55 | N/A |
| | dBm/9 MHz | N/A | -67.35 |
| \hat{E}_s/I_{ot} | dB | -2.7 | -2.7 |
| Propagation Condition | | AWGN | |
| Note 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in 3GPP TS 36.211 [26]. | | | |
| Note 2: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |
| Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | |
| Note 4: RSRP and I _o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | |

Table 8.1.2.5-2: Sounding Reference Symbol Configuration to be used in TDD UE Rx – Tx time difference test

| Field | Sub-test 1 | Sub-test 2 | Comment |
|--|------------|------------|---|
| | Value | | |
| srsBandwidthConfiguration | bw7 | bw5 | |
| srsSubframeConfiguration | sc1 | | |
| ackNackSrsSimultaneousTransmission | FALSE | | |
| srsMaxUpPTS | TRUE | | |
| srsBandwidth | 0 | | No hopping |
| srsHoppingBandwidth | hbw0 | | |
| frequencyDomainPosition | 0 | | |
| Duration | TRUE | | Indefinite duration |
| Srs-ConfigurationIndex | 10 | | SRS periodicity of 10ms. |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | | No cyclic shift |
| SRS-AntennaPort | an1 | | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in 3GPP TS 36.331 [22]. | | | |

The UE Rx – Tx time difference measurement accuracy shall fulfil the requirements in Table 8.1.2.5-3.

Table 8.1.2.5-3: Test requirements UE Rx – Tx time difference measurement accuracy requirements

| | Sub-test 1 | Sub-test 2 |
|------------------------|---|---|
| Lowest reported value | (Measured value from step 7 - 23) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 | (Measured value from step 7 - 13) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 |
| Highest reported value | (Measured value from step 7 + 23) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 | (Measured value from step 7 + 13) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 |

NOTE: Each sub-test in table 8.1.2.5-3 has two test points starting at 32 T_s and 5008 T_s .

The test tolerances are defined in Annex C.

For the overall test to pass, the ratio of successful reported values in each test point of each sub-test shall be more than 90% with a confidence level of 95%. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test then Sub-test 1 shall be omitted.

8.1.3 [FFS]

8.1.4 [FFS]

8.1.5 E-UTRAN FDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (feICIC)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Test tolerances are TBD

8.1.5.1 Test purpose

The purpose of this test is to verify that the E-UTRAN FDD UE Rx – Tx time difference measurement accuracy is within the specified limits in TS 36.133 [23] clause 9.1.9.4 when the UE is provided with a time-domain measurement resource restriction pattern and CRS assistance information, and when non-MBSFN ABS is configured in the interfering cells.

8.1.5.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 11 and forward that supports ECID positioning.

8.1.5.3 Minimum conformance requirements

NOTE: This measurement is used for UE positioning purposes.

The UE RX-TX time difference is measured from the serving cell.

For UE configured with a time-domain measurement resource restriction pattern for PCell measurements, the accuracy requirements in Table 8.1.5.3-1 apply provided that the following conditions are met for the PCell:

The accuracy requirements in Table 8.1.5.3-1 are valid under the following conditions:

PCell cell specific reference signals are transmitted from one, two or four antenna ports,

Conditions defined in TS 36.101 [2] clause 7.3 for reference sensitivity are fulfilled,

No changes to the uplink transmission timing are applied during the measurement period,

RSRP_{dBm} according to clause E.1 for a corresponding Band,

The time domain measurement resource restriction pattern configured for the measured cell indicates at least one subframe per radio frame for performing the RSRP measurement,

Four symbols containing CRS are available in all subframes indicated by the time domain measurement resource restriction pattern, and

The UE is provided via PCell with the CRS assistance information (TS 36.331 [22]) and the CRS assistance information is valid throughout the entire evaluation period.

The requirements in this section shall also be met when the number of transmit antenna ports TS 36.211 [26] of one or more cells whose CRS assistance information is provided TS 36.331 [22] is different from the number of transmit antenna ports of the measured cell.

Table 8.1.5.3-1: UE Rx – Tx time difference measurement accuracy

| Accuracy | Conditions | | | | |
|--|------------------------|--------------------|--|-----------------------------|---------------------------|
| | \hat{E}_s/lot | Downlink bandwidth | Io ^{Note 1} range | | |
| | | | E-UTRA operating band groups ^{Note 6} | Minimum Io | Maximum Io |
| Ts ^{Note 2} | dB | MHz | | dBm/15kHz ^{Note 5} | dBm/BW _{Channel} |
| ±20 | ≥ -3 dB | ≤ 3 MHz | FDD_A, TDD_A | -121 | -50 |
| | | | FDD_C, TDD_C | -120 | -50 |
| | | | FDD_D | -119.5 | -50 |
| | | | FDD_E, TDD_E | -119 | -50 |
| | | | FDD_F | -118.5 | -50 |
| | | | FDD_G ^{Note 4} | -118 | -50 |
| | | | FDD_H | -117.5 | -50 |
| ±10 | ≥ -3 dB | ≥ 5 MHz | Note 3 | Note 3 | Note 3 |
| NOTE 1: When in dBm/15kHz, the minimum Io condition is expressed as the average Io per RE over all REs in that symbol. Io may be different in different symbols within a subframe. | | | | | |
| NOTE 2: Ts is the basic timing unit defined in TS 36.211 [26]. | | | | | |
| NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with downlink bandwidth ≤ 3 MHz. | | | | | |
| NOTE 4: Except Band 29 | | | | | |
| NOTE 5: The condition level is increased by Δ>0, when applicable, as described in TS 36.521-3 [25] Sections I.4.2 and I.4.3. | | | | | |
| NOTE 6: E-UTRA operating band groups are as defined in TS 36.521-3 [25] Section 3.5. | | | | | |

The normative reference for this requirement is TS 36.133 [23] clause 9.1.9.4 and A.9.7.5.

8.1.5.4 Test description

The test has two test points with time delays starting at $32 T_s$ and $5008 T_s$, respectively. In this test case, there are three cells, Cell 1, Cell 2 and Cell 3, on the same RF channel. Cell 1 is the PCell on which UE Rx-Tx is measured. Cell 2 and Cell 3 are the interfering cells. A non-MBSFN ABS pattern is configured in each of the Cell 2 and Cell 3 during the entire test. The tested UE is connected to the PCell and configured to transmit SRS signals periodically. The SRS configuration is provided to the UE before the measurement starts. The UE is configured to report UE Rx-Tx time difference measurement. The test equipment measures the transmit timing of the UE using the transmitted SRS. The test equipment then compares this timing to the UE Rx-Tx measurement reported by the UE. The UE is configured by higher layers via Cell 1 with a time-domain measurement resource restriction pattern for performing E-UTRAN FDD intra-frequency measurements on PCell. The UE is also provided via higher layers with the CRS assistance information for Cell 2. The information for both measurement patterns and the CRS assistance information shall be provided via RRC to the UE before the measurement starts.

8.1.5.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: According to TS 36.521-1 [24] Annex E table E-1 and TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [18] Annex A figure A.54 (without faders).
2. Propagation conditions are set according to clause 4.6.2.1.
3. Message contents are defined in clause 8.1.5.4.3.
4. Cell 1 is the serving cell. Cell 1 is the cell used for connection setup with the power levels set according to TS 36.521-3 [25] clauses C.0 and C.1 for this test. Cell 2 and Cell 3 are the neighbour cells. All cells are on the same RF channel. Cell 3 in the test is the Cell 4 defined in clause 4.7.1

Table 8.1.5.4.1-1: General test parameters for FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Parameter | | Unit | Value | Comment |
|---|--------------------------|------|---|--|
| Serving cell (PCell) | | | Cell 1 | The measured cell |
| Neighbour cell | | | Cell 2 and Cell 3 | Cell 2 is the first interfering cell to Cell 1, whilst Cell 3 is the second interfering cell to Cell 1. |
| ABS transmission configuration | | | Non-MBSFN ABS | As defined in TS 36.521-3 [25] Table C.3.1.2-1. |
| E-UTRA RF Channel Number | | | 1 | One FDD carrier frequency is used |
| Downlink Channel Bandwidth (BW _{channel}) | | MHz | 10 | For all cells in the test |
| CP length | | | Normal | For all cells in the test |
| DRX | | | | OFF |
| Time offset between cells | | μs | Cell 2 offset with respect to Cell 1: 3 Cell 3 offset with respect to Cell 1: 2 | Three synchronous cells |
| Physical cell ID PCI | | | $(PCI_{cell1} - PCI_{cell2}) \bmod 6 = 0$ $(PCI_{cell1} - PCI_{cell3}) \bmod 6 \neq 0$ PCI_{cell1} not equal to PCI_{cell2} | Cell PCIs are selected so that all conditions are met |
| ABS pattern | | | '10000000100000001000000100000000' | Non-MBSFN ABS. FDD ABS Pattern Info IE, as defined in TS 36.423 [35], clause 9.2.54. The first/leftmost bit corresponds to the subframe #0 of a radio frame satisfying SFN mod 40 = 0. No MBSFN subframes are configured in the ABS subframes. Configured in Cell 2 and Cell 3 during the testing. |
| Time-domain measurement resource restriction pattern for PCell measurements | | | '10000000100000001000000100000000' | Configured for measurements on Cell 1. |
| CRS assistance information | physCellId | | see PCI conditions above | The CRS assistance information is provided for Cell 2 and Cell 3 in CRS-AssistanceInfo. It includes a single MBSFN-SubframeConfigList element with subframe allocation one Frame='000000'. |
| | antennaPortsCount | | 1 | |
| | mbsfn-SubframeConfigList | | oneFrame = '000000' | |

8.1.5.4.2 Test procedure

1. Bring the UE to State 3A or 3A-RF according to TS 36.508 [18] clause 4.5.3A or 5.2A.2 with exceptions listed in 7.2A.6, using a value of initial timing advance command $T_A = 2$ in the Random Access Response which indicates an initial timing advance value $N_{TA} = 32 T_s$. Note that in the remainder of the test the timing advance command $T_A = 31$ which indicates a timing advance adjustment value $N_{TA} = 0 T_s$.
2. Set the parameters according to Tables 8.1.5.5-1 and 8.1.5.5-2. Propagation conditions are set according to clause 4.6.2.1.
3. The SS adjusts the downlink timing for Cell 1 to a delay of $+4 T_s$, compared to the current value.
4. Wait for 1.6 s to allow for the possibility that the UE makes autonomous timing adjustments.
5. The SS shall transmit an LPP REQUEST CAPABILITIES message.
6. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the ECID capabilities supported by the UE in the *ECID-ProvideCapabilities* IE.
7. The SS shall transmit an LPP REQUEST LOCATION INFORMATION message, including the *ECID-RequestLocationInformation* IE. If the UE message at step 6 includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP REQUEST LOCATION INFORMATION message.

8. The UE shall transmit an LPP PROVIDE LOCATION INFORMATION message including the *ecid-SignalMeasurementInformation* IE.
9. As soon as possible after step 8 the SS shall measure the transmit timing of the UE using the transmitted SRS, relative to the current downlink timing.
10. If the UE message at step 8 includes the *ackRequested* IE set to TRUE, then the SS shall send a LPP acknowledgment message.
11. The SS shall check the reported value of *ue-RxTxTimeDiff* in the *ecid-SignalMeasurementInformation* IE provided by the UE in step 8 and compare it with the value measured in step 9. The SS shall check that the reported value is within the limits specified in table 8.1.5.5-3 compared to the measured value. If the reported value is within the limits the number of successful results for the test point is increased by one. If the reported value is not within the limits, or the UE reports an error in the LPP PROVIDE LOCATION INFORMATION message in step 6, or does not respond at step 8 within the time given by the *responseTime* IE in the *ECID-RequestLocationInformation* IE in step 7, then the number of unsuccessful results for the test point test is increased by one.
12. Repeat steps 3-11 until the confidence level according to Annex D.4.3 is achieved.
NOTE: To avoid a large divergence between the sent TA and the set downlink timing, the SS may reset the downlink timing for Cell 1 to its initial value after a certain amount of loops. The loop during the reset does not count for the result statistics.
13. Repeat steps 1-12 for test point 2.

8.1.5.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

Table 8.1.5.4.3-1: SoundingRS-RL-ConfigCommon-DEFAULT: FDD UE Rx-Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-21 SoundingRS-UL-ConfigCommon-DEFAULT | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| srs-BandwidthConfig | bw5 | | |
| srs-SubframeConfig | sc1 | | FDD |
| ackNackSRS-SimultaneousTransmission | FALSE | | |
| srsMaxUpPts | Not present | | FDD |
| } | | | |
| } | | | |

Table 8.1.5.4.3-2: *SoundingRS-RL-ConfigDedicated-DEFAULT*: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-22 SoundingRS-UL-ConfigDedicated-DEFAULT | | | |
|--|--------------|---------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-Bandwidth | bw5 | | |
| srs-HoppingBandwidth | hbw0 | | |
| freqDomainPosition | 0 | | |
| duration | TRUE | Indefinite duration | |
| srs-ConfigIndex | 0 | | |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | No cyclic shift | |
| } | | | |
| } | | | |

Table 8.1.5.4.3-3: LPP REQUEST CAPABILITIES: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Information Element | Value/remark |
|---------------------------------|--------------|
| <i>ecid-RequestCapabilities</i> | TRUE |

Table 8.1.5.4.3-4: ECID-RequestLocationInformation: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.355 clause 6.2 | | | |
|--|--------------------------------|-----------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 2 | | |
| velocityRequest | FALSE | | |
| } | | | |
| Environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation | Not present | | |
| ecid-RequestLocationInformation ::= SEQUENCE { | | | |
| requestedMeasurements | 0 0 1 | ueRxTxReq | |
| } | | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.4.3-5: *ECID-ProvideLocationInformation*: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: 36.355 clause 6.2 | | | |
|--|----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | Not present | | |
| ecid-ProvideLocationInformation ::= | | | |
| SEQUENCE { | | | |
| ecid-SignalMeasurementInformation ::= | | | |
| SEQUENCE { | | | |
| primaryCellMeasuredResults | Not Present | | |
| MeasuredResultsList ::= SEQUENCE | | | |
| (SIZE(1..32)) OF | | | |
| MeasuredResultsElement | | | |
| MeasuredResultsElement ::= SEQUENCE { | | | |
| physCellId | | | |
| cellGlobalId | | | |
| arfcnEUTRA | | | |
| systemFrameNumber | | | |
| rsrp-Result | Not Present | | |
| rsrq-Result | Not Present | | |
| ue-RxTxTimeDiff | | Set according to specific sub-test and test point. | |
| } | | | |
| } | | | |
| } | | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.4.3-6: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|---|----------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| NeighCellsCRS-Info-r11 ::= CHOICE { | | | |
| Release | NULL | | |
| Setup | CRS-AssistanceInfoList-r11 | | |
| } | | | |
| } | | | |

Table 8.1.5.4.3-7: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|---|---|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| CRS-AssistanceInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11 | | | |
| CRS-AssistanceInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | $(PCI_{cell1} - PCI_{cell3}) \bmod 6 = 0$ $(PCI_{cell2} - PCI_{cell3}) \bmod 6 \neq 0$ | Cell PCIs are selected so that both conditions are met | |
| antennaPortsCount-r11 | an1 | | |
| mbsfn-SubframeConfigList-r11 | MBSFN-SubframeConfigList | | |
| } | | | |

Table 8.1.5.4.3-8: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| MBSFN-SubframeConfigList ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig | | | |
| MBSFN-SubframeConfig ::= SEQUENCE { | | | |
| subframeAllocation CHOICE { | | | |
| oneFrame | '000000' | Only the CRS information of Cell 2 is provided in CRS-AssistanceInfo. It includes a single MBSFN-SubframeConfig element with subframe allocation <i>oneFrame</i> ='000000' BIT STRING (SIZE(6)) | |
| } | | | |
| } | | | |

8.1.5.5 Test requirement

Table 8.1.5.5-1 defines the primary level settings including test tolerances for the test.

The UE Rx – Tx time difference measurement accuracy shall fulfil the requirements in Table 8.1.5.5-3.

Table 8.1.5.5-1: Test parameters test parameters for FDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|------------|----------|---|----------|
| E-UTRAN RF Channel Number | | 1 | 1 | 1 |
| PDSCH Reference measurement channel defined in TS 36.521-3 [25] A.1.1 | | R.0 FDD | N/A | N/A |
| PDSCH allocation | n_{PRB} | 13—36 | N/A | N/A |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in TS 36.521-3 [25] A.2.1 | | R.6 FDD | N/A | N/A |
| OCNG Patterns defined in TS 36.521-3 [25] D.1.5 (OP.5 FDD) and in D.1.6 (OP.6 FDD) | | OP.5 FDD | OP.6 FDD | OP.6 FDD |
| PBCH_RA | dB | 0 | Non-ABS and ABS subframe channel powers defined in Table C.3.1.1.1-1-1 in TS 36.521-3 [25]. | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA ^{Note 1} | dB | | | |
| OCNG_RB ^{Note 1} | dB | | | |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | -98 | -98 |
| $CRS \hat{E}_s / N_{oc}$ | dB | -3 | 3 | 1 |
| $CRS \left(\hat{E}_s / I_{ot} \right)_{meas}$ ^{Note 3} | dB | -7.76 | 1.24 | -0.76 |
| $CRS \left(\hat{E}_s / I_{ot} \right)_{nonABS}$ ^{Note 3} | dB | -9.29 | -1.41 | -4.44 |
| RSRP ^{Note 4} | dBm/15 kHz | -101 | -95 | -97 |
| $(I_o)_{meas}$ ^{Note 4} | dBm/9 MHz | -67.11 | -67.11 | -67.11 |
| $(I_o)_{nonABS}$ ^{Note 4} | dBm/9 MHz | -63.45 | -63.45 | -63.45 |
| Propagation condition | | AWGN | | |
| Note 1: OCNG shall be used such that the resources in the active cell are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. Applies to all subframes. | | | | |
| Note 3: $\left(\hat{E}_s / I_{ot} \right)_{meas}$ is calculated in CRS REs in the subframes indicated for PCell measurements by measurement resource restriction pattern, whilst $\left(\hat{E}_s / I_{ot} \right)_{nonABS}$ is calculated in CRS REs in the subframes not indicated for PCell measurements by measurement resource restriction pattern. | | | | |
| Note 4: RSRP and I_o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. $(I_o)_{meas}$ is calculated in CRS symbols in the subframes indicated for PCell measurements by measurement resource restriction pattern, whilst $(I_o)_{nonABS}$ is calculated in CRS symbols in the subframes not indicated for PCell measurements by measurement resource restriction pattern. | | | | |

Table 8.1.5.5-2: Sounding Reference Symbol Configuration to be used in FDD UE Rx–Tx time difference test

| Field | Value | Comment |
|---|--------|-----------------------------|
| UL bandwidth | 50 RBs | Same as the DL bandwidth |
| srsBandwidthConfiguration | bw5 | |
| srsSubframeConfiguration | sc1 | |
| ackNackSrsSimultaneousTransmission | FALSE | |
| srsMaxUpPTS | N/A | Not applicable for FDD |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 | |
| frequencyDomainPosition | 0 | |
| Duration | TRUE | Indefinite duration |
| srs-ConfigIndex | 0 | SRS periodicity of 2ms |
| transmissionComb | 0 | |
| cyclicShift | cs0 | No cyclic shift |
| srsAntennaPort | an1 | Number of SRS antenna ports |
| Note: For further information see clause 6.3.2 in TS 36.331 [22]. | | |

Table 8.1.5.5-3: Test requirements UE Rx – Tx time difference measurement accuracy requirements

| | Test requirement |
|------------------------|------------------|
| Lowest reported value | TBD |
| Highest reported value | TBD |

[NOTE: The test in table 8.1.5.5-3 has two test points starting at $32 T_s$ and $5008 T_s$.]

The test tolerances are defined in Annex C.

For the overall test to pass, the ratio of successful reported values in each test point shall be more than 90% with a confidence level of 95%.

8.1.6 E-UTRAN TDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (feICIC)

Editor's notes: This test case is incomplete. The following item is missing or incomplete:

- Test tolerances are TBD

8.1.6.1 Test purpose

The purpose of this test is to verify that the E-UTRAN TDD UE Rx – Tx time difference measurement accuracy is within the specified limits in TS 36.133 [23] clause 9.1.9.4 when the UE is provided with a time-domain measurement resource restriction pattern and CRS assistance information, and when non-MBSFN ABS is configured in the interfering cells.

8.1.6.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 11 and forward that supports ECID positioning.

8.1.6.3 Minimum conformance requirements

NOTE: This measurement is used for UE positioning purposes.

The UE RX-TX time difference is measured from the serving cell.

For UE configured with a time-domain measurement resource restriction pattern for PCell measurements, the accuracy requirements in Table 8.1.5.3-1 apply provided that the following conditions are met for the PCell:

The accuracy requirements in Table 8.1.5.3-1 are valid under the following conditions:

PCell cell specific reference signals are transmitted from one, two or four antenna ports,

Conditions defined in TS 36.101 [2] clause 7.3 for reference sensitivity are fulfilled,

No changes to the uplink transmission timing are applied during the measurement period,

$RSRP_{dBm}$ according to clause E.1 for a corresponding Band,

The time domain measurement resource restriction pattern configured for the measured cell indicates at least one subframe per radio frame for performing the RSRP measurement,

Four symbols containing CRS are available in all subframes indicated by the time domain measurement resource restriction pattern, and

The UE is provided via PCell with the CRS assistance information (TS 36.331 [22]) and the CRS assistance information is valid throughout the entire evaluation period.

The requirements in this section shall also be met when the number of transmit antenna ports TS 36.211 [26] of one or more cells whose CRS assistance information is provided TS 36.331 [22] is different from the number of transmit antenna ports of the measured cell.

| Accuracy | \hat{E}_s/lot | Downlink bandwidth | Conditions | | |
|---|------------------------|--------------------|--|---|---|
| | | | I_o ^{Note 1} range | | |
| | | | E-UTRA operating band groups ^{Note 6} | Minimum I_o | Maximum I_o |
| T_s ^{Note 2} | dB | MHz | | $\text{dBm}/15\text{kHz}$ ^{Note 5} | $\text{dBm}/\text{BW}_{\text{Channel}}$ |
| ± 20 | ≥ -3 dB | ≤ 3 MHz | FDD_A, TDD_A | -121 | -50 |
| | | | FDD_C, TDD_C | -120 | -50 |
| | | | FDD_D | -119.5 | -50 |
| | | | FDD_E, TDD_E | -119 | -50 |
| | | | FDD_F | -118.5 | -50 |
| | | | FDD_G ^{Note 4} | -118 | -50 |
| | | | FDD_H | -117.5 | -50 |
| ± 10 | ≥ -3 dB | ≥ 5 MHz | Note 3 | Note 3 | Note 3 |
| NOTE 1: When in $\text{dBm}/15\text{kHz}$, the minimum I_o condition is expressed as the average I_o per RE over all REs in that symbol. I_o may be different in different symbols within a subframe. NOTE 2: T_s is the basic timing unit defined in TS 36.211 [26]. NOTE 3: The same bands and the same I_o conditions for each band apply for this requirement as for the corresponding requirement with downlink bandwidth ≤ 3 MHz. NOTE 4: Except Band 29 NOTE 5: The condition level is increased by $\Delta > 0$, when applicable, as described in TS 36.521-3 [25] Sections I.4.2 and I.4.3. NOTE 6: E-UTRA operating band groups are as defined in TS 36.521-3 [25] Section 3.5. | | | | | |

The normative reference for this requirement is TS 36.133 [23] clause 9.1.9.4 and A.9.7.6.

8.1.6.4 Test description

The test has two test points with time delays starting at $32 T_s$ and $5008 T_s$, respectively. In this test case, there are three cells, Cell 1, Cell 2 and Cell 3, on the same RF channel. Cell 1 is the PCell on which UE Rx-Tx is measured. Cell 2 and Cell 3 are the interfering cells. A non-MBSFN ABS pattern is configured in each of the Cell 2 and Cell 3 during the entire test. The tested UE is connected to the PCell and configured to transmit SRS signals periodically. The SRS configuration is provided to the UE before the measurement starts. The UE is configured to report UE Rx-Tx time difference measurement. The test equipment measures the transmit timing of the UE using the transmitted SRS. The test equipment then compares this timing to the UE Rx-Tx measurement reported by the UE. The UE is configured by higher layers via Cell 1 with a time-domain measurement resource restriction pattern for performing E-UTRAN FDD intra-frequency measurements on PCell. The UE is also provided via higher layers with the CRS assistance information for Cell 2. The information for both measurement patterns and the CRS assistance information shall be provided via RRC to the UE before the measurement starts.

8.1.6.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: According to TS 36.521-1 [24] Annex E table E-1 and TS 36.508 [7] clauses 4.4.2 and 4.3.1.

Channel Bandwidth to be tested: 10MHz as defined in TS 36.508 [7] clause 4.3.1.

1. Connect the SS (node B emulator) and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [18] Annex A Figure A.54 (without faders).
2. Propagation conditions are set according to clause 4.6.2.1.
3. Message contents are defined in clause 8.1.6.4.3.
4. Cell 1 is the serving cell. Cell 1 is the cell used for connection setup with the power levels set according to TS 36.521-3 [25] clauses C.0 and C.1 for this test. Cell 2 and Cell 3 are the neighbour cells. All cells are on the same RF channel. Cell 3 in the test is the Cell 4 defined in clause 4.7.1

Table 8.1.6.4.1-1: General test parameters for TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Parameter | | Unit | Value | Comment |
|--|--------------------------|------|---|--|
| Serving cell (PCell) | | | Cell 1 | Cell to be measured |
| Neighbour cell | | | Cell 2 and Cell 3 | Cell 2 is the first interfering cell to Cell 1, whilst Cell 3 is the second interfering cell to Cell 1. |
| ABS transmission configuration | | | Non-MBSFN ABS | As defined in TS 36.521-3 [25] Table C.3.1.2.1-1 |
| E-UTRA RF Channel Number | | | 1 | One TDD carrier frequency is used |
| Downlink Channel Bandwidth (BW _{channel}) | | MHz | 10 | For all cells in the test |
| CP length | | | Normal | For all cells in the test |
| Special subframe configuration | | | 6 | For all cells in the test. For special subframe configurations see Table 4.2-1 in TS 36.211. |
| Uplink/downlink subframe configuration | | | 1 | For all cells in the test. For uplink-downlink subframe configurations see Table 4.2-2 in [16]. |
| DRX | | | | OFF |
| Time offset between cells | | μs | Cell 2 offset with respect to Cell 1: 3 Cell 3 offset with respect to Cell 1: 2 | Three synchronous cells |
| Physical cell ID PCI | | | $(PCI_{cell1} - PCI_{cell2}) \bmod 6 = 0$ $(PCI_{cell1} - PCI_{cell3}) \bmod 6 \neq 0$ PCI_{cell1} not equal to PCI_{cell2} | Cell PCIs are selected so that both conditions are met |
| ABS pattern | | | '00000000010000000001' | Non-MBSFN ABS. TDD ABS Pattern Info IE, as defined in TS 36.423 [35], clause 9.2.54. The first/leftmost bit corresponds to the subframe #0 of a radio frame satisfying SFN mod 20 = 0. No MBSFN subframes are configured in the ABS subframes. Configured in Cell 2 and Cell 3 during the testing. |
| Time-domain measurement resource restriction pattern for serving cell measurements | | | '00000000010000000001' | Configured for measurements on Cell 1. |
| CRS assistance information | physCellId | | see PCI conditions above | The CRS assistance information is provided for Cell 2 and Cell 3 in CRS-AssistanceInfo. It includes a single MBSFN-SubframeConfig element with subframe allocation one Frame='000000'. |
| | antennaPortsCount | | 1 | |
| | mbsfn-SubframeConfigList | | oneFrame = '000000' | |

8.1.6.4.2 Test procedure

1. Bring the UE to State 3A or 3A-RF according to TS 36.508 [18] clause 4.5.3A or 5.2A.2, with exceptions listed in 7.2A.6 using a value of initial timing advance command $T_A = 2$ in the Random Access Response which indicates an initial timing advance value $N_{TA} = 32 T_s$. Note that in the remainder of the test the timing advance command $T_A = 31$ which indicates a timing advance adjustment value $N_{TA} = 0 T_s$.
2. Set the parameters according to Tables 8.1.6.5-1 and 8.1.6.5-2 as appropriate. Propagation conditions are set according to clause 4.6.2.1.
3. The SS adjusts the downlink timing for Cell 1 to a delay of $+4 T_s$, compared to the current value.
4. Wait for 1.6s to allow for the possibility that the UE makes autonomous timing adjustments.
5. The SS shall transmit an LPP REQUEST CAPABILITIES message.
6. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the ECID capabilities supported by the UE in the *ECID-ProvideCapabilities* IE.

7. The SS shall transmit an LPP REQUEST LOCATION INFORMATION message, including the *ECID-RequestLocationInformation* IE. If the UE message at step 4b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP REQUEST LOCATION INFORMATION message.
8. The UE shall transmit an LPP PROVIDE LOCATION INFORMATION message including the *ecid-SignalMeasurementInformation* IE.
9. As soon as possible after step 8 the SS shall measure the transmit timing of the UE using the transmitted SRS, relative to the current downlink timing.
10. If the UE message at step 8 includes the *ackRequested* IE set to TRUE, then the SS shall send a LPP acknowledgment message.
11. The SS shall check the reported value of *ue-RxTxTimeDiff* in the *ecid-SignalMeasurementInformation* IE provided by the UE in step 8 and compare it with the value measured in step 9. The SS shall check that the reported value is within the limits specified in table 8.1.6.5-3 for test compared to the measured value. If the reported value is within the limits the number of successful results for test is increased by one. If the reported value is not within the limits, or the UE reports an error in the LPP PROVIDE LOCATION INFORMATION message in step 8, or does not respond at step 8 within the time given by the *responseTime* IE in the *ECID-RequestLocationInformation* IE in step 7, then the number of unsuccessful results for test is increased by one.
12. Repeat steps 3-11 until the confidence level according to Annex D.4.3 is achieved.
NOTE: To avoid a large divergence between the sent TA and the set downlink timing, the SS may reset the downlink timing for Cell 1 to its initial value after a certain amount of loops. The loop during the reset does not count for the result statistics.
13. Repeat steps 1-12 for test point 2.

8.1.6.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 5.2A.5.1 with the following exceptions:

Table 8.1.6.4.3-1: *SoundingRS-RL-ConfigCommon-DEFAULT*: TDD UE Rx-Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-21 SoundingRS-UL-ConfigCommon-DEFAULT | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigCommon-DEFAULT ::= SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| srs-BandwidthConfig | bw5 | | |
| srs-SubframeConfig | sc1 | | FDD |
| ackNackSRS-SimultaneousTransmission | FALSE | | |
| srsMaxUpPts | Not present | | FDD |
| } | | | |
| } | | | |

Table 8.1.6.4.3-2: *SoundingRS-RL-ConfigDedicated-DEFAULT*: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-22 SoundingRS-UL-ConfigDedicated-DEFAULT | | | |
|--|--------------|---------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SoundingRS-UL-ConfigDedicated-DEFAULT ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| srs-Bandwidth | bw5 | | |
| srs-HoppingBandwidth | hbw0 | | |
| freqDomainPosition | 0 | | |
| duration | TRUE | Indefinite duration | |
| srs-ConfigIndex | 0 | | |
| transmissionComb | 0 | | |
| cyclicShift | cs0 | No cyclic shift | |
| } | | | |
| } | | | |

Table 8.1.6.4.3-3: LPP REQUEST CAPABILITIES: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Information Element | Value/remark |
|---------------------------------|--------------|
| <i>ecid-RequestCapabilities</i> | TRUE |

Table 8.1.6.4.3-4: ECID-RequestLocationInformation: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.355 clause 6.2 | | | |
|--|--------------------------------|-----------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 2 | | |
| velocityRequest | FALSE | | |
| } | | | |
| Environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation | Not present | | |
| ecid-RequestLocationInformation ::= SEQUENCE { | | | |
| requestedMeasurements | 0 0 1 | ueRxTxReq | |
| } | | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.6.4.3-5: *ECID-ProvideLocationInformation*: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: 36.355 clause 6.2 | | | |
|--|----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | Not present | | |
| ecid-ProvideLocationInformation ::= | | | |
| SEQUENCE { | | | |
| ecid-SignalMeasurementInformation ::= | | | |
| SEQUENCE { | | | |
| primaryCellMeasuredResults | Not Present | | |
| MeasuredResultsList ::= SEQUENCE | | | |
| (SIZE(1..32)) OF | | | |
| MeasuredResultsElement | | | |
| MeasuredResultsElement ::= SEQUENCE { | | | |
| physCellId | | | |
| cellGlobalId | | | |
| arfcnEUTRA | | | |
| systemFrameNumber | | | |
| rsrp-Result | Not Present | | |
| rsrq-Result | Not Present | | |
| ue-RxTxTimeDiff | | Set according to specific sub-test and test point. | |
| } | | | |
| } | | | |
| } | | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.6.4.3-6: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|---|----------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| neighCellsCRS-Info-r11 ::= CHOICE { | | | |
| NeighCellsCRS-Info-r11 ::= CHOICE { | | | |
| Release | NULL | | |
| Setup | CRS-AssistanceInfoList-r11 | | |
| } | | | |
| } | | | |

Table 8.1.6.4.3-7: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|---|---|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| CRS-AssistanceInfoList-r11 ::= SEQUENCE (SIZE (1..maxCellReport)) OF CRS-AssistanceInfo-r11 | | | |
| CRS-AssistanceInfo-r11 ::= SEQUENCE { | | | |
| physCellId-r11 | $(PCI_{cell1} - PCI_{cell3}) \bmod 6 = 0$ $(PCI_{cell2} - PCI_{cell3}) \bmod 6 \neq 0$ | Cell PCIs are selected so that both conditions are met | |
| antennaPortsCount-r11 | an1 | | |
| mbsfn-SubframeConfigList-r11 | MBSFN-SubframeConfigList | | |
| } | | | |

Table 8.1.6.4.3-8: *RadioResourceConfigDedicated-SRB2-DRB(n, m)*: TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-16 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| MBSFN-SubframeConfigList ::= SEQUENCE (SIZE (1..maxMBSFN-Allocations)) OF MBSFN-SubframeConfig | | | |
| MBSFN-SubframeConfig ::= SEQUENCE { | | | |
| subframeAllocation CHOICE { | | | |
| oneFrame | '000000' | Only the CRS information of Cell 2 is provided in CRS-AssistanceInfo. It includes a single MBSFN-SubframeConfig element with subframe allocation <i>oneFrame</i> ='000000' BIT STRING (SIZE(6)) | |
| } | | | |
| } | | | |

8.1.6.5 Test requirement

Table 8.1.6.5-1 defines the primary level settings including test tolerances for the test.

The UE Rx – Tx time difference measurement accuracy shall fulfil the requirements in Table 8.1.6.5-3.

Table 8.1.6.5-1: Test parameters test parameters for TDD UE Rx–Tx time difference measurement under time-domain measurement resource restriction with CRS assistance information and non-MBSFN ABS

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|--|------------|----------|---|----------|
| E-UTRAN RF Channel Number | | 1 | 1 | 1 |
| PDSCH Reference measurement channel defined in TS 36.521-3 [25] A.1.2 | | R.0 TDD | N/A | N/A |
| PDSCH allocation | n_{PRB} | 13—36 | N/A | N/A |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in TS 36.521-3 [25] A.2.2 | | R.6 TDD | N/A | N/A |
| OCNG Patterns defined in TS 36.521-3 [25] D.2.1 (OP.1 TDD) and D.2.2 (OP.2 TDD) | | OP.1 TDD | OP.2 TDD | OP.2 TDD |
| PBCH_RA | dB | 0 | Non-ABS and ABS subframe channel powers defined in TS 36.521-3 [25] Table C.3.1.2.1-1 | |
| PBCH_RB | dB | | | |
| PSS_RA | dB | | | |
| SSS_RA | dB | | | |
| PCFICH_RB | dB | | | |
| PHICH_RA | dB | | | |
| PHICH_RB | dB | | | |
| PDCCH_RA | dB | | | |
| PDCCH_RB | dB | | | |
| PDSCH_RA | dB | | | |
| PDSCH_RB | dB | | | |
| OCNG_RA ^{Note 1} | dB | | | |
| OCNG_RB ^{Note 1} | dB | | | |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | -98 | -98 |
| $CRS \hat{E}_s / N_{oc}$ | dB | -3 | 3 | 1 |
| $CRS \left(\hat{E}_s / I_{ot} \right)_{meas}$ ^{Note 3} | dB | -7.76 | 1.24 | -0.76 |
| $CRS \left(\hat{E}_s / I_{ot} \right)_{nonABS}$ ^{Note 3} | dB | -9.29 | -1.41 | -4.44 |
| RSRP ^{Note 4} | dBm/15 kHz | -101 | -95 | -97 |
| $(I_o)_{meas}$ ^{Note 4} | dBm/9 MHz | -67.11 | -67.11 | -67.11 |
| $(I_o)_{nonABS}$ ^{Note 4} | dBm/9 MHz | -63.45 | -63.45 | -63.45 |
| Propagation Condition | | AWGN | | |
| <p>Note 1: OCNG shall be used such that the resources in the active cell are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.</p> <p>Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.</p> <p>Note 3: $\left(\hat{E}_s / I_{ot} \right)_{meas}$ is calculated in CRS REs in the subframes indicated for PCell measurements by measurement resource restriction pattern, whilst $\left(\hat{E}_s / I_{ot} \right)_{nonABS}$ is calculated in CRS REs in the subframes not indicated for PCell measurements by measurement resource restriction pattern.</p> <p>Note 4: RSRP and I_o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. $(I_o)_{meas}$ is calculated in CRS symbols in the subframes indicated for PCell measurements by measurement resource restriction pattern, whilst $(I_o)_{nonABS}$ is calculated in CRS symbols</p> | | | | |

Table 8.1.6.5-2: Sounding Reference Symbol Configuration to be used in FDD UE Rx–Tx time difference test

| Field | Value | Comment |
|---|--------|---|
| UL bandwidth | 50 RBs | Same as the DL bandwidth |
| srsBandwidthConfiguration | bw5 | |
| srsSubframeConfiguration | sc1 | |
| ackNackSrsSimultaneousTransmission | FALSE | |
| srsMaxUpPTS | TRUE | |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 | |
| frequencyDomainPosition | 0 | |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigurationIndex | 10 | SRS periodicity of 10ms for all Tests. |
| transmissionComb | 0 | |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331 [22]. | | |

Table 8.1.6.5-3: Test requirements UE Rx – Tx time difference measurement accuracy requirements

| | Test requirement |
|------------------------|------------------|
| Lowest reported value | TBD |
| Highest reported value | TBD |

[NOTE: The test in table 8.1.6.5-3 has two test points starting at $32 T_s$ and $5008 T_s$.]

The test tolerances are defined in Annex C.

For the overall test to pass, the ratio of successful reported values in each test point shall be more than 90% with a confidence level of 95%.

9 E-UTRA OTDOA measurement requirements

9.1 RSTD Intra-Frequency Measurements

9.1.1 FDD RSTD Measurement Reporting Delay

Editor's note: The levels defined in Table 9.1.1.5-2 for Cell 2 and Cell 3 may not be sufficient to pass a compliant UE and are under discussion in RAN 4.

9.1.1.1 Test purpose

To verify that the RSTD measurement reporting delay meets the requirements in an environment with fading propagation conditions.

9.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that supports UE-assisted OTDOA.

9.1.1.3 Minimum conformance requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure intra-frequency RSTD, specified in 3GPP TS 36.214 [6], for at least $n=16$ cells,

including the reference cell, on the same carrier frequency f_1 as that of the reference cell within

$T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ ms as given below (see also Figure 9.1.1.3-1):

$$T_{\text{RSTD IntraFreqFDD, E-UTRAN}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \quad \text{ms},$$

where

$T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ is the total time for detecting and measuring at least n cells,

T_{PRS} is the cell-specific positioning subframe configuration period as defined in 3GPP TS 36.211 [26],

M is the number of PRS positioning occasions as defined in Table 9.1.1.3-1, where each PRS positioning occasion comprises of N_{PRS} ($1 \leq N_{\text{PRS}} \leq 6$) consecutive downlink positioning subframes defined in 3GPP TS 36.211 [26], and

$\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$ ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time.

Table 9.1.1.3-1: Number of PRS positioning occasions within $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$

| Positioning subframe configuration period T_{PRS} | Number of PRS positioning occasions M |
|---|---|
| | f_1 ^{NOTE 1} |
| 160 ms | 16 |
| >160 ms | 8 |
| Note 1: When only intra-frequency RSTD measurements are performed over cells belonging to the serving FDD carrier frequency f_1 . | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbour cells i out of at least $(n-1)$ neighbour cells within $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ provided:

$(\text{PRS } \hat{E}_s / \text{Iot})_{\text{ref}} \geq -6$ dB for all Frequency Bands for the reference cell,

$(\text{PRS } \hat{E}_s / \text{Iot})_i \geq -13$ dB for all Frequency Bands for neighbour cell i ,

$(\text{PRS } \hat{E}_s / \text{Iot})_{\text{ref}}$ and $(\text{PRS } \hat{E}_s / \text{Iot})_i$ conditions apply for all subframes of at least $L = \frac{M}{2}$ PRS positioning

occasions,

PRP 1,2_{dBm} according to clause E.2 for a corresponding Band.

The time $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in 3GPP TS 36.355 [4], are delivered to the physical layer of the UE as illustrated in Figure 9.1.1.3-1.

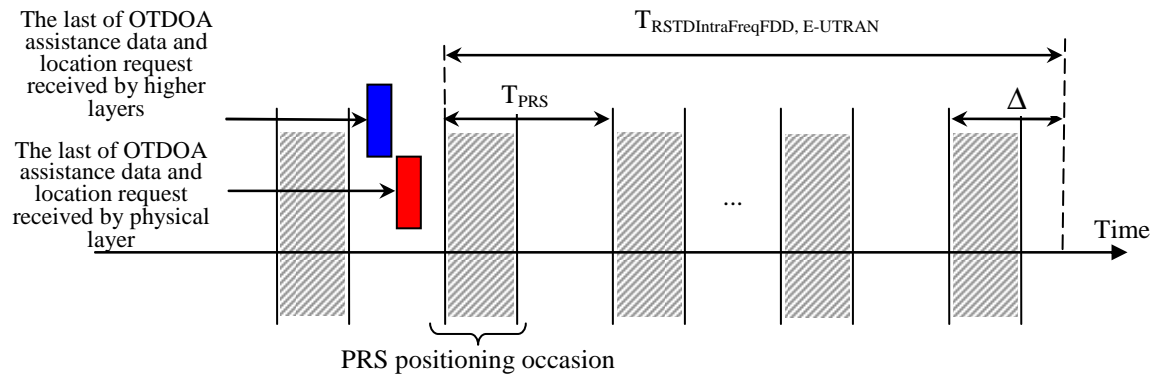


Figure 9.1.1.3-1: Illustration of the RSTD reporting time requirement in an FDD system

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{DCCH}$. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.5.1 and A.8.12.1.

9.1.1.4 Test description

9.1.1.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 10 MHz as defined in TS 36.508 [18] clause 4.3.1.

1. Connect the SS, faders and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.4.
2. The general test parameter settings are set up according to Table 9.1.1.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 9.1.1.4.3.
5. In the test there are three synchronized cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the OTDOA assistance data reference as well as the serving cell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the same RF channel. Cell 3 in the test is the Cell 4 defined in clause 4.7.1. The assistance data neighbour cell list includes in total 15 cells, where 13 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between two cells as seen at the UE antenna connector) is set to 0 Ts (0 μ s) between neighbour Cell 2 and serving Cell 1; and set to 92 Ts (about 3 μ s) between neighbour Cell 3 and serving Cell 1.

Table 9.1.1.4.1-1: General test parameters for E-UTRAN FDD intra-frequency RSTD measurement reporting delay under fading propagation conditions

| Parameter | Unit | Value | Comment |
|--|---------------|---|---|
| Reference cell | | Cell 1 | Reference cell is the cell in the OTDOA assistance data with respect to which the RSTD measurement is defined, as specified in 3GPP TS 36.214 [6] and 3GPP TS 36.355 [4]. The reference cell is the serving cell in this test case. |
| Neighbour cells | | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at random places in the neighbour cell list in the OTDOA assistance data, but Cell 2 always appears in the first half of the list, whilst Cell 3 appears in the second half of the list. |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.6 FDD | As specified in TS 36.521-3 [25] clause A.2.1 |
| Channel Bandwidth (BW_{channel}) | MHz | 10 | |
| PRS Transmission Bandwidth Note 2 | RB | 50 | PRS are transmitted over the system bandwidth |
| PRS configuration index I_{PRS} Note 2 | | 171 | This corresponds to periodicity of 320 ms and PRS subframe offset of $I_{\text{PRS}} - 160$ DL subframes, as defined in 3GPP TS 36.211 [26], Table 6.10.4.3-1 |
| Number of consecutive downlink positioning subframes N_{PRS} Note 2 | | 1 | As defined in 3GPP TS 36.211 [26]. The number of subframes in a positioning occasion |
| Physical cell ID PCI Note 2 | | (PCI of Cell 1 – PCI of Cell 2) mod 6 = 0 and (PCI of Cell 1 – PCI of Cell 3) mod 6 = 0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length Note 2 | | Normal | |
| DRX | | ON | DRX parameters are further specified in Table 9.1.1.4.1-2 |
| Maximum radio frame transmit time offset between the cells at the UE antenna connector Note 3 | μs | 3 | Synchronous cells |
| Expected RSTD Note 1 | μs | 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| Expected RSTD uncertainty Note 1 | μs | 5 | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| Number of cells provided in OTDOA assistance data | | 16 | Including the reference cell |
| PRS muting info Note 2 | | Cell 1: '11110000' Cell 2: '00001111' Cell 3: '11110000' | Corresponds to prs-MutingInfo defined in TS 36.355 [4] |
| T1 | s | 3 | The length of the time interval from the beginning of each test |
| T2 | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

| | | | |
|---------|--|------|---|
| T3 | s | 1.28 | The length of the time interval that follows immediately after time interval T2 |
| Note 1: | Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.1.1.4.3-5 and TS 37.571-5 [20], clause 7.2.2. | | |
| Note 2: | Parameters "PRS Transmission Bandwidth", "PRS configuration index", "Number of consecutive downlink positioning subframes", "Physical cell ID PCI", "CP length", and "PRS muting info" are settable parameters and also parameters signalled in LPP. The values to be used for "Physical cell ID PCI" are as follows: Cell 1: 0, Cell 2: 6, Cell 3: 12. For all the values to be used in LPP see Table 9.1.1.4.3-5 and TS 37.571-5 [20], clause 7.2.2. | | |
| Note 3: | The parameter "Maximum radio frame transmit time offset between the cells at the UE antenna connector" is not a settable parameter but is used to set the "true RSTD" values in step 6 of clause 9.1.1.4.1. | | |

Table 9.1.1.4.1-2: DRX parameters for E-UTRAN FDD intra-frequency RSTD measurement reporting delay under fading propagation conditions

| Field | Value | Comment |
|--------------------------|---------|---|
| onDurationTimer | psf1 | As specified in 3GPP TS 36.331 [22], clause 6.3.2 |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | sf1 | |
| longDRX-CycleStartOffset | sf320 | |
| shortDRX | Disable | |

9.1.1.4.2 Test procedure

The test consists of three consecutive time intervals, with duration of T1, T2 and T3 defined in Table 9.1.1.4.1-1. Cell 1 is active in T1, T2 and T3, whilst Cell 2 and Cell 3 are activated only in the beginning of T2. Cell 2 is active until the end of T3, and Cell 3 is active until the end of T2. The beginning of the time interval T2 shall be aligned 5 ms before the first PRS positioning subframe of a positioning occasion in the reference cell, where 5 ms is the necessary test tolerance. Cell 1 transmits PRS in T2, while Cell 2 transmits PRS only in T3, and Cell 3 transmits PRS only in T2.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.1.1.4.3 shall be provided to the UE during T1. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of T2, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.1.1.5-1. Propagation conditions are set according to clause 4.7.2.2 (ETU30).
4. T1 starts.
5. The SS shall transmit an RRCConnectionReconfiguration message with the DRX configuration.
6. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 6a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 6b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
7. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. The position of neighbour Cell 2 in the *OTDOA-NeighbourCellInfoList* is randomly selected to be in the first 7 elements of the sequence, and the position of neighbour Cell 3 is randomly selected to be in the last 8 elements of the sequence, as described in 3GPP TS 37.571-5 [20], clause 7.2.3. If the

UE message at step 6b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.

8. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of T2, where $\Delta T = 150$ ms.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 9.1.1.5-2.
10. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 9.1.1.5-2.
11. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message including the *OTDOA-ProvideLocationInformation* IE within the response time (see clause 4.7.3) specified in clause 9.1.1.5. The UE shall perform and report the RSTD measurements for both Cell 2 and Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 1. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for both Cell 2 and Cell 3 within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with both the *rstd* fields included within the response time then the number of failure tests is increased by one.
12. If the UE message at step 11 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
13. Repeat steps 2-12 until the confidence level according to Annex D is achieved. For each iteration, at step 7 change the random position of the Cells 2 and 3 in the *OTDOA-NeighbourCellInfoList*.

9.1.1.4.3

Message contents

Table 9.1.1.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.1.1.4.3-2: MAC-MainConfig-RBC: FDD RSTD Measurement Reporting Delay

| Derivation Path: TS 36.508 [18] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | sf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf320 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |

Table 9.1.1.4.3-2a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.1.1.4.3-4: Void

Table 9.1.1.4.3-5: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.1.4.3-6: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.1.1.5 Test requirement

Table 9.1.1.5-1 and 9.1.1.5-2 define the primary level settings including test tolerances for the test.

Table 9.1.1.5-1: Cell-specific test parameters for E-UTRAN FDD intra-frequency RSTD measurement reporting delay under fading propagation conditions during T1

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|----------------|-----------|-----------|-----------|
| E-UTRA RF Channel Number | | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.5 FDD | N/A | N/A |
| PBCH_RA | dB | 0 | N/A | N/A |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| N_{oc} ^{Note 3} | dBm/ 15 kHz | -95 | | |
| $\text{PRS } \hat{E}_s / N_{oc}$ | dB | -Infinity | -Infinity | -Infinity |
| I_o ^{Note 4} | dBm/ 9 MHz | -67.22 | N/A | N/A |
| \hat{E}_s / N_{oc} | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | | ETU30 | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 4: I_o levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

Table 9.1.1.5-2: Cell-specific test parameters for E-UTRAN FDD intra-frequency RSTD measurement reporting delay under fading propagation conditions during T2 and T3

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|---|------------|----------|-----------|-----------|--------|----------|-----------|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| E-UTRA RF Channel Number | | 1 | | 1 | | 1 | |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | | 1x2 Low | | 1x2 Low | |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.5 FDD | | OP.6 FDD | | OP.6 FDD | N/A |
| PBCH_RA | dB | 0 | | 0 | | 0 | N/A |
| PBCH_RB | | | | | | | |
| PSS_RA | | | | | | | |
| SSS_RA | | | | | | | |
| PCFICH_RB | | | | | | | |
| PHICH_RA | | | | | | | |
| PHICH_RB | | | | | | | |
| PDCCH_RA | | | | | | | |
| PDCCH_RB | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | |
| PRS_RA | | | | | | | |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -95 | -98 | -95 | -98 | -95 |
| $PRS \hat{E}_s / N_{oc}$ | dB | -4 | -Infinity | -Infinity | -10 | -10 | -Infinity |
| $PRS \hat{E}_s / I_{ot}$ ^{Note 4} | dB | -4.41 | -Infinity | -Infinity | -10 | -11.46 | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -69.87 | -67.15 | -69.87 | -67.15 | -69.87 | N/A |
| PRP ^{Note 4} | dBm/15 kHz | -102 | -Infinity | -Infinity | -105 | -108 | -Infinity |
| RSRP ^{Note 4} | dBm/15 kHz | -96 | -93 | -105 | -105 | -108 | -Infinity |
| \hat{E}_s / N_{oc} ^{Note 4} | dB | 2 | 2 | -7 | -10 | -10 | -Infinity |
| Propagation Condition | | ETU30 | | | | | |
| <p>Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS.</p> <p>Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.</p> <p>Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled.</p> <p>Note 4: If PRS_RA is not “N/A”, \hat{E}_s / N_{oc}, $PRS \hat{E}_s / I_{ot}$, I_o, RSRP and PRP levels have been derived from other parameters and are given for information purpose. If PRS_RA is “N/A”, I_o and RSRP levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. Interference conditions shall be applied to all PRS symbols of DL positioning subframes.</p> | | | | | | | |

The response time including test tolerance is 3.3 s. The response time is equal to the LPP responseTime IE value plus the test tolerance. The LPP responseTime IE value is derived from the RSTD reporting delay plus ΔT , where $\Delta T = 150$ ms, giving a value of 2710 ms. This is rounded up to the next allowed LPP value of 3 seconds. The RSTD measurement

reporting delay in the test is derived from the following expression, $T_{PRS}(M-1) + 160 \left\lceil \frac{n}{M} \right\rceil$, where $M=8$ and

$n=16$ are the parameters specified in clause 9.1.1.3 and Table 9.1.1.3-1. This gives the total RSTD reporting delay of 2560 ms for the 15 neighbour cells including Cell 2 and Cell 3 with respect to the reference cell, Cell 1.

The test tolerances are defined in clauses C.1.3 and C4.

The rate of successful tests during repeated tests shall be at least 90% with a confidence level of 95%.

9.1.2 TDD RSTD Measurement Reporting Delay

Editor's note: The levels defined in Table 9.1.2.5-2 for Cell 2 and Cell 3 may not be sufficient to pass a compliant UE and are under discussion in RAN 4.

9.1.2.1 Test purpose

To verify that the RSTD measurement reporting delay meets the requirements in an environment with fading propagation conditions.

9.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward that supports UE-assisted OTDOA.

9.1.2.3 Minimum conformance requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure intra-frequency RSTD, specified in 3GPP TS 36.214 [6], for at least $n=16$ cells, including the reference cell, on the same carrier frequency f_1 as that of the reference cell within

$T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$ ms as given below:

$$T_{\text{RSTD IntraFreqTDD, E-UTRAN}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \quad \text{ms},$$

where

$T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$ is the total time for detecting and measuring at least n cells,

T_{PRS} is the cell-specific positioning subframe configuration period as defined in 3GPP TS 36.211 [26],

M is the number of PRS positioning occasions as defined in Table 9.1.2.3-1, where each PRS positioning occasion comprises of N_{PRS} ($1 \leq N_{\text{PRS}} \leq 6$) consecutive downlink positioning subframes defined in 3GPP TS 36.211 [26], and

$\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$ ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time.

Table 9.1.2.3-1: Number of PRS positioning occasions within $T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$

| Positioning subframe configuration period T_{PRS} | Number of PRS positioning occasions M |
|---|---|
| | f_1 ^{Note 1} |
| 160 ms | 16 |
| >160 ms | 8 |
| Note 1: When only intra-frequency RSTD measurements are performed over cells belonging to the serving FDD carrier frequency f_1 . | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbour cells i out of at least $(n-1)$ neighbour cells within $T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$ provided:

$(\text{PRS } \hat{E}_s / \text{Iot})_{\text{ref}} \geq -6$ dB for all Frequency Bands for the reference cell,

$(\text{PRS } \hat{E}_s / \text{Iot})_i \geq -13$ dB for all Frequency Bands for neighbour cell i ,

$(\text{PRS } \hat{E}_s / \text{Iot})_{ref}$ and $(\text{PRS } \hat{E}_s / \text{Iot})_i$ conditions apply for all subframes of at least $L = \frac{M}{2}$ PRS positioning

occasions,

PRP 1,2_{dBm} according to clause E.2 for a corresponding Band.

The time $T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$ starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in 3GPP TS 36.355 [4], are delivered to the physical layer of the UE.

The requirements shall apply for all TDD special subframe configurations specified in 3GPP TS 36.211 [26] and for the TDD uplink-downlink configurations as specified in Table 9.1.2.3-2.

Table 9.1.2.3-2: TDD uplink-downlink subframe configurations applicable for TDD intra-frequency requirements

| PRS Transmission Bandwidth [RB] | Applicable TDD uplink-downlink configurations |
|---|---|
| 6, 15 | 1, 2, 3, 4 and 5 |
| 25, 50, 75, 100 | 0, 1, 2, 3, 4, 5 and 6 |
| Note: Uplink-downlink configurations are specified in Table 4.2-2 in 3GPP TS 36.211 [26]. | |

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times TTI_{\text{DCCH}}$. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.5.2 and A.8.12.2.

9.1.2.4 Test description

9.1.2.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.2.

Channel bandwidth to be tested: 10 MHz as defined in TS 36.508 [18] clause 4.3.1.

1. Connect the SS, faders and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.4.
2. The general test parameter settings are set up according to Table 9.1.2.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 9.1.2.4.3.
5. In the test there are three synchronized cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the OTDOA assistance data reference as well as the serving cell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the same RF channel. Cell 3 in the test is the Cell 4 defined in clause 4.7.1. The assistance data neighbour cell list includes in total 15 cells, where 13 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between two cells as seen at the UE antenna connector) is set to 0 Ts (0 μ s) between neighbour Cell 2 and serving Cell 1; and set to 92 Ts (about 3 μ s) between neighbour Cell 3 and serving Cell 1.

Table 9.1.2.4-1: General test parameters for E-UTRAN TDD intra-frequency RSTD measurement reporting delay under fading propagation conditions

| Parameter | Unit | Value | Comment |
|--|------|--|---|
| Reference cell | | Cell 1 | Reference is the cell in the OTDOA assistance data with respect to which the RSTD measurement is defined, as specified in 3GPP TS 36.214 [16] and 3GPP TS 36.355 [4]. The reference cell is the serving cell in this test case. |
| Neighbour cells | | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at random places in the neighbour cell list in the OTDOA assistance data, but Cell 2 always appears in the first half of the list, whilst Cell 3 appears in the second half of the list. |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.6 TDD | As specified in TS 36.521-3 [25] clause A.2.2 |
| Channel Bandwidth (BW_{channel}) | MHz | 10 | |
| PRS Transmission Bandwidth ^{Note 2} | RB | 50 | PRS are transmitted over the system bandwidth |
| PRS configuration index I_{PRS} ^{Note 2} | | 174 | This corresponds to periodicity of 320 ms and PRS subframe offset of $I_{\text{PRS}} - 160$ DL subframes, as defined in 3GPP TS 36.211 [26], Table 6.10.4.3-1 |
| Number of consecutive downlink positioning subframes N_{PRS} ^{Note 2} | | 1 | As defined in 3GPP TS 36.211 [26]. The number of subframes in a positioning occasion |
| Physical cell ID PCI ^{Note 2} | | (PCI of Cell 1 – PCI of Cell 2)mod6=0 and (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| TDD uplink-downlink configuration | | 1 | As specified in TS 36.211 [26], Section 4.2; corresponds to a configuration with 5 ms switch-point periodicity and two downlink consecutive subframes |
| TDD special subframe configuration | | 6 | As specified in TS 36.211 [26], Section 4.2; corresponds to DwPTS of $19760 \cdot T_s$ and UpPTS of $4384 \cdot T_s$ |
| CP length ^{Note 2} | | Normal | The same CP length applies for DL and UL |
| DRX | | ON | DRX parameters are further specified in Table 9.1.2.4-2 |
| Maximum radio frame transmit time offset between the cells at the UE antenna connector ^{Note 3} | μs | 3 | Synchronous cells |
| Expected RSTD ^{Note 1} | μs | 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| Expected RSTD uncertainty ^{Note 1} | μs | 5 | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| Number of cells provided in OTDOA assistance data | | 16 | Including the reference cell |
| PRS muting info ^{Note 2} | | Cell 1: '11110000' Cell 2: '00001111' Cell 3: '11110000' | Corresponds to prs-MutingInfo defined in TS 36.355 [4] |
| T1 | s | 3 | The length of the time interval from the beginning of each test |
| T2 | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

| | | | |
|---------|--|------|---|
| T3 | s | 1.28 | The length of the time interval that follows immediately after time interval T2 |
| Note 1: | Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.1.2.4.3-5 and TS 37.571-5 [20], clause 7.2.2. | | |
| Note 2: | Parameters "PRS Transmission Bandwidth", "PRS configuration index", "Number of consecutive downlink positioning subframes", "Physical cell ID PCI", "CP length", and "PRS muting info" are settable parameters and also parameters signalled in LPP. The values to be used for "Physical cell ID PCI" are as follows: Cell 1: 0, Cell 2: 6, Cell 3: 12. For all the values to be used in LPP see Table 9.1.2.4.3-5 and TS 37.571-5 [20], clause 7.2.2. | | |
| Note 3: | The parameter "Maximum radio frame transmit time offset between the cells at the UE antenna connector" is not a settable parameter but is used to set the "true RSTD" values in step 6 of clause 9.1.2.4.1. | | |

Table 9.1.2.4-2: DRX parameters for E-UTRAN TDD intra-frequency RSTD measurement reporting delay under fading propagation conditions

| Field | Value | Comment |
|--------------------------|---------|--|
| onDurationTimer | psf1 | As specified in 3GPP TS 36.331 [22], clause 6.3.2. |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | sf1 | |
| longDRX-CycleStartOffset | sf320 | |
| shortDRX | disable | |

9.1.2.4.2 Test procedure

The test consists of three consecutive time intervals, with duration of T1, T2 and T3 defined in Table 9.1.2.4-1. Cell 1 is active in T1, T2 and T3, whilst Cell 2 and Cell 3 are activated only in the beginning of T2. Cell 2 is active until the end of T3, and Cell 3 is active until the end of T2. The beginning of the time interval T2 shall be aligned 5 ms before the first PRS positioning subframe of a positioning occasion in the reference cell, where 5 ms is the necessary test tolerance. Cell 1 transmits PRS in T2, while Cell 2 transmits PRS only in T3, and Cell 3 transmits PRS only in T2.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.1.2.4.3 shall be provided to the UE during T1. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of T2, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.1.2.5-1. Propagation conditions are set according to clause 4.7.2.2 (ETU30).
4. T1 starts.
5. The SS shall transmit an RRCConnectionReconfiguration message with the DRX configuration.
6. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 6a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 6b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
7. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. The position of neighbour Cell 2 in the *OTDOA-NeighbourCellInfoList* is randomly selected to be in the first 7 elements of the sequence, and the position of neighbour Cell 3 is randomly selected to be in the last 8 elements of the sequence, as described in 3GPP TS 37.571-5 [20], clause 7.2.3. If the

UE message at step 6b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.

8. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of T2, where $\Delta T = 150$ ms.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 9.1.2.5-3.
10. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 9.1.2.5-3.
11. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION including the *OTDOA-ProvideLocationInformation* IE within the response time (see clause 4.7.3) specified in clause 9.1.1.5. The UE shall perform and report the RSTD measurements for both Cell 2 and Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 1. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for both Cell 2 and Cell 3 within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with both the *rstd* fields included within the response time then the number of failure tests is increased by one.
12. If the UE message at step 11 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
13. Repeat steps 2-12 until the confidence level according to Annex D is achieved. For each iteration, at step 9 change the random position of the Cells 2 and 3 in the *OTDOA-NeighbourCellInfoList*.

9.1.2.4.3

Message contents

Table 9.1.2.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.1.2.4.3-2: MAC-MainConfig-RBC: TDD RSTD Measurement Reporting Delay

| Derivation Path: TS 36.508 [18] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | sf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf320 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |

Table 9.1.2.4.3-2a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.1.2.4.3-4: Void

Table 9.1.2.4.3-5: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.2.4.3-6: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| Rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.1.2.5 Test requirement

Table 9.1.2.5-1 and 9.1.2.5-2 define the primary level settings including test tolerances for the test.

Table 9.1.2.5-1: Cell-specific test parameters for E-UTRAN TDD intra-frequency RSTD measurement reporting delay under fading propagation conditions during T1

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|------------|-----------|-----------|-----------|
| E-UTRA RF Channel Number | | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.1 TDD | N/A | N/A |
| PBCH_RA | dB | 0 | N/A | N/A |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| N_{oc} ^{Note 3} | dBm/15 kHz | -95 | | |
| $\text{PRS } \hat{E}_s / N_{oc}$ | dB | -Infinity | -Infinity | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -67.22 | N/A | N/A |
| \hat{E}_s / N_{oc} | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | | ETU30 | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 4: I_o levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

Table 9.1.2.5-2: Cell-specific test parameters for E-UTRAN TDD intra-frequency RSTD measurement reporting delay under fading propagation conditions

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|--|------------|----------|-----------|-----------|--------|----------|-----------|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| E-UTRA RF Channel Number | | 1 | | 1 | | 1 | |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | | 1x2 Low | | 1x2 Low | |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.1 TDD | | OP.2 TDD | | OP.2 TDD | N/A |
| PBCH_RA | dB | 0 | | 0 | | 0 | N/A |
| PBCH_RB | | | | | | | |
| PSS_RA | | | | | | | |
| SSS_RA | | | | | | | |
| PCFICH_RB | | | | | | | |
| PHICH_RA | | | | | | | |
| PHICH_RB | | | | | | | |
| PDCCH_RA | | | | | | | |
| PDCCH_RB | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | |
| PRS_RA | dB | -6 | N/A | N/A | 0 | 0 | N/A |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -95 | -98 | -95 | -98 | -95 |
| $\text{PRS } \hat{E}_s / N_{oc}$ | dB | -4 | -Infinity | -Infinity | -10 | -10 | -Infinity |
| $\text{PRS } \hat{E}_s / I_{ot}$ ^{Note 4} | dB | -4.41 | -Infinity | -Infinity | -10 | -11.46 | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -69.87 | -67.15 | -69.87 | -67.15 | -69.87 | N/A |
| PRP ^{Note 4} | dBm/15 kHz | -102 | -Infinity | -Infinity | -105 | -108 | -Infinity |
| RSRP ^{Note 4} | dBm/15 kHz | -96 | -93 | -105 | -105 | -108 | -Infinity |
| \hat{E}_s / N_{oc} ^{Note 4} | dB | 2 | 2 | -7 | -10 | -10 | -Infinity |
| Propagation Condition | | ETU30 | | | | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. | | | | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | |
| Note 4: If PRS_RA is not “N/A”, \hat{E}_s / N_{oc} , $\text{PRS } \hat{E}_s / I_{ot}$, I_o , RSRP and PRP levels have been derived from other parameters and are given for information purpose. If PRS_RA is “N/A”, I_o and RSRP levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. Interference conditions shall be applied to all PRS symbols of DL positioning subframes. | | | | | | | |

The response time including test tolerance is 3.3 s. The response time is equal to the LPP responseTime IE value plus the test tolerance. The LPP responseTime IE value is derived from the RSTD reporting delay plus ΔT , where $\Delta T = 150$ ms, giving a value of 2710 ms. This is rounded up to the next allowed LPP value of 3 seconds. The RSTD measurement

reporting delay in the test is derived from the following expression, $T_{PRS}(M-1) + 160 \left\lceil \frac{n}{M} \right\rceil$, where $M=8$ and

$n=16$ are the parameters specified in clause 9.2.1.3 and Table 9.2.1.3-1. This gives the total RSTD reporting delay of 2560 ms for the 15 neighbour cells including Cell 2 and Cell 3 with respect to the reference cell, Cell 1.

The test tolerances are defined in clauses C.1.3 and C4.

The rate of successful tests during repeated tests shall be at least 90% with a confidence level of 95%.

9.1.3 FDD RSTD Measurement Accuracy

9.1.3.1 Test purpose

To verify that the RSTD FDD intra-frequency measurement accuracy is within the specified limits.

9.1.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 9 and forward that supports UE-assisted OTDOA.

9.1.3.3 Minimum conformance requirements

The accuracy requirements in Table 9.1.3.3-1 are valid under the following conditions:

Conditions defined in TS 36.101 [2] clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2_{dBm} according to clause E.2 for a corresponding Band.

There are no measurement gaps overlapping with the PRS subframes of the measured cell.

The parameter *expectedRSTDUncertainty* signalled over LPP as defined in 3GPP TS 36.355 [4] is less than 5 μ s.

Table 9.1.3.3-1: RSTD measurement accuracy

| Accuracy | Conditions | | | | | |
|---|--|--|--|---|------------------------------|-------------------------------|
| | PRS \hat{E}_s/lot | Minimum PRS bandwidth, which is minimum of serving cell channel bandwidth and the PRS bandwidths of the reference cell and the measured neighbour cell i ^{Note 6} | Minimum number of available measurement subframes among the reference cell and the measured neighbour cell i | Io ^{Note 9} range | | |
| | | | | E-UTRA operating band groups ^{Note 10} | Minimum Io ^{Note 1} | Maximum Io |
| Ts ^{Note 2} | dB | RB | | | dBm/15kHz ^{Note 8} | dBm/BW _{Chan} nel |
| ±15 | (PRS \hat{E}_s/lot) _{ref} ≥ -6dB and (PRS \hat{E}_s/lot) _i ≥ -13dB | ≥ 6 | 6 | FDD_A, TDD_A | -121 | -50 |
| | | | | FDD_C, TDD_C | -120 | -50 |
| | | | | FDD_D | -119.5 | -50 |
| | | | | FDD_E, TDD_E | -119 | -50 |
| | | | | FDD_F | -118.5 | -50 |
| | | | | FDD_G | -118 | -50 |
| | | | | FDD_H | -117.5 | -50 |
| ±6 | (PRS \hat{E}_s/lot) _{ref} ≥ -6dB and (PRS \hat{E}_s/lot) _i ≥ -13dB | ≥ 25 | ≥ 2 | Note 5 | Note 5 | Note 5 |
| | | | | | | |
| ±5 | (PRS \hat{E}_s/lot) _{ref} ≥ -6dB and (PRS \hat{E}_s/lot) _i ≥ -13dB | ≥ 50 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol. NOTE 2: Ts is the basic timing unit defined in TS 36.211 [26]. NOTE 3: PRS bandwidth is as indicated in <i>prs-Bandwidth</i> in the OTDOA assistance data defined in TS 36.355 [4]. NOTE 4: Void. NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 6 RB. NOTE 6: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency. NOTE 7: Void. NOTE 8: The condition level is increased by Δ>0, when applicable, as described in TS 36.133 [23] Annexes B.4.2 and B.4.3. NOTE 9: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe. NOTE 10: E-UTRA operating band groups are as defined in clause 4.4.2. | | | | | | |

The normative reference for this requirement is TS 36.133 [23] clause 9.1.10.1 and A.9.8.1.

9.1.3.4 Test description

9.1.3.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 1.4 MHz (Test 1 and 2) and 10 MHz (Test 3 and 4). In the case that 1.4MHz channel bandwidth is not defined for the operating band under test, as defined in TS 36.101 [2] clause 5.6.1, then this part of the test shall be omitted.

1. Connect the SS and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.3.
 2. The general test parameter settings are set up according to Table 9.1.3.4.1-1.
 3. Propagation conditions are set according to clause 4.7.2.1.
 4. Message contents are defined in clause 9.1.3.4.3.
 5. All cells are on the same carrier frequency. Cell 1 is the serving cell and OTDOA assistance data reference cell; Cell 2 is the neighbour cell. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 [20], clause 7.2.2).
 6. The true RSTD (which is the receive time difference for frame 0 between the two cells as seen at the UE antenna connector) is set to the following values:
 - Test 1: 92 Ts (about 3 μ s)
 - Test 2: 0 Ts (0 μ s)
 - Test 3: 0 Ts (0 μ s)
 - Test 4: -92 Ts (- about -3 μ s)
- Note that the related expectedRSTD values to be signalled over LPP are defined in Table 9.1.3.4-1 for each test.

Table 9.1.3.4.1-1: General Test Parameters for intra frequency RSTD Tests for E-UTRAN FDD

| Parameter | Unit | Value | | | | Comment |
|--|------|---|---|---|---|---|
| | | Test1 | Test2 | Test3 | Test4 | |
| PCFICH/PDCCH/PHICH parameters | | R.8 FDD | | R.6 FDD | | As specified in TS 36.521-3 [25] clause A.2.1 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.1 | | OP.7 FDD | | OP.6 FDD | | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Reference cell | | Cell 1 | | | | |
| Neighbour cell | | Cell 2 | | | | |
| E-UTRA RF Channel Number | | 1 | | | | One FDD carrier frequency is used. |
| Channel Bandwidth (BW_{channel}) | MHz | 1.4 | | 10 | | |
| PRS Transmission Bandwidth <small>Note 2</small> | RB | 6 | | 50 | | |
| PRS configuration Index I_{PRS} <small>Note 2</small> | | 12 | | 2 | | As defined in 3GPP TS 36.211 [26] |
| Number of consecutive positioning downlink subframes N_{PRS} <small>Note 2</small> | | 6 | | 1 | | As defined in 3GPP TS 36.211 [26] |
| prs-MutingInfo <small>Note 2</small> | | Cell 1: ‘11110000’ Cell 2: ‘11110000’ | | | | See section 6.5.1.2 in 3GPP TS 36.355 [4] for more information |
| Cell ID <small>Note 2</small> | | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 0 | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 1 | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 0 | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 3 | |
| expectedRSTD <small>Note 1</small> | us | 3 | 0 | 0 | -3 | |
| expectedRSTDUncertainty <small>Note 1</small> | us | 5 | 5 | 5 | 5 | |
| CP length <small>Note 2</small> | | Normal | | | | |
| DRX | | OFF | | | | |
| Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time) <small>Note 3</small> | | 3 us | | | | Synchronous cells |
| Number of cells provided in OTDOA assistance data | | 16 | | | | The number of cells includes the reference cell |
| $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ <small>Note 4</small> | ms | 2560 | | | | Derived according to the RSTD measurement requirements specified in Section 9.1.1.3 |

NOTE 1: Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.1.3.4.3-4 and TS 37.571-5 [20], clause 7.2.2.

NOTE 2: Parameters "PRS Transmission Bandwidth", "PRS configuration index", "Number of consecutive positioning downlink subframes", "prs-MutingInfo", "Cell ID" and "CP length" are settable parameters and also parameters signalled in LPP. The values to be used for "Cell ID" are as follows: Cell 1: 0, Cell 2: Test 1: 6, Test 2: 7, Test 3: 6, Test 4: 9. For all the values to be used in LPP see Table 9.1.3.4.3-4 and TS 37.571-5 [20], clause 7.2.2.

NOTE 3: The parameter "Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time)" is not a settable parameter but is used to set the "true RSTD" values in step 6 of clause 9.1.3.4.1.

NOTE 4: The parameter " $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ " is not a settable parameter but is used to set the LPP "responseTime" value in Table 9.1.3.4.3-2. The value of the LPP responseTime IE is set to $T_{\text{RSTD IntraFreqFDD, E-UTRAN}} + \Delta T$ ms, where $\Delta T = 150$ ms, giving a value of 2710 ms. This is rounded up to the next allowed LPP value of 3 seconds.

9.1.3.4.2 Test procedure

The test consists of a set-up period and a measurement period. Cell 1 and Cell 2 are both active during the complete test. The beginning of the measurement period shall be aligned with the first PRS positioning subframe of a positioning occasion in the reference cell.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.1.3.4.3 shall be provided to the UE during the set-up period. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of the measurement period, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the UE.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.1.3.5-1 as appropriate. Propagation conditions are set according to clause 4.7.2.1.
- 3a. The SS shall send an LPP REQUEST CAPABILITIES message.
- 3b. The UE shall send an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
4. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. If the UE message at step 3b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
5. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of measurement period, where $\Delta T = 150$ ms.
6. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message, including the *OTDOA-ProvideLocationInformation* IE.
7. If the UE message at step 6 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
8. The SS shall check the *rstd* value for Cell 2 in the *OTDOA-SignalMeasurementInformation* IE according to Table 9.1.3.5-2.
9. Repeat step 2-8 until the confidence level according to Annex D is achieved.
10. Repeat step 1-9 for each sub-test in Table 9.1.3.5-1 as appropriate.

9.1.3.4.3 Message contents

Table 9.1.3.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.1.3.4.3-1a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.1.3.4.3-2: LPP RequestLocationInformation

| Derivation Path: 36.355 clause 6.2 | | | |
|--|--------------------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 3 | See Note 4 of Table 9.1.3.4.1-1 | |
| velocityRequest | FALSE | | |
| } | | | |
| environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation SEQUENCE { | | | |
| assistanceAvailability | FALSE | | |
| } | | | |
| ecid-RequestLocationInformation | Not present | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.3.4.3-3: Void

Table 9.1.3.4.3-4: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.3.4.3-5: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(1)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Set according to Table 9.1.3.5-2 for each specific test | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.3.4.3-6: CQI-ReportConfig-DEFAULT: FDD RSTD Measurement Accuracy

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | This IE should be omitted for Test 1 and Test 2 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| release | NULL | | |
| } | | | |

9.1.3.5 Test requirement

Table 9.1.3.5-1 defines the primary level settings including test tolerances for all tests.

The RSTD FDD intra-frequency accuracy test shall meet the reported values in Table 9.1.3.5-2.

Table 9.1.3.5-1: Cell Specific Test Parameters for intra frequency RSTD Tests for E-UTRAN FDD

| Parameter | Unit | Test1 | | Test2 | | Test3 | | Test4 | |
|---|--------------|---------|---------|--------|--------|---------|---------|--------|--------|
| | | Cell1 | Cell2 | Cell1 | Cell2 | Cell1 | Cell2 | Cell1 | Cell2 |
| E-UTRA RF Channel Number | | 1 | | | | | | | |
| PBCH_RA | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PBCH_RB | | | | | | | | | |
| PSS_RA | | | | | | | | | |
| SSS_RA | | | | | | | | | |
| PCFICH_RB | | | | | | | | | |
| PHICH_RA | | | | | | | | | |
| PHICH_RB | | | | | | | | | |
| PDCCH_RA | | | | | | | | | |
| PDCCH_RB | | | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | | | |
| PRS_RA | dB | 0 | 0 | -2.7 | 0.3 | 0 | 0 | -2.7 | 0.3 |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | -98 | -98 | -98 | -98 | -98 | -98 | -98 |
| $PRS \hat{E}_s/N_{oc}$ | dB | -2.37 | -8.02 | -5.7 | -12.7 | -2.37 | -8.02 | -5.7 | -12.7 |
| $PRS \hat{E}_s/I_{ot}$ ^{Note 3} | dB | -3 | -10 | -5.7 | -12.7 | -3 | -10 | -5.7 | -12.7 |
| I_o ^{Note 3} | dBm/1.08 MHz | -78.92 | -78.92 | -79.2 | -79.2 | N/A | N/A | N/A | N/A |
| | dBm/9 MHz | N/A | N/A | N/A | N/A | -69.72 | -69.72 | -69.99 | -69.99 |
| PRP ^{Note 3} | dBm/15kHz | -100.37 | -106.02 | -103.7 | -110.7 | -100.37 | -106.02 | -103.7 | -110.7 |
| \hat{E}_s/N_{oc} ^{Note 3} | dB | -2.37 | -8.02 | -3 | -13 | -2.37 | -8.02 | -3 | -13 |
| RSRP ^{Note 3} | dBm/15kHz | -100.37 | -106.02 | -101 | -111 | -100.37 | -106.02 | -101 | -111 |
| Propagation condition | | AWGN | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). | | | | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | | | |
| Note 3: \hat{E}_s/N_{oc} , $PRS \hat{E}_s/I_{ot}$, I_o , RSRP and PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. I_o values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS. | | | | | | | | | |

Table 9.1.3.5-2: RSTD FDD intra-frequency accuracy requirements for the reported values

| | Test 1 | Test 2 | Test 3 | Test 4 |
|------------------------|-----------|-----------|-----------|-----------|
| Lowest reported value | RSTD_6431 | RSTD_6340 | RSTD_6350 | RSTD_6258 |
| Highest reported value | RSTD_6463 | RSTD_6371 | RSTD_6361 | RSTD_6270 |

For the overall test to pass, the ratio of successful reported values in each sub-test shall be more than 90% with a confidence level of 95%. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test then Test 1 and Test 2 shall be omitted.

9.1.4 TDD RSTD Measurement Accuracy

9.1.4.1 Test purpose

To verify that the RSTD TDD intra-frequency measurement accuracy is within the specified limits.

9.1.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 9 and forward that supports UE-assisted OTDOA.

9.1.4.3 Minimum conformance requirements

The accuracy requirements in Table 9.1.3.3-1 are valid under the following conditions:

Conditions defined in TS 36.101 [2] clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2_{dBm} according to clause E.2 for a corresponding Band.

There are no measurement gaps overlapping with the PRS subframes of the measured cell.

The parameter *expectedRSTDUncertainty* signalled over LPP as defined in 3GPP TS 36.355 [4] is less than 5 μ s.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.10.1 and A.9.8.2.

9.1.4.4 Test description

9.1.4.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.2.

Channel bandwidth to be tested: 1.4 MHz (Test 1 and 2) and 10 MHz (Test 3 and 4). In the case that 1.4MHz channel bandwidth is not defined for the operating band under test, as defined in TS 36.101 [2] clause 5.6.1, then this part of the test shall be omitted.

1. Connect the SS and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.3.
2. The general test parameter settings are set up according to Table 9.1.4.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 9.1.4.4.3.
5. All cells are on the same carrier frequency. Cell 1 is the serving cell and OTDOA assistance data reference cell; Cell 2 is the neighbour cell. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between the two cells as seen at the UE antenna connector) is set to the following values:
 - Test 1: 92 Ts (about 3 μ s)
 - Test 2: 0 Ts (0 μ s)
 - Test 3: 0 Ts (0 μ s)
 - Test 4: -92 Ts (- about 3 μ s)

Note that the related *expectedRSTD* values to be signalled over LPP are defined in Table 9.1.4.4-1 for each test.

Table 9.1.4.4.1-1: General Test Parameters for intra frequency RSTD Tests for E-UTRAN TDD

| Parameter | Unit | Value | | | | Comment |
|---|------|---|---|---|---|---|
| | | Test1 | Test2 | Test3 | Test4 | |
| PCFICH/PDCCH/PHICH parameters | | R.8 TDD | | R.6 TDD | | As specified in TS 36.521-3 [25] clause A.2.2. |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.2 | | OP.4 TDD | | OP.2 TDD | | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Reference cell | | Cell 1 | | | | |
| Neighbour cell | | Cell 2 | | | | |
| E-UTRA RF Channel Number | | 1 | | | | One TDD carrier frequency is used. |
| Channel Bandwidth (BW _{channel}) | MHz | 1.4 | | 10 | | |
| Special subframe configuration | | 6 | | 6 | | As specified in table 4.2-1 in TS 36.211 [26]. The same configuration in both cells. |
| Uplink-downlink configuration | | 3 | | 1 | | As specified in table 4.2-2 in TS 36.211 [26] and table 9.1.2.3-2. The same configuration in both cells. |
| PRS Transmission Bandwidth <small>Note 2</small> | RB | 6 | | 50 | | |
| PRS configuration Index I_{PRS} <small>Note 2</small> | | 9 | | 14 | | As defined in 3GPP TS 36.211 [26]. |
| Number of consecutive positioning downlink subframes N_{PRS} <small>Note 2</small> | | 6 | | 1 | | As defined in 3GPP TS 36.211 [26]. |
| prs-MutingInfo <small>Note 2</small> | | Cell 1: ‘11110000’ Cell 2: ‘11110000’ | | | | See section 6.5.1.2 in 3GPP TS 36.355 [4] for more information |
| Cell ID <small>Note 2</small> | | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 0 | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 1 | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 0 | (Cell ID of cell 1 – Cell ID of cell 2) mod 6 = 3 | |
| expectedRSTD <small>Note 1</small> | us | 3 | 0 | 0 | -3 | |
| expectedRSTDUncertainty <small>Note 1</small> | us | 5 | 5 | 5 | 5 | |
| CP length <small>Note 2</small> | | Normal | | | | |

| | | | |
|--|----|------|---|
| DRX | | OFF | |
| Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time) ^{Note 3} | | 3 us | Synchronous cells |
| Number of cells provided in OTDOA assistance data | | 16 | The number of cells includes the reference cell |
| $T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$ ^{Note 4} | ms | 2560 | Derived according to the RSTD measurement requirements specified in Section 9.1.2.3 |
| <p>NOTE 1: Parameters “Expected RSTD” and “Expected RSTD uncertainty” are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.1.4.4.3-4 and TS 37.571-5 [20], clause 7.2.2.</p> <p>NOTE 2: Parameters “PRS Transmission Bandwidth”, “PRS configuration index”, “Number of consecutive positioning downlink subframes”, “prs-MutingInfo”, “Cell ID” and “CP length” are settable parameters and also parameters signalled in LPP. The values to be used for “Cell ID” are as follows: Cell 1: 0, Cell 2: Test 1: 6, Test 2: 7, Test 3: 6, Test 4: 9. For all the values to be used in LPP see Table 9.1.4.4.3-4 and TS 37.571-5 [20], clause 7.2.2.</p> <p>NOTE 3: The parameter “Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time)” is not a settable parameter but is used to set the “true RSTD” values in step 6 of clause 9.1.4.4.1.</p> <p>NOTE 4: The parameter “$T_{\text{RSTD IntraFreqTDD, E-UTRAN}}$” is not a settable parameter but is used to set the LPP “responseTime” value in Table 9.1.4.4.3-2. The value of the LPP responseTime IE is set to $T_{\text{RSTD IntraFreqTDD, E-UTRAN}} + \Delta T$ ms, where $\Delta T = 150$ ms, giving a value of 2710 ms. This is rounded up to the next allowed LPP value of 3 seconds.</p> | | | |

9.1.4.4.2 Test procedure

The test consists of a set-up period and a measurement period. Cell 1 and Cell 2 are both active during the complete test. The beginning of the measurement period shall be aligned with the first PRS positioning subframe of a positioning occasion in the reference cell.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.1.4.4.3 shall be provided to the UE during the set-up period. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of the measurement period, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the UE.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.1.4.5-1 as appropriate. Propagation conditions are set according to clause 4.7.2.1.
- 3a. The SS shall send an LPP REQUEST CAPABILITIES message.
- 3b. The UE shall send an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
4. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. If the UE message at step 3b includes the ackRequested IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
5. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of measurement period, where $\Delta T = 150$ ms.
6. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message, including the *OTDOA-ProvideLocationInformation* IE.

7. If the UE message at step 6 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
8. The SS shall check the *rstd* value for Cell 2 in the *OTDOA-SignalMeasurementInformation* IE according to Table 9.1.4.5-2.
9. Repeat step 2-8 until the confidence level according to Annex D is achieved.
10. Repeat step 1-9 for each sub-test in Table 9.1.4.5-1 as appropriate.

9.1.4.4.3 Message contents

Table 9.1.4.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.1.4.4.3-1a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

| | | | |
|--|---|--|--|
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.4.4.3-6: CQI-ReportConfig-DEFAULT: TDD RSTD Measurement Accuracy

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | This IE should be omitted for Test 1 and Test 2 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| release | NULL | | |
| } | | | |

9.1.4.5 Test requirement

Table 9.1.4.5-1 defines the primary level settings including test tolerances for all tests.

Each RSTD TDD intra-frequency accuracy test shall meet the reported values in Table 9.1.4.5-2.

Table 9.1.4.5-1: Cell Specific Test Parameters for intra frequency RSTD Tests for E-UTRAN TDD

| Parameter | Unit | Test1 | | Test2 | | Test3 | | Test4 | |
|---|--------------|---------|---------|--------|--------|---------|---------|--------|--------|
| | | Cell1 | Cell2 | Cell1 | Cell2 | Cell1 | Cell2 | Cell1 | Cell2 |
| E-UTRA RF Channel Number | | 1 | | | | | | | |
| PBCH_RA | dB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| PBCH_RB | | | | | | | | | |
| PSS_RA | | | | | | | | | |
| SSS_RA | | | | | | | | | |
| PCFICH_RB | | | | | | | | | |
| PHICH_RA | | | | | | | | | |
| PHICH_RB | | | | | | | | | |
| PDCCH_RA | | | | | | | | | |
| PDCCH_RB | | | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | | | |
| PRS_RA | dB | 0 | 0 | -2.7 | 0.3 | 0 | 0 | -2.7 | 0.3 |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | -98 | -98 | -98 | -98 | -98 | -98 | -98 |
| PRS \hat{E}_s/N_{oc} | dB | -2.37 | -8.02 | -5.7 | -12.7 | -2.37 | -8.02 | -5.7 | -12.7 |
| PRS \hat{E}_s/I_{ot} ^{Note 3} | dB | -3 | -10 | -5.7 | -12.7 | -3 | -10 | -5.7 | -12.7 |
| I_o ^{Note 3} | dBm/1.08 MHz | -78.92 | -78.92 | -79.2 | -79.2 | N/A | N/A | N/A | N/A |
| | dBm/9 MHz | N/A | N/A | N/A | N/A | -69.72 | -69.72 | -69.99 | -69.99 |
| PRP ^{Note 3} | dBm/15kHz | -100.37 | -106.02 | -103.7 | -110.7 | -100.37 | -106.02 | -103.7 | -110.7 |
| \hat{E}_s/N_{oc} ^{Note 3} | dB | -2.37 | -8.02 | -3 | -13 | -2.37 | -8.02 | -3 | -13 |
| RSRP ^{Note 3} | dBm/15kHz | -100.37 | -106.02 | -101 | -111 | -100.37 | -106.02 | -101 | -111 |
| Propagation condition | | AWGN | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). | | | | | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | | | |
| Note 3: \hat{E}_s/N_{oc} , PRS \hat{E}_s/I_{ot} , I_o , RSRP and PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. I_o values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS. | | | | | | | | | |

Table 9.1.4.5-2: RSTD TDD intra-frequency accuracy requirements for the reported values

| | Test 1 | Test 2 | Test 3 | Test 4 |
|------------------------|-----------|-----------|-----------|-----------|
| Lowest reported value | RSTD_6431 | RSTD_6340 | RSTD_6350 | RSTD_6258 |
| Highest reported value | RSTD_6463 | RSTD_6371 | RSTD_6361 | RSTD_6270 |

For the overall test to pass, the ratio of successful reported values in each sub-test shall be more than 90% with a confidence level of 95%. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test then Test 1 and Test 2 shall be omitted.

9.2 RSTD Inter-Frequency Measurements

9.2.1 FDD-FDD inter-frequency RSTD measurement reporting delay

Editor's note: The value of Es/Noc for Cell 1 in Table 9.2.1.5-1 is not sufficient to maintain a reliable connection under fading conditions. This has been corrected in other similar test cases but RAN 4 has not yet corrected this in this test case.

Editor's note: The levels defined in Table 9.2.1.5-2 for Cell 2 and Cell 3 may not be sufficient to pass a compliant UE and are under discussion in RAN 4.

9.2.1.1 Test purpose

To verify that the FDD-FDD inter-frequency RSTD measurement reporting delay meets the requirements in an environment with fading propagation conditions.

9.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support inter-frequency RSTD measurements.

9.2.1.3 Minimum conformance requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-frequency RSTD, specified in 3GPP TS 36.214 [6], for at least $n=16$ cells, including the reference cell, within $T_{\text{RSTD InterFreqFDD, E-UTRAN}}$ ms as given below:

$$T_{\text{RSTD InterFreqFDD, E-UTRAN}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \quad \text{ms},$$

where

$T_{\text{RSTD InterFreqFDD, E-UTRAN}}$ is the total time for detecting and measuring at least n cells,

T_{PRS} is the largest value of the cell-specific positioning subframe configuration period, defined in 3GPP TS 36.211 [26], among the measured n cells including the reference cell,

M is the number of PRS positioning occasions as defined in Table 9.2.1.3-1, where each PRS positioning occasion comprises of N_{PRS} ($1 \leq N_{\text{PRS}} \leq 6$) consecutive downlink positioning subframes defined in 3GPP TS 36.211 [26], and

$\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$ ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time.

Table 9.2.1.3-1: Number of PRS positioning occasions within $T_{\text{RSTD InterFreqFDD, E-UTRAN}}$

| Positioning subframe configuration period T_{PRS} | Number of PRS positioning occasions M | |
|---|---|-------------------------------|
| | $f2^{\text{Note 1}}$ | $f1$ and $f2^{\text{Note 2}}$ |
| 160 ms | 16 | 32 |
| >160 ms | 8 | 16 |
| Note 1: When inter-frequency RSTD measurements are performed over the reference cell and neighbour cells, which belong to the FDD inter-frequency carrier frequency $f2$. Note 2: When inter-frequency RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the serving FDD carrier frequency $f1$ and the FDD inter-frequency carrier frequency $f2$ respectively. | | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbour cells i out of at least $(n-1)$ neighbour cells within $T_{\text{RSTD InterFreqFDD, E-UTRAN}}$ provided:

$$\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_{\text{ref}} \geq -6 \text{ dB for all Frequency Bands for the reference cell,}$$

$$\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_i \geq -13 \text{ dB for all Frequency Bands for neighbour cell } i,$$

$\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_{\text{ref}}$ and $\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_i$ conditions apply for all subframes of at least $L = \frac{M}{2}$ PRS positioning occasions,

PRP 1,2_{dBm} according to E.3 for a corresponding Band.

$\text{PRS } \hat{E}_s / \text{Iot}$ is as defined in Section 9.1.1.3.

The time $T_{\text{RSTD InterFreqFDD, E-UTRAN}}$ starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in 3GPP TS 36.355 [4], are delivered to the physical layer of the UE.

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times \text{TTI}_{\text{DCCH}}$. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.6.1 and A.8.13.1.

9.2.1.4 Test description

9.2.1.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 10 MHz as defined in TS 36.508 [18] clause 4.3.1.

1. Connect the SS, faders and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.4.
2. The general test parameter settings are set up according to Table 9.2.1.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 9.2.1.4.3.

5. In the test there are three synchronized cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the OTDOA assistance data reference as well as the serving cell. Cell 2 and Cell 3 are the neighbour cells. Cell 1 is on FDD RF channel 1. Cell 2 and Cell 3 are on a FDD RF channel 2. The assistance data neighbour cell list includes in total 15 cells, where 13 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between two cells as seen at the UE antenna connector) is set to 0 Ts (0 μ s) between neighbour Cell 2 and serving Cell 1; and set to 92 Ts (about 3 μ s) between neighbour Cell 3 and serving Cell 1.
7. The gap pattern configuration # 0 as defined in Table 8.1.2.1-1 in 3GPP TS 36.133 [23] is configured and does not overlap with PRS subframes of Cell 1.

Table 9.2.1.4.1-1: General test parameters for E-UTRAN FDD-FDD inter-frequency RSTD measurement reporting delay under fading propagation conditions

| Parameter | Unit | Value | Comment |
|---|------|---|--|
| Reference cell | | Cell 1 | Reference cell is the cell with respect to which the RSTD measurement is defined, as specified in 3GPP TS 36.214 [6] and 3GPP TS 36.355 [4]. The reference cell is the serving cell on RF channel 1 in this test case. |
| Neighbour cells | | Cell 2 and Cell 3 | Cells on RF channel 2. The cells appear at random places in the neighbour cell list in the OTDOA assistance data, but Cell 2 always appears in the first half of the list, whilst Cell 3 appears in the second half of the list. |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.6 FDD | As specified in TS 36.521-3 [25] clause A.2.1 |
| Channel Bandwidth (BW_{channel}) | MHz | 10 | |
| PRS Bandwidth ^{Note 2} | RB | 50 | PRS are transmitted over the system bandwidth |
| Gap pattern Id | | 0 | As specified in Table 8.1.2.1-1 in TS 36.133[23]. |
| Gap offset | | 9 | As specified in 36.331 [22], Section 6.3.5 |
| PRS configuration index I_{PRS} ^{Note 2} | | Cell 1: 181, Cell 2, Cell 3: 171 | This corresponds to periodicity of 320 ms and PRS subframe offset of $I_{\text{PRS}} - 160$ DL subframes, as defined in 3GPP TS 36.211 [26], Table 6.10.4.3-1 |
| Number of consecutive downlink positioning subframes N_{PRS} ^{Note 2} | | 1 | As defined in TS 36.211 [26]. The number of subframes in a positioning occasion |
| Physical cell ID PCI ^{Note 2} | | (PCI of Cell 1 – PCI of Cell 2)mod6=0 and (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length ^{Note 2} | | Normal | |
| DRX | | ON | DRX parameters are further specified in Table 9.2.1.4.1-2 |
| prs-SubframeOffset ^{Note 2} | | 310 | Number of subframes rounded to the closest integer. The corresponding parameter in the OTDOA assistance data is prs-SubframeOffset specified in TS 36.355 [4] |
| slotNumberOffset ^{Note 2} | | 0 | The slot number offset at the transmitter between a neighbour cell and the assistance data reference cell specified in TS 36.355 [4] |
| Maximum subframe shift between the cells at the UE antenna connector ^{Note 3} | µs | 3 | Synchronous cells |
| Expected RSTD ^{Note 1} | µs | 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |

| | | | |
|--|----|--|---|
| Expected RSTD uncertainty ^{Note 1} | μs | 5 | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| Number of cells provided in OTDOA assistance data | | 16 | The list includes the reference cell (received in <i>OTDOA-ReferenceCellInfo</i> [4]) on RF channel 1 and 15 other cells on RF channel 2, all received in <i>OTDOA-ProvideAssistanceData</i> [4]. |
| PRS muting info ^{Note 2} | | Cell 1: '1111111100000000' Cell 2: '0000000011111111' Cell 3: '1111111100000000' | Corresponds to prs-MutingInfo defined in TS 36.355 [4] |
| T1 | s | 3 | The length of the time interval from the beginning of each test |
| T2 | s | 2.48 | The length of the time interval that follows immediately after time interval T1 |
| T3 | s | 2.48 | The length of the time interval that follows immediately after time interval T2 |
| <p>Note 1: Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.2.1.4.3-5 and TS 37.571-5 [20], clause 7.2.2.</p> <p>Note 2: Parameters "PRS Bandwidth", "PRS configuration index", "Number of consecutive downlink positioning subframes", "Physical cell ID PCI", "CP length", "prs-SubframeOffset", "slotNumberOffset" and "PRS muting info" are settable parameters and also parameters signalled in LPP. The values to be used for "Physical cell ID PCI" are as follows: Cell 1: 0, Cell 2: 6, Cell 3: 12. For all the values to be used in LPP see Table 9.2.1.4.3-5 and TS 37.571-5 [20], clause 7.2.2.</p> <p>Note 3: The parameter "Maximum subframe shift between the cells at the UE antenna connector" is not a settable parameter but is used to set the "true RSTD" values in step 6 of clause 9.2.1.4.1.</p> | | | |

Table 9.2.1.4.1-2: DRX parameters for E-UTRAN FDD-FDD inter-frequency RSTD measurement reporting delay under fading propagation conditions

| Field | Value | Comment |
|--------------------------|---------|---|
| onDurationTimer | psf1 | As specified in 3GPP TS 36.331 [22], clause 6.3.2 |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | sf1 | |
| longDRX-CycleStartOffset | sf320 | |
| shortDRX | Disable | |

9.2.1.4.2 Test procedure

The test consists of three consecutive time intervals, with duration of T1, T2 and T3 defined in Table 9.2.1.4.1-1. Cell 1 is active in T1, T2 and T3, whilst Cell 2 and Cell 3 are activated only in the beginning of T2. Cell 2 is active until the end of T3, and Cell 3 is active until the end of T2. The beginning of the time interval T2 shall be aligned 5 ms before the first PRS positioning subframe of a positioning occasion in the reference cell, where 5 ms is the necessary test tolerance. Cell 1 transmits PRS only in T2, Cell 2 transmits PRS only in T3, and Cell 3 transmits PRS only in T2.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.2.1.4.3 shall be provided to the UE during T1. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of T2, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.

3. Set the parameters according to Table 9.2.1.5-1. Propagation conditions are set according to clause 4.7.2.2 (ETU30).
4. T1 starts.
5. The SS shall transmit an *RRCCConnectionReconfiguration* message with the DRX configuration and the measurement gap configuration.
6. The UE shall transmit *RRCCConnectionReconfigurationComplete* message.
- 6a. The SS shall transmit an *LPP REQUEST CAPABILITIES* message.
- 6b. The UE shall transmit an *LPP PROVIDE CAPABILITIES* message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
7. The SS shall send a *LPP PROVIDE ASSISTANCE DATA* message, including the *OTDOA-ProvideAssistanceData* IE. The position of neighbour Cell 2 in the *OTDOA-NeighbourCellInfoList* is randomly selected to be in the first 7 elements of the sequence, and the position of neighbour Cell 3 is randomly selected to be in the last 8 elements of the sequence, as described in 3GPP TS 37.571-5 [20], clause 7.2.3. If the UE message at step 6b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the *LPP PROVIDE ASSISTANCE DATA* message.
8. The SS shall send a *LPP REQUEST LOCATION INFORMATION* message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of T2, where $\Delta T = 150$ ms.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 9.2.1.5-2.
10. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 9.2.1.5-2.
11. The UE shall transmit a *LPP PROVIDE LOCATION INFORMATION* message including the *OTDOA-ProvideLocationInformation* IE within the response time (see clause 4.7.3) specified in clause 9.2.1.5. The UE shall perform and report the RSTD measurements for both Cell 2 and Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 1. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for both Cell 2 and Cell 3 within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with both the *rstd* fields included within the response time then the number of failure tests is increased by one.
12. If the UE message at step 11 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
13. Repeat steps 2-12 until the confidence level according to Annex D is achieved. For each iteration, at step 7 change the random position of the Cells 2 and 3 in the *OTDOA-NeighbourCellInfoList*.

9.2.1.4.3

Message contents

Table 9.2.1.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.2.1.4.3-2: MAC-MainConfig-RBC: FDD-FDD Inter-frequency RSTD Measurement Reporting Delay

| Derivation Path: TS 36.508 [18] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | sf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf320 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |

Table 9.2.1.4.3-3: MeasGapConfig-GP1: FDD-FDD inter-frequency RSTD Measurement Reporting Delay

| Derivation Path: TS 36.508 [18] clause 4.6.6, Table 4.6.6-1A: MeasGapConfig-GP1 | | | |
|---|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP1 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | TGRP = 40 ms | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.1.4.3-3a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.2.1.4.3-5: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.1.4.3-6: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | RF channel 2 | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | RF channel 2 | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.2.1.5 Test requirement

Table 9.2.1.5-1 and 9.2.1.5-2 define the primary level settings including test tolerances for the test.

Table 9.2.1.5-1: Cell-specific test parameters for E-UTRAN FDD-FDD inter-frequency RSTD measurement reporting delay under fading propagation conditions during T1

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|------------|-----------|-----------|-----------|
| E-UTRA RF Channel Number | | 1 | N/A | N/A |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.5 FDD | N/A | N/A |
| PBCH_RA | dB | 0 | N/A | N/A |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| N_{oc} ^{Note 3} | dBm/15 kHz | -95 | N/A | N/A |
| PRS \hat{E}_s/N_{oc} | dB | -Infinity | -Infinity | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -67.22 | N/A | N/A |
| \hat{E}_s/N_{oc} | dB | -5 | -Infinity | -Infinity |
| Propagation Condition | | ETU30 | | |
| Note 1: OCNG shall be used such that the active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 4: I_o levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

Table 9.2.1.5-2: Cell-specific test parameters for E-UTRAN FDD-FDD inter-frequency RSTD measurement reporting delay under fading propagation conditions during T2 and T3

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|--|------------|----------|-----------|-----------|--------|----------|-----------|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| E-UTRA RF Channel Number | | 1 | | 2 | | 2 | N/A |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | | 1x2 Low | | 1x2 Low | |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.5 FDD | | OP.6 FDD | | OP.6 FDD | N/A |
| PBCH_RA | dB | 0 | | 0 | | 0 | N/A |
| PBCH_RB | | | | | | | |
| PSS_RA | | | | | | | |
| SSS_RA | | | | | | | |
| PCFICH_RB | | | | | | | |
| PHICH_RA | | | | | | | |
| PHICH_RB | | | | | | | |
| PDCCH_RA | | | | | | | |
| PDCCH_RB | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | |
| PRS_RA | dB | -6 | N/A | N/A | 0 | 0 | N/A |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -98 | -98 | -95 | -98 | N/A |
| $\text{PRS } \hat{E}_s/N_{oc}$ | dB | -4 | -Infinity | -Infinity | -10 | -11 | -Infinity |
| $\text{PRS } \hat{E}_s/I_{ot}$ ^{Note 4} | dB | -4 | -Infinity | -Infinity | -10 | -11 | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -69.94 | -70.22 | -70.16 | -67.15 | -70.16 | N/A |
| PRP ^{Note 4} | dBm/15 kHz | -102 | -Infinity | -Infinity | -105 | -109 | -Infinity |
| RSRP ^{Note 4} | dBm/15 kHz | -96 | -96 | -105 | -105 | -109 | -Infinity |
| \hat{E}_s/N_{oc} ^{Note 4} | dB | 2 | 2 | -7 | -10 | -11 | -Infinity |
| Propagation Condition | | ETU30 | | | | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. | | | | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test and assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | |
| Note 4: If PRS_RA is not “N/A”, \hat{E}_s/N_{oc} , $\text{PRS } \hat{E}_s/I_{ot}$, I_o , RSRP and PRP levels have been derived from other parameters and are given for information purpose. If PRS_RA is “N/A”, I_o and RSRP levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. Interference conditions shall be applied to all PRS symbols of DL positioning subframes. | | | | | | | |

The response time including test tolerance is 6.3 s. The response time is equal to the LPP responseTime IE value plus the test tolerance. The LPP responseTime IE value is derived from the RSTD reporting delay plus ΔT , where $\Delta T = 150$ ms, giving a value of 5110 ms. This is rounded up to the next allowed LPP value of 6 seconds. The RSTD measurement

reporting delay in the test is derived from the following expression, $T_{PRS}(M-1) + 160 \left\lceil \frac{n}{M} \right\rceil$, where $M=16$ and $n=16$ are the parameters specified in clause 9.2.1.3 and Table 9.2.1.3-1. This gives the total RSTD reporting delay of 4960 ms for the 15 neighbour cells including Cell 2 and Cell 3 with respect to the reference cell, Cell 1.

The test tolerances are defined in clauses C.1.3 and C4.

The rate of successful tests during repeated tests shall be at least 90% with a confidence level of 95%.

9.2.2 TDD-TDD inter-frequency RSTD measurement reporting delay

Editor's note: The value of Es/Noc for Cell 1 in Table 9.2.2.5-1 is not sufficient to maintain a reliable connection under fading conditions. This has been corrected in other similar test cases but RAN 4 has not yet corrected this in this test case.

Editor's note: The levels defined in Table 9.2.2.5-2 for Cell 2 and Cell 3 may not be sufficient to pass a compliant UE and are under discussion in RAN 4.

9.2.2.1 Test purpose

To verify that the TDD-TDD inter-frequency RSTD measurement reporting delay meets the requirements in an environment with fading propagation conditions.

9.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support inter-frequency RSTD measurements.

9.2.2.3 Minimum conformance requirements

When the physical layer cell identities of neighbour cells together with the OTDOA assistance data are provided, the UE shall be able to detect and measure inter-frequency RSTD, specified in 3GPP TS 36.214 [6], for at least $n=16$ cells, including the reference cell, within $T_{\text{RSTD InterFreqTDD, E-UTRAN}}$ ms as given below:

$$T_{\text{RSTD InterFreqTDD, E-UTRAN}} = T_{\text{PRS}} \cdot (M - 1) + \Delta \quad \text{ms},$$

where

$T_{\text{RSTD InterFreqTDD, E-UTRAN}}$ is the total time for detecting and measuring at least n cells,

T_{PRS} is the largest value of the cell-specific positioning subframe configuration period, defined in 3GPP TS 36.211 [26], among the measured n cells including the reference cell,

M is the number of PRS positioning occasions as defined in Table 9.2.2.3-1, where each PRS positioning occasion comprises of N_{PRS} ($1 \leq N_{\text{PRS}} \leq 6$) consecutive downlink positioning subframes defined in 3GPP TS 36.211 [26], and

$\Delta = 160 \cdot \left\lceil \frac{n}{M} \right\rceil$ ms is the measurement time for a single PRS positioning occasion which includes the sampling time and the processing time.

Table 9.2.2.3-1: Number of PRS positioning occasions within $T_{\text{RSTD InterFreqTDD, E-UTRAN}}$

| Positioning subframe configuration period T_{PRS} | Number of PRS positioning occasions M | |
|---|---|---------------------------------|
| | $f2$ ^{Note 1} | $f1$ and $f2$ ^{Note 2} |
| 160 ms | 16 | 32 |
| >160 ms | 8 | 16 |
| Note 1: When inter-frequency RSTD measurements are performed over the reference cell and neighbour cells, which belong to the TDD inter-frequency carrier frequency $f2$. Note 2: When inter-frequency RSTD measurements are performed over the reference cell and the neighbour cells, which belong to the serving TDD carrier frequency $f1$ and the TDD inter-frequency carrier frequency $f2$ respectively. | | |

The UE physical layer shall be capable of reporting RSTD for the reference cell and all the neighbour cells i out of at least $(n-1)$ neighbour cells within $T_{\text{RSTD InterFreqTDD, E-UTRAN}}$ provided:

$$\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_{\text{ref}} \geq -6 \text{ dB for all Frequency Bands for the reference cell,}$$

$$\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_i \geq -13 \text{ dB for all Frequency Bands for neighbour cell } i,$$

$\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_{\text{ref}}$ and $\left(\text{PRS } \hat{E}_s / \text{Iot} \right)_i$ conditions apply for all subframes of at least $L = \frac{M}{2}$ PRS positioning occasions,

PRP 1,2_{dBm} according to E.3 for a corresponding Band.

$\text{PRS } \hat{E}_s / \text{Iot}$ is as defined in Section 9.1.1.3.

The time $T_{\text{RSTD InterFreqTDD, E-UTRAN}}$ starts from the first subframe of the PRS positioning occasion closest in time after both the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the OTDOA-ProvideAssistanceData message as specified in 3GPP TS 36.355 [4], are delivered to the physical layer of the UE.

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: $2 \times \text{TTI}_{\text{DCCH}}$. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The normative reference for this requirement is TS 36.133 [23] clause 8.1.2.6.1 and A.8.13.1.

9.2.2.4 Test description

9.2.2.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 10 MHz as defined in TS 36.508 [18] clause 4.3.1.

1. Connect the SS, faders and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.4.
2. The general test parameter settings are set up according to Table 9.2.2.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 9.2.2.4.3.

5. In the test there are three synchronized cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the OTDOA assistance data reference as well as the serving cell. Cell 2 and Cell 3 are the neighbour cells. Cell 1 is on TDD RF channel 1. Cell 2 and Cell 3 are on a TDD RF channel 2. The assistance data neighbour cell list includes in total 15 cells, where 13 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between two cells as seen at the UE antenna connector) is set to 0 Ts (0 μ s) between neighbour Cell 2 and serving Cell 1; and set to 92 Ts (about 3 μ s) between neighbour Cell 3 and serving Cell 1.
7. The gap pattern configuration # 0 as defined in Table 8.1.2.1-1 in 3GPP TS 36.133 [23] is configured and does not overlap with PRS subframes of Cell 1.

Table 9.2.2.4.1-1: General test parameters for E-UTRAN TDD-TDD inter-frequency RSTD measurement reporting delay under fading propagation conditions

| Parameter | Unit | Value | Comment |
|---|------|---|--|
| Reference cell | | Cell 1 | Reference cell is the cell with respect to which the RSTD measurement is defined, as specified in 3GPP TS 36.214 [6] and 3GPP TS 36.355 [4]. The reference cell is the serving cell on RF channel 1 in this test case. |
| Neighbour cells | | Cell 2 and Cell 3 | Cells on RF channel 2. The cells appear at random places in the neighbour cell list in the OTDOA assistance data, but Cell 2 always appears in the first half of the list, whilst Cell 3 appears in the second half of the list. |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.6 TDD | As specified in TS 36.521-3 [25] clause A.2.2 |
| Channel Bandwidth (BW_{channel}) | MHz | 10 | |
| PRS Bandwidth ^{Note 2} | RB | 50 | PRS are transmitted over the system bandwidth |
| Gap pattern Id | | 0 | As specified in Table 8.1.2.1-1 in TS 36.133 [23]. |
| Gap offset | | 12 | As specified in 36.331 [22], Section 6.3.5 |
| PRS configuration index I_{PRS} ^{Note 2} | | Cell 1: 184, Cell 2, Cell 3: 174 | This corresponds to periodicity of 320 ms and PRS subframe offset of $I_{\text{PRS}} - 160$ DL subframes, as defined in 3GPP TS 36.211 [26], Table 6.10.4.3-1 |
| Number of consecutive downlink positioning subframes N_{PRS} ^{Note 2} | | 1 | As defined in TS 36.211 [26]. The number of subframes in a positioning occasion |
| Physical cell ID PCI ^{Note 2} | | (PCI of Cell 1 – PCI of Cell 2) mod 6 = 0 and (PCI of Cell 1 – PCI of Cell 3) mod 6 = 0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| TDD uplink-downlink configuration | | 1 | As specified in TS 36.211 [26], Section 4.2; corresponds to a configuration with 5 ms switch-point periodicity and two downlink consecutive subframes |
| TDD special subframe configuration | | 6 | As specified in TS 36.211 [26], Section 4.2; corresponds to DwPTS of $19760 \cdot T_s$ and UpPTS of $4384 \cdot T_s$ |
| CP length ^{Note 2} | | Normal | |
| DRX | | ON | DRX parameters are further specified in Table 9.2.2.4.1-2 |
| prs-SubframeOffset ^{Note 2} | | 310 | Number of subframes rounded to the closest integer. The corresponding parameter in the OTDOA assistance data is prs-SubframeOffset specified in TS 36.355 [4] |
| slotNumberOffset ^{Note 2} | | 0 | The slot number offset at the transmitter between a neighbour cell and the assistance data reference cell specified in TS 36.355 [4] |
| Maximum subframe shift between the cells at the UE antenna connector ^{Note 3} | μs | 3 | Synchronous cells |

| | | | |
|--|---------|--|---|
| Expected RSTD ^{Note 1} | μ s | 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| Expected RSTD uncertainty ^{Note 1} | μ s | 5 | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| Number of cells provided in OTDOA assistance data | | 16 | The list includes the reference cell (received in <i>OTDOA-ReferenceCellInfo</i> [4]) on RF channel 1 and 15 other cells on RF channel 2, all received in <i>OTDOA-ProvideAssistanceData</i> [4]. |
| PRS muting info ^{Note 2} | | Cell 1: '1111111100000000' Cell 2: '0000000011111111' Cell 3: '1111111100000000' | Corresponds to prs-MutingInfo defined in TS 36.355 [4] |
| T1 | s | 3 | The length of the time interval from the beginning of each test |
| T2 | s | 2.48 | The length of the time interval that follows immediately after time interval T1 |
| T3 | s | 2.48 | The length of the time interval that follows immediately after time interval T2 |
| <p>Note 1: Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.2.2.4.3-5 and TS 37.571-5 [20], clause 7.2.2.</p> <p>Note 2: Parameters "PRS Bandwidth", "PRS configuration index", "Number of consecutive downlink positioning subframes", "Physical cell ID PCI", "CP length", "prs-SubframeOffset", "slotNumberOffset" and "PRS muting info" are settable parameters and also parameters signalled in LPP. The values to be used for "Physical cell ID PCI" are as follows: Cell 1: 0, Cell 2: 6, Cell 3: 12. For all the values to be used in LPP see Table 9.2.2.4.3-5 and TS 37.571-5 [20], clause 7.2.2.</p> <p>Note 3: The parameter "Maximum subframe shift between the cells at the UE antenna connector" is not a settable parameter but is used to set the "true RSTD" values in step 6 of clause 9.2.2.4.1.</p> | | | |

Table 9.2.2.4.1-2: DRX parameters for E-UTRAN TDD-TDD inter-frequency RSTD measurement reporting delay under fading propagation conditions

| Field | Value | Comment |
|--------------------------|---------|---|
| onDurationTimer | psf1 | As specified in 3GPP TS 36.331 [22], clause 6.3.2 |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | sf1 | |
| longDRX-CycleStartOffset | sf320 | |
| shortDRX | Disable | |

9.2.2.4.2 Test procedure

The test consists of three consecutive time intervals, with duration of T1, T2 and T3 defined in Table 9.2.2.4.1-1. Cell 1 is active in T1, T2 and T3, whilst Cell 2 and Cell 3 are activated only in the beginning of T2. Cell 2 is active until the end of T3, and Cell 3 is active until the end of T2. The beginning of the time interval T2 shall be aligned 5 ms before the first PRS positioning subframe of a positioning occasion in the reference cell, where 5 ms is the necessary test tolerance. Cell 1 transmits PRS only in T2, Cell 2 transmits PRS only in T3, and Cell 3 transmits PRS only in T2.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.2.2.4.3 shall be provided to the UE during T1. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of T2, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.2.2.5-1. Propagation conditions are set according to clause 4.7.2.2 (ETU30).
4. T1 starts.
5. The SS shall transmit an RRCConnectionReconfiguration message with the DRX configuration and the measurement gap configuration.
6. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 6a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 6b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
7. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. The position of neighbour Cell 2 in the *OTDOA-NeighbourCellInfoList* is randomly selected to be in the first 7 elements of the sequence, and the position of neighbour Cell 3 is randomly selected to be in the last 8 elements of the sequence, as described in 3GPP TS 37.571-5 [20], clause 7.2.3. If the UE message at step 6b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
8. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of T2, where $\Delta T = 150$ ms.
9. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 9.2.2.5-2.
10. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 9.2.2.5-2.
11. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message including the *OTDOA-ProvideLocationInformation* IE within the response time (see clause 4.7.3) specified in clause 9.2.2.5. The UE shall perform and report the RSTD measurements for both Cell 2 and Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 1. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for both Cell 2 and Cell 3 within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with both the *rstd* fields included within the response time then the number of failure tests is increased by one.
12. If the UE message at step 11 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
13. Repeat steps 2-12 until the confidence level according to Annex D is achieved. For each iteration, at step 7 change the random position of the Cells 2 and 3 in the *OTDOA-NeighbourCellInfoList*.

9.2.2.4.3

Message contents

Table 9.2.2.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.2.2.4.3-2: MAC-MainConfig-RBC: TDD-TDD Inter-frequency RSTD Measurement Reporting Delay

| Derivation Path: TS 36.508 [18] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | sf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf320 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |

Table 9.2.2.4.3-3: MeasGapConfig-GP1: TDD-TDD inter-frequency RSTD Measurement Reporting Delay

| Derivation Path: TS 36.508 [18] clause 4.6.6, Table 4.6.6-1A: MeasGapConfig-GP1 | | | |
|---|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP1 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 12 | TGRP = 40 ms | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.2.4.3-3a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.2.2.4.3-5: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.2.4.3-6: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | RF channel 2 | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbor | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | RF channel 2 | | |
| rstd | Present | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9.2.2.5 Test requirement

Table 9.2.2.5-1 and 9.2.2.5-2 define the primary level settings including test tolerances for the test.

Table 9.2.2.5-1: Cell-specific test parameters for E-UTRAN TDD-TDD inter-frequency RSTD measurement reporting delay under fading propagation conditions during T1

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|----------------|-----------|-----------|-----------|
| E-UTRA RF Channel Number | | 1 | N/A | N/A |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.1 TDD | N/A | N/A |
| PBCH_RA | dB | 0 | N/A | N/A |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| N_{oc} ^{Note 3} | dBm/ 15 kHz | -95 | N/A | N/A |
| $PRS \hat{E}_s / N_{oc}$ | dB | -Infinity | -Infinity | -Infinity |
| I_o ^{Note 4} | dBm/ 9 MHz | -67.22 | N/A | N/A |
| \hat{E}_s / N_{oc} | dB | -5 | -Infinity | -Infinity |
| Propagation Condition | | ETU30 | | |
| Note 1: OCNG shall be used such that the active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 4: I_o levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

Table 9.2.2.5-2: Cell-specific test parameters for E-UTRAN TDD-TDD inter-frequency RSTD measurement reporting delay under fading propagation conditions during T2 and T3

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|---|------------|----------|-----------|-----------|--------|----------|-----------|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| E-UTRA RF Channel Number | | 1 | | 2 | | 2 | N/A |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | | 1x2 Low | | 1x2 Low | |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.1 TDD | | OP.2 TDD | | OP.2 TDD | N/A |
| PBCH_RA | dB | 0 | | 0 | | 0 | N/A |
| PBCH_RB | | | | | | | |
| PSS_RA | | | | | | | |
| SSS_RA | | | | | | | |
| PCFICH_RB | | | | | | | |
| PHICH_RA | | | | | | | |
| PHICH_RB | | | | | | | |
| PDCCH_RA | | | | | | | |
| PDCCH_RB | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | |
| PRS_RA | dB | -6 | N/A | N/A | 0 | 0 | N/A |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -98 | -98 | -95 | -98 | N/A |
| $\text{PRS } \hat{E}_s/N_{oc}$ | dB | -4 | -Infinity | -Infinity | -10 | -11 | -Infinity |
| $\text{PRS } \hat{E}_s/I_{ot}$ ^{Note 4} | dB | -4 | -Infinity | -Infinity | -10 | -11 | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -69.94 | -70.22 | -70.16 | -67.15 | -70.16 | N/A |
| PRP ^{Note 4} | dBm/15 kHz | -102 | -Infinity | -Infinity | -105 | -109 | -Infinity |
| RSRP ^{Note 4} | dBm/15 kHz | -96 | -96 | -105 | -105 | -109 | -Infinity |
| \hat{E}_s/N_{oc} ^{Note 4} | dB | 2 | 2 | -7 | -10 | -11 | -Infinity |
| Propagation Condition | | ETU30 | | | | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. | | | | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | |
| Note 4: If PRS_RA is not “N/A”, \hat{E}_s/N_{oc} , $\text{PRS } \hat{E}_s/I_{ot}$, I_o , RSRP and PRP levels have been derived from other parameters and are given for information purpose. If PRS_RA is “N/A”, I_o and RSRP levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. Interference conditions shall be applied to all PRS symbols of DL positioning subframes | | | | | | | |

The response time including test tolerance is 6.3 s. The response time is equal to the LPP responseTime IE value plus the test tolerance. The LPP responseTime IE value is derived from the RSTD reporting delay plus ΔT , where $\Delta T = 150$ ms, giving a value of 5110 ms. This is rounded up to the next allowed LPP value of 6 seconds. The RSTD measurement

reporting delay in the test is derived from the following expression, $T_{PRS}(M-1)+160\left\lceil \frac{n}{M} \right\rceil$, where $M=16$ and

$n=16$ are the parameters specified in clause 9.2.2.3 and Table 9.2.2.3-1. This gives the total RSTD reporting delay of 4960 ms for the 15 neighbour cells including Cell 2 and Cell 3 with respect to the reference cell, Cell 1.

The test tolerances are defined in clauses C.1.3 and C4.

The rate of successful tests during repeated tests shall be at least 90% with a confidence level of 95%.

9.2.3 Void

9.2.4 FDD-FDD inter-frequency RSTD Accuracy

9.2.4.1 Test purpose

To verify that the Reference Signal Time Difference (RSTD) FDD-FDD inter-frequency measurement accuracy is within the specified limit for all bands in AWGN channels.

9.2.4.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that support inter-frequency RSTD measurements.

9.2.4.3 Minimum conformance requirements

The accuracy of FDD-FDD inter-frequency RSTD measurement shall meet the requirement defined in the Table 9.2.4.3-1 without DRX as well as for all the DRX cycles specified in TS 36.331 [22].

The accuracy requirements in Table 9.2.4.3-1 are valid under the following conditions:

Conditions defined in TS 36.101 [2] Section 7.3 for reference sensitivity are fulfilled.

PRP 1,2_{dBm} according to clause E.3 for a corresponding Band.

There are no measurement gaps overlapping with the PRS subframes in cells belonging to the serving carrier frequency.

The parameter expectedRSTDUncertainty signalled over LPP by E-SMLC as defined in TS 36.355 [4] is less than 5 μ s.

Table 9.2.4.3-1: RSTD measurement accuracy

| Accuracy | Conditions | | | | | |
|--|--|--|--|---|----------------------------------|--|
| | PRS \hat{E}_s/lot | Minimum PRS bandwidth which is minimum of serving cell channel bandwidth and the PRS bandwidths of the reference cell and the measured neighbour cell i <small>Note 9</small> | Minimum number of available measurement subframes among the reference cell and the measured neighbour cell i | Io <small>Note 8</small> range | | |
| | | | | E-UTRA operating band groups <small>Note 10</small> | Minimum Io <small>Note 1</small> | Maximum Io |
| T_s <small>Note 2</small> | dB | RB | | | dBm/15kHz <small>Note 7</small> | dBm/BW _{Chan} <small>nel</small> |
| ± 21 | (PRS \hat{E}_s/lot) _{ref} ≥ -6 dB and (PRS \hat{E}_s/lot) _i ≥ -13 dB | ≥ 6 | 4 | FDD_A, TDD_A | -121 | -50 |
| | | | | FDD_C, TDD_C | -120 | -50 |
| | | | | FDD_D | -119.5 | -50 |
| | | | | FDD_E, TDD_E | -119 | -50 |
| | | | | FDD_F | -118.5 | -50 |
| | | | | FDD_G | -118 | -50 |
| | | | | FDD_H | -117.5 | -50 |
| ± 10 | (PRS \hat{E}_s/lot) _{ref} ≥ -6 dB and (PRS \hat{E}_s/lot) _i ≥ -13 dB | ≥ 25 | ≥ 2 | Note 5 | Note 5 | Note 5 |
| | | | | | | |
| ± 9 | (PRS \hat{E}_s/lot) _{ref} ≥ -6 dB and (PRS \hat{E}_s/lot) _i ≥ -13 dB | ≥ 50 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| <p>NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.</p> <p>NOTE 2: T_s is the basic timing unit defined in TS 36.211 [16].</p> <p>NOTE 3: PRS bandwidth is as indicated in <i>prs-Bandwidth</i> in the OTDOA assistance data defined in [24].</p> <p>NOTE 4: Void.</p> <p>NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 6 RB.</p> <p>NOTE 6: Void.</p> <p>NOTE 7: The condition level is increased by $\Delta > 0$, when applicable, as described in TS 36.133 [23] Annexes B.4.2 and B.4.3.</p> <p>NOTE 8: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.</p> <p>NOTE 9: If a CA capable UE is configured with SCell, the serving cell channel bandwidth is the minimum of the serving cell channel bandwidths in the component carriers involved in the RSTD measurement. If one of the serving cells is not involved in this RSTD measurement for CA, the channel bandwidth of that serving cell is not included in the determination of the minimum PRS bandwidth.</p> <p>NOTE 10: E-UTRA operating band groups are as defined in clause 4.4.2.</p> | | | | | | |

The normative reference for this requirement is TS 36.133 [23] clause 9.1.10.2 and A.9.8.3.

9.2.4.4 Test description

9.2.4.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 1.4 MHz (Test 1) and 10 MHz (Test 2). In the case that 1.4MHz channel bandwidth is not defined for the operating band under test, as defined in TS 36.101 [2] clause 5.6.1, then this part of the test shall be omitted.

1. Connect the SS and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.3.
2. The general test parameter settings are set up according to Table 9.2.4.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 9.2.4.4.3.
5. Two cells are on the different carrier frequencies. Cell 1 is the serving cell and OTDOA assistance data reference cell; Cell 2 is the neighbour cell. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 [20], clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between the two cells as seen at the UE antenna connector) is set to 92 Ts (about 3 μ s) between neighbour cell 2 and serving cell 1.

Note that the related expectedRSTD values to be signalled over LPP are defined in Table 9.2.4.4-1.

7. The gap pattern configuration # 0 as defined in Table 8.1.2.1-1 in 3GPP TS 36.133 [23] is configured and does not overlap with PRS subframes of Cell 1.

Table 9.2.4.4.1-1: General Test Parameters for inter-frequency RSTD Tests for E-UTRAN FDD

| Parameter | Unit | Value | | Comment |
|--|------|--------------------------------------|-------------------------|---|
| | | Test1 | Test2 | |
| PCFICH/PDCCH/PHICH parameters | | R.8 FDD | R.6 FDD | As specified in TS 36.521-3 [25] clause A.2.1 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.1 | | OP.7 FDD | OP.6 FDD | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Reference cell | | Cell 1 | | Cell 1 on RF channel number 1 |
| Neighbour cell | | Cell 2 | | Cell 2 on RF channel number 2 |
| E-UTRA RF Channel Number | | 1,2 | | Two FDD carrier frequencies are used. |
| Channel Bandwidth (BW _{channel}) | MHz | 1.4 | 10 | |
| GapOffset | | 18 | 11 | For Cell 1 |
| Gap Pattern ID | | 0 | 0 | For Cell 1 |
| PRS Bandwidth | RB | 6 | 50 | |
| PRS configuration Index <i>I</i> _{PRS} Note 2 | | Cell 1: 12 Cell 2: 19 | Cell 1: 2 Cell 2: 12 | As defined in 3GPP TS 36.211 [26] |
| PRS subframe offset | | 7 | 10 | For Cell 2 |
| Number of consecutive positioning downlink subframes <i>N</i> _{PRS} Note 2 | | 6 | 1 | As defined in 3GPP TS 36.211 [26] |
| prs-MutingInfo Note 2 | | Cell1:‘11110000’ Cell2:‘11110000’ | | See section 6.5.1.2 in 3GPP TS 36.355 [4] for more information |
| Cell ID Note 2 | | Cell 1: 0 Cell 2: 1 | | |
| expectedRSTD Note 1 | μs | 3 | 3 | |
| expectedRSTDUncertainty 1 | μs | 5 | | |
| CP length Note 2 | | Normal | | |
| DRX | | OFF | | |
| Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time) 3 | μs | 3 | | Synchronous cells |
| Number of cells provided in OTDOA assistance data | | 16 | | The list includes the reference cell (received in <i>OTDOA-ReferenceCellInfo</i> [4]) on RF channel 1 and 15 other cells on RF channel 2, all received in <i>OTDOA-ProvideAssistanceData</i> [4]. |
| <i>T</i> _{RSTD InterFreqFDD, E-UTRAN} Note 4 | ms | 5120 | | Derived according to the RSTD measurement requirements specified in Section 8.1.2.6.1 in TS 36.133 [23]. |
| NOTE 1: Parameters “Expected RSTD” and “Expected RSTD uncertainty” in Table 9.2.4.4.1-1 are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.2.4.4.3-4 and TS 37.571-5 [20], clause 7.2.2. | | | | |
| NOTE 2: Parameters “PRS Bandwidth”, “PRS configuration index”, “Number of consecutive positioning downlink subframes”, “prs-MutingInfo”, “Cell ID” and “CP length” in Table 9.2.4.4.1-1 are settable parameters and also parameters signalled in LPP. For all the values to be used in LPP see Table 9.2.4.4.3-4 and TS 37.571-5 [20], clause 7.2.2. | | | | |
| NOTE 3: The parameter “Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time)” is not a settable parameter but is used to set the “true RSTD” values in step 6 of clause 9.2.4.4.1. | | | | |
| NOTE 4: The parameter “ <i>T</i> _{RSTD InterFreqFDD, E-UTRAN} ” is not a settable parameter but is used to set the LPP “responseTime” value in Table 9.2.4.4.3-3. The value of the LPP responseTime IE is set to <i>T</i> _{RSTD InterFreqFDD, E-UTRAN} + Δ <i>T</i> ms, where Δ <i>T</i> = 150 ms, giving a value of 5270 ms. This is rounded up to the next allowed LPP value of 6 seconds. | | | | |

9.2.4.4.2 Test procedure

The test consists of a set-up period and a measurement period. Cell 1 and Cell 2 are both active during the complete test. The beginning of the measurement period shall be aligned with the first PRS positioning subframe of a positioning occasion in the reference cell.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.2.4.4.3 shall be provided to the UE during the set-up period. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of the measurement period, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the UE.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.2.4.5-1 as appropriate. Propagation conditions are set according to clause 4.7.2.1.
4. The SS shall transmit an RRCConnectionReconfiguration message with the measurement gap configuration.
5. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 5a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 5b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
6. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. If the UE message at step 5b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
7. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of measurement period, where $\Delta T = 150$ ms.
8. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message, including the *OTDOA-ProvideLocationInformation* IE.
9. If the UE message at step 8 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
10. The SS shall check the *rstd* value for Cell 2 in the *OTDOA-SignalMeasurementInformation* IE according to Table 9.2.4.5-2.
11. Repeat step 2-10 until the confidence level according to Annex D is achieved.
12. Repeat step 1-11 for each sub-test in Table 9.2.4.5-1 as appropriate.

9.2.4.4.3 Message contents

Table 9.2.4.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.2.4.4.3-2: MeasGapConfig-GP1: FDD-FDD inter-frequency RSTD Accuracy

| Derivation Path: TS 36.508 [18] clause 4.6.6, Table 4.6.6-1A: MeasGapConfig-GP1 | | | |
|---|----------------------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP1 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 14 (Test 1) 11 (Test 2) | TGRP = 40 ms | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.4.4.3-2a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.2.4.4.3-4: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.4.4.3-5: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(1)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | RF channel 2 | | |
| Rstd | Set according to Table 9.2.4.5-2 for each specific test | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.4.4.3-6: CQI-ReportConfig-DEFAULT: FDD-FDD inter-frequency RSTD Accuracy

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|--|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | This IE should be omitted for Test 1 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| release | NULL | | |
| } | | | |

9.2.4.5 Test requirement

Table 9.2.4.5-1 defines the primary level settings including test tolerances for all tests.

RSTD FDD-FDD inter-frequency accuracy test shall meet the reported values in Table 9.2.4.5-2.

Table 9.2.4.5-1: Cell Specific Test Parameters for inter-frequency RSTD Tests for E-UTRAN FDD

| Parameter | Unit | Test 1 | | Test 2 | |
|---|--------------|--------|--------|--------|--------|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| E-UTRA RF Channel Number | | 1 | 2 | 1 | 2 |
| PBCH_RA | dB | 0 | 0 | 0 | 0 |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| OCNG_RA ^{Note 1} | | | | | |
| OCNG_RB ^{Note 1} | | | | | |
| PRS_RA | dB | -2.7 | 0.3 | -2.7 | 0.3 |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | | | |
| PRS \hat{E}_s/N_{oc} | dB | -5.7 | -12.7 | -5.7 | -12.7 |
| PRS \hat{E}_s/I_{ot} ^{Note 3} | dB | -5.7 | -12.7 | -5.7 | -12.7 |
| I_o ^{Note 3} | dBm/1.08 MHz | -79.24 | -79.39 | N/A | N/A |
| | dBm/9 MHz | N/A | N/A | -70.03 | -70.18 |
| PRP ^{Note 3} | dBm/15kHz | -103.7 | -110.7 | -103.7 | -110.7 |
| \hat{E}_s/N_{oc} ^{Note 3} | dB | -3 | -13 | -3 | -13 |
| RSRP ^{Note 3} | dBm/15kHz | -101 | -111 | -101 | -111 |
| Propagation condition | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | |
| Note 3: \hat{E}_s/N_{oc} , PRS \hat{E}_s/I_{ot} , RSRP, I_o and PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. I_o values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS | | | | | |

Table 9.2.4.5-2: RSTD FDD inter-frequency accuracy requirements for the reported values

| | Test 1 | Test 2 |
|------------------------|-----------|-----------|
| Lowest reported value | RSTD_6424 | RSTD_6436 |
| Highest reported value | RSTD_6470 | RSTD_6458 |

For the overall test to pass, the ratio of successful reported values in each sub-test shall be more than 90% with a confidence level of 95%. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test then Test 1 shall be omitted.

9.2.5 TDD-TDD inter-frequency RSTD Accuracy

9.2.5.1 Test purpose

To verify that the Reference Signal Time Difference (RSTD) of TDD-TDD inter-frequency measurement accuracy is within the specified limit for all bands in AWGN channels

9.2.5.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that support inter-frequency RSTD measurements.

9.2.5.3 Minimum conformance requirements

This RSTD measurement is used for UE positioning purposes.

The accuracy of TDD-TDD inter-frequency RSTD measurement shall meet the requirement defined in the Table 9.2.4.3-1 without DRX as well as for all the DRX cycles specified in TS 36.331 [22].

The accuracy requirements in Table 9.2.4.3-1 are valid under the following conditions:

Conditions defined in TS 36.101 [2] Section 7.3 for reference sensitivity are fulfilled.

PRP 1,2_{dBm} according to clause E.3 for a corresponding Band

There are no measurement gaps overlapping with the PRS subframes in cells belonging to the serving carrier frequency.

The parameter expectedRSTDUncertainty signalled over LPP by E-SMLC as defined in TS 36.355 [4] is less than 5 μ s.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.10.2 and A.9.8.4.

9.2.5.4 Test description

9.2.5.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.2.

Channel bandwidth to be tested: 1.4 MHz (Test 1) and 10 MHz (Test 2). In the case that 1.4MHz channel bandwidth is not defined for the operating band under test, as defined in TS 36.101 [2] clause 5.6.1, then this part of the test shall be omitted.

1. Connect the SS and AWGN noise sources to the UE antenna connector or antenna connectors as shown in Annex A, Figure A.3.
2. The general test parameter settings are set up according to Table 9.2.5.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.

4. Message contents are defined in clause 9.2.5.4.3.
5. Two cells are on the different carrier frequencies. Cell 1 is the serving cell and OTDOA assistance data reference cell; Cell 2 is the neighbour cell. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 [20], clause 7.2.2).
6. The true RSTD (which is the receive time difference for frame 0 between the two cells as seen at the UE antenna connector) is set to 92 Ts (about 3 μ s) between neighbour cell 2 and serving cell 1.

Note that the related expectedRSTD values to be signalled over LPP are defined in Table 9.2.5.4-1.

7. The gap pattern configuration # 0 as defined in Table 8.1.2.1-1 in 3GPP TS 36.133 [23] is configured and does not overlap with PRS subframes of Cell 1.

Table 9.2.5.4.1-1: General Test Parameters for inter-frequency RSTD Tests for E-UTRAN TDD-TDD

| Parameter | Unit | Value | | Comment |
|--|------|--|-------------------------|---|
| | | Test 1 | Test 2 | |
| PCFICH/PDCCH/PHICH parameters | | R.8 TDD | R.6 TDD | As specified in TS 36.521-3 [25] clause A.2.2 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.2 | | OP.4 TDD | OP.2 TDD | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Reference cell | | Cell 1 | | Cell 1 on RF channel number 1 |
| Neighbour cell | | Cell 2 | | Cell 2 on RF channel number 2 |
| E-UTRA RF Channel Number | | 1,2 | | Two TDD carrier frequencies are used. |
| Channel Bandwidth (BW_{channel}) | MHz | 1.4 | 10 | |
| PRS Bandwidth ^{Note 2} | RB | 6 | 50 | |
| GapOffset | | 34 | 13 | For Cell 1 |
| Gap Pattern ID | | 0 | | For Cell 1 |
| Special subframe configuration | | 6 | | As specified in table 4.2-1 in TS 36.211 [26]. The same configuration in both cells. |
| Uplink-downlink configuration | | 3 | 1 | As specified in table 4.2-2 in TS 36.211 [26] and table 9.1.2.3-2. The same configuration in both cells. |
| PRS configuration Index I_{PRS} ^{Note 2} | | Cell 1: 15 Cell 2: 35 | Cell 1: 4 Cell 2: 14 | As defined in 3GPP TS 36.211 [26] |
| PRS subframe offset | | 20 | 10 | For Cell 2 |
| Number of consecutive positioning downlink subframes N_{PRS} ^{Note 2} | | 6 | 1 | As defined in 3GPP TS 36.211 [26] |
| prs-MutingInfo ^{Note 2} | | Cell 1: '11110000' Cell 2: '11110000' | | See section 6.5.1.2 in 3GPP TS 36.355 [4] for more information |
| Cell ID ^{Note 2} | | Cell 1: 0 Cell 2: 1 | | |
| expectedRSTD ^{Note 1} | μs | 3 | 3 | |
| expectedRSTDUncertainty ^{Note 1} | μs | 5 | | |
| CP length ^{Note 2} | | Normal | | |
| DRX | | OFF | | |
| Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time) ^{Note 3} | μs | 3 | | Synchronous cells |
| Number of cells provided in OTDOA assistance data | | 16 | | The list includes the reference cell (received in <i>OTDOA-ReferenceCellInfo</i> [4]) on RF channel 1 and 15 other cells on RF channel 2, all received in <i>OTDOA-ProvideAssistanceData</i> [4]. |
| $T_{\text{RSTD InterFreqTDD, E-UTRAN}}$ ^{Note 4} | ms | 5120 | | Derived according to the RSTD measurement requirements specified in Section 8.1.2.6.1 in TS 36.133 [23]. |
| NOTE 1: Parameters “expected RSTD” and “expected RSTDUncertainty” are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 9.2.5.4.3-4 and TS 37.571-5 [20], clause 7.2.2. | | | | |
| NOTE 2: Parameters “PRS Bandwidth”, “PRS configuration index”, “Number of consecutive positioning downlink subframes”, “prs-MutingInfo”, “Cell ID” and “CP length” are settable parameters and also parameters signalled in LPP. For all the values to be used in LPP see Table 9.2.5.4.3-4 and TS 37.571-5 [20], clause 7.2.2. | | | | |
| NOTE 3: The parameter “Radio frame transmit time difference between cells (cell 2 TX time – cell 1 TX time)” is not a settable parameter but is used to set the “true RSTD” values in step 6 of clause 9.2.5.4.1. | | | | |
| NOTE 4: The parameter “ $T_{\text{RSTD InterFreqTDD, E-UTRAN}}$ ” is not a settable parameter but is used to set the LPP “responseTime” value in Table 9.2.5.4.3-3. The value of the LPP responseTime IE is set to $T_{\text{RSTD InterFreqTDD, E-UTRAN}} + \Delta T$ ms, where $\Delta T = 150$ ms, giving a value of 5270 ms. This is rounded up to the next allowed LPP value of 6 seconds. | | | | |

9.2.5.4.2 Test procedure

The test consists of a set-up period and a measurement period. Cell 1 and Cell 2 are both active during the complete test. The beginning of the measurement period shall be aligned with the first PRS positioning subframe of a positioning occasion in the reference cell.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 9.2.5.4.3 shall be provided to the UE during the set-up period. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of the measurement period, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the UE.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
3. Set the parameters according to Table 9.2.5.5-1 as appropriate. Propagation conditions are set according to clause 4.7.2.1.
4. The SS shall transmit an RRCConnectionReconfiguration message with the measurement gap configuration.
5. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 5a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 5b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
6. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. If the UE message at step 5b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
7. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of measurement period, where $\Delta T = 150$ ms.
8. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message, including the *OTDOA-ProvideLocationInformation* IE.
9. If the UE message at step 8 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
10. The SS shall check the *rstd* value for Cell 2 in the *OTDOA-SignalMeasurementInformation* IE according to Table 9.2.5.5-2.
11. Repeat step 2-10 until the confidence level according to Annex D is achieved.
12. Repeat step 1-11 for each sub-test in Table 9.2.5.5-1 as appropriate.

9.2.5.4.3 Message contents

Table 9.2.5.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 9.2.5.4.3-2: MeasGapConfig-GP1: TDD-TDD inter-frequency RSTD Accuracy

| Derivation Path: TS 36.508 [18] clause 4.6.6, Table 4.6.6-1A: MeasGapConfig-GP1 | | | |
|---|----------------------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP1 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 15 (Test 1) 14 (Test 2) | TGRP = 40 ms | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.5.4.3-2a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 9.2.5.4.3-4: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.2.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.5.4.3-5: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 1 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(1)) { | | | |
| physCellIdNeighbor | Cell 2 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | RF channel 2 | | |
| rstd | Set according to Table 9.2.5.5-2 for each specific test | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.2.5.4.3-6: CQI-ReportConfig-DEFAULT: TDD-TDD inter-frequency RSTD Accuracy

| Derivation Path: TS 36.508 [18] clause 4.6.3, Table 4.6.3-2 CQI-ReportConfig-DEFAULT | | | |
|--|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CQI-ReportConfig-DEFAULT ::= SEQUENCE { | | | |
| cqi-ReportModeAperiodic | rm30 | This IE should be omitted for Test 1 | |
| nomPDSCH-RS-EPRE-Offset | 0 | | |
| cqi-ReportPeriodic CHOICE { | | | |
| release | NULL | | |
| } | | | |

9.2.5.5 Test requirement

Table 9.2.5.5-1 defines the primary level settings including test tolerances for all tests.

The RSTD TDD-TDD inter frequency measurement accuracy test shall meet the reported values in Table 9.2.5.5-2.

Table 9.2.5.5-1: Cell Specific Test Parameters for inter frequency RSTD Tests for E-UTRAN TDD-TDD

| Parameter | Unit | Test 1 | | Test 2 | |
|---|--------------|--------|--------|--------|--------|
| | | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| E-UTRA RF Channel Number | | 1 | 2 | 1 | 2 |
| PBCH_RA | dB | 0 | | | |
| PBCH_RB | | | | | |
| PSS_RA | | | | | |
| SSS_RA | | | | | |
| PCFICH_RB | | | | | |
| PHICH_RA | | | | | |
| PHICH_RB | | | | | |
| PDCCH_RA | | | | | |
| PDCCH_RB | | | | | |
| OCNG_RA ^{Note 1} | | | | | |
| OCNG_RB ^{Note 1} | | | | | |
| PRS_RA | dB | -2.7 | 0.3 | -2.7 | 0.3 |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | | | |
| PRS \hat{E}_s/N_{oc} | dB | -5.7 | -12.7 | -5.7 | -12.7 |
| PRS \hat{E}_s/I_{ot} ^{Note 3} | dB | -5.7 | -12.7 | -5.7 | -12.7 |
| I_o ^{Note 3} | dBm/1.08 MHz | -79.24 | -79.39 | N/A | N/A |
| | dBm/9 MHz | N/A | N/A | -70.03 | -70.18 |
| PRP ^{Note 3} | dBm/15kHz | -103.7 | -110.7 | -103.7 | -110.7 |
| \hat{E}_s/N_{oc} ^{Note 3} | dB | -3 | -13 | -3 | -13 |
| RSRP ^{Note 3} | dBm/15kHz | -101 | -111 | -101 | -111 |
| Propagation condition | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). | | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | |
| Note 3: \hat{E}_s/N_{oc} , PRS \hat{E}_s/I_{ot} , I_o , RSRP and PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. I_o values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS. | | | | | |

Table 9.2.5.5-2: RSTD TDD inter-frequency accuracy requirements for the reported values

| | Test 1 | Test 2 |
|------------------------|-----------|-----------|
| Lowest reported value | RSTD_6424 | RSTD_6436 |
| Highest reported value | RSTD_6470 | RSTD_6458 |

For the overall test to pass, the ratio of successful reported values in each sub-test shall be more than 90% with a confidence level of 95%. In the case that 1.4MHz channel bandwidth is not defined for the operating band under test then Test 1 shall be omitted.

10 E-UTRA OTDOA measurement requirements for Carrier Aggregation

10.1 FDD RSTD Measurement Reporting Delay for Carrier Aggregation

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test system uncertainties applicable to this test are undefined.
- The Test tolerances applicable to this test are undefined.
- The test case design is such that the nominal Cell 2 PRS Es/Iot is specified at 4 dB below the requirement specified in TS36.133 which implies that a requirement change is needed prior to the completion of the test.
- The levels defined in Table 10.1.5-2 for Cell 2 and Cell 3 may not be sufficient to pass a compliant UE and are under discussion in RAN 4.

10.1.1 Test purpose

To verify that the RSTD measurement reporting delay meets the requirements in an environment with fading propagation conditions. This test case verifies the measurement period requirements for RSTD measurements performed on the secondary component carrier and also the measurement period requirements for RSTD measurements performed on both the primary and secondary component carriers.

10.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.1.3 Minimum conformance requirements

10.1.3.1 Measurements on the secondary component carrier

The RSTD measurements when all cells are on the configured secondary component carrier shall meet all applicable requirements (FDD) specified in TS 36.133 [23] section 8.1.2.5, i.e., E-UTRAN intra-frequency RSTD measurement period applies, regardless of whether the SCell on the corresponding frequency is activated or deactivated by the MAC-CE commands as specified in 3GPP TS 36.321 [34].

10.1.3.2 Measurements on both primary component carrier and secondary component carrier

The RSTD measurements of cells on both primary component carrier and configured secondary component carrier shall meet all applicable requirements (FDD) specified in TS 36.133 [23] section 8.1.2.6, i.e., E-UTRAN inter-frequency RSTD measurement period applies regardless of whether the SCell on the corresponding frequency is activated or deactivated by the MAC-CE commands as specified in 3GPP TS 36.321 [34], with the following exception

- the number of PRS positioning occasions is as specified in Table 10.1.3.2-1 shall apply.

Table 10.1.3.2-1: Number of PRS positioning occasions within measurement period

| Positioning subframe configuration period T_{PRS} | Number of PRS positioning occasions M |
|--|---|
| 160 ms | 32 |
| >160 ms | 16 |

The normative reference for this requirement is TS 36.133 [23] clause 8.4.3, 8.4.4 and A.8.17.1.

10.1.4 Test description

10.1.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 10 MHz as defined in TS 36.508 [18] clause 4.3.1.

1. Connect the SS, faders and AWGN noise sources to the UE antenna connector or antenna connectors as shown in TS 36.508 [18] Annex A, Figure group A.42 as appropriate.
2. The general test parameter settings are set up according to Table 10.1.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 10.1.4.3.
5. In the tests, there are two configured component carriers: PCC and SCC, and three synchronized cells: Cell 1, Cell 2 and Cell 3. Cell 1 is PCell on the PCC, Cell 2 is an active SCell on the SCC, and Cell 3 is a neighbour cell on the SCC. In both tests, Cell 2 is the OTDOA assistance data reference cell. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.3.2) for Test 1 and where 13 of the cells are not simulated for Test 2. PCell (Cell 1) is the cell used for connection setup with the power level and mapping set according to TS 36.521-1 [24] Annex C.0 and C.1 as appropriate for this test. Cell 2 and Cell 3 are powered OFF.
6. The true RSTD (which is the receive time difference for frame 0 between two cells as seen at the UE antenna connector) is set to 0 Ts (0 μ s) between Cell 1 and OTDOA assistance data reference cell, Cell 2; and set to 92 Ts (about 3 μ s) between neighbour Cell 3 and OTDOA assistance data reference cell, Cell 2.

Table 10.1.4.1-1: General test parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions for Carrier Aggregation

| Parameter | Unit | Value | | Comment |
|--|------|--|--|---|
| | | Test 1 | Test 2 | |
| PCell | | Cell 1 | | PCell is on RF channel 1 (PCC). |
| SCell | | Cell 2 | | SCell on RF channel 2 (SCC). Cell 2 is the assistance data reference cell. |
| Other neighbour cell | | Cell 3 | | Neighbour cell on RF channel 2 (SCC). |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.6 FDD | | As specified in TS 36.521-3 [25] clause A.2.1 |
| Channel Bandwidth (BW _{channel}) | MHz | 10 | | |
| PRS Transmission Bandwidth ^{Note 2} | RB | 50 | | PRS are transmitted over the system bandwidth |
| PRS configuration index ^{Note 2} I_{PRS} | | 171 for all cells on PCC 181 for all cells on SCC | | This corresponds to periodicity of 320 ms and PRS subframe offset of $I_{PRS} - 160$ DL subframes, as defined in 3GPP TS 36.211 [26], Table 6.10.4.3-1 |
| Number of consecutive downlink positioning subframes N_{PRS} ^{Note 2} | | 1 | | As defined in 3GPP TS 36.211 [26]. The number of subframes in a positioning occasion |
| Physical cell ID PCI ^{Note 2} | | (PCI of Cell 2 – PCI of Cell 3)mod6=0 | | The PCI of Cell 1 is selected randomly. PCIs of Cell 2 and Cell 3 are selected randomly such that the relative subcarrier shifts of PRS patterns among these cells are as given by the condition. |
| CP length ^{Note 2} | | Normal | | |
| DRX | | ON | | DRX parameters are further specified in Table 10.1.4.1-2 |
| Radio frame transmit time offset between Cell 2 and Cell 3 at the UE antenna connector ^{Note 3} | μs | 3 | | Synchronous cells |
| Cell 2 timing offset to Cell 1 ^{Note 3} | μs | 0 | | Synchronous cells |
| Expected RSTD ^{Note 1} | μs | 3 | | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| Expected RSTD uncertainty ^{Note 1} | μs | 5 | | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| Number of cells provided in OTDOA assistance data | | 16 cells in total | | The list includes the reference cell and 15 other cells. Cell 1 (when included) appears at random places in the first half of the neighbour cell list in the OTDOA assistance data. Cell 3 always appears at random places in the second half of the list |
| | | OTDOA neighbour cells include Cell 3 and other 14 cells on SCC | OTDOA neighbour cells include Cell 1 and other 7 cells on PCC, and Cell 3 and other 6 cells on SCC | |

| | | | | |
|---|---|---|---|---|
| prs-SubframeOffset ^{Note 2} | | Cells on PCC: 310 Cells on SCC, except reference cell: 0 | | Subframe offset, counted in full subframes. The corresponding parameter in the OTDOA assistance data is prs-SubframeOffset specified in TS 36.355 [4] |
| slotNumberOffset ^{Note 2} | | Cells on PCC: 0 Cells on SCC, except reference cell: 0 | | The slot number offset at the transmitter between a neighbour cell and the assistance data reference cell. The corresponding parameter in the OTDOA assistance data is slotNumberOffset specified in TS 36.355 [4]. |
| PRS muting info ^{Note 2} | | Cell 1: '11110000' Cell 2: '00001111' Cell 3: '11110000' | Cell 1: '1111111100000000' Cell 2: '0000000011111111' Cell 3: '1111111100000000' | Corresponds to prs-MutingInfo defined in TS 36.355 [4] |
| T1 | S | 3 | | The length of the time interval from the beginning of each test |
| T2 | S | 1.28 | 2.48 | The length of the time interval that follows immediately after time interval T1 |
| T3 | S | 1.28 | 2.48 | The length of the time interval that follows immediately after time interval T2 |
| <p>Note 1: Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 10.1.4.3-4 and TS 37.571-5 [20], clause 7.3.2.</p> <p>Note 2: Parameters "PRS Transmission Bandwidth", "PRS configuration index", "Number of consecutive downlink positioning subframes", "Physical cell ID PCI", "CP length", "prs-SubframeOffset", "slotNumberOffset" and "PRS muting info" are settable parameters and also parameters signalled in LPP. The values to be used for "Physical cell ID PCI" are as follows: Cell 1: 0, Cell 2: 6, Cell 3: 12. For the values to be used in LPP see Table 10.1.4.3-4 and TS 37.571-5 [20], clause 7.3.2.</p> <p>Note 3: The parameters "Radio frame transmit time offset between Cell 2 and Cell 3 at the UE antenna connector" and "Cell 2 timing offset to Cell 1" are used to set the "true RSTD" values in step 6 of clause 10.1.4.1.</p> | | | | |

Table 10.1.4.1-2: DRX parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions for Carrier Aggregation

| Field | Value | Comment |
|--------------------------|---------|---|
| onDurationTimer | psf1 | As specified in 3GPP TS 36.331 [22], clause 6.3.2 |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | sf1 | |
| longDRX-CycleStartOffset | sf320 | |
| shortDRX | Disable | |

10.1.4.2 Test procedure

The test case includes two tests. Test 1 is designed for the scenario where the UE receives OTDOA assistance data with cells on SCC, and the UE is expected to report RSTD measurements performed on SCC only. Test 2 is designed for the scenario where the UE receives OTDOA assistance data with cells on PCC and SCC, and the UE is expected to report RSTD measurements performed on PCC and on SCC.

Each test consists of three consecutive time intervals, with duration of T1, T2 and T3 defined in Table 10.1.4.1-1. Cell 1 is active in T1, T2 and T3, whilst Cell 2 is active only in T2 and T3, and Cell 3 is active only during T2. The beginning of the time interval T2 shall be aligned 5 ms before the first PRS positioning subframe of a positioning occasion in the OTDOA assistance data reference cell, where 5 ms is the necessary test tolerance. Cell 1 transmits PRS in T2, while Cell 2 transmits PRS only in T3, and Cell 3 transmits PRS only in T2.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 10.1.4.3 shall be provided to the UE during T1. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of T2, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. Configure Cell 2 and Cell 3 on the SCC according to TS 36.521-1 [24] Annex C.0 and C.1 for all downlink physical channels except PHICH.
3. The SS shall configure the SCell (Cell 2) on the SCC as per TS 36.508 [18] clause 5.2A.4.
4. The SS activates the SCell (Cell 2) by sending the Activation/Deactivation MAC control element according to TS 36.321 [34] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [23] clause 8.3.3.2.
5. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
6. Set the parameters according to Table 10.1.5-1. Propagation conditions are set according to clause 4.7.2.2 (ETU30).
7. T1 starts.
8. The SS shall transmit an RRCConnectionReconfiguration message with the DRX configuration.
9. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 9a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 9b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
10. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. The position of neighbour Cell 3 in the *OTDOA-NeighbourCellInfoList* is randomly selected to be in the last 8 elements of the sequence for Test 1 and in the 7 elements of the relevant sequence for Test 2, and the position of neighbour Cell 1 is randomly selected to be in the first 7 elements of the relevant sequence for Test 2, as described in 3GPP TS 37.571-5 [20], clause 7.3.2. If the UE message at step 9b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
11. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of T2, where $\Delta T = 150$ ms.
12. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.1.5-2.
13. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 10.1.5-2.
14. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message including the *OTDOA-ProvideLocationInformation* IE within the response time (see clause 4.7.3) specified in clause 10.1.5.

For Test 1 the UE shall perform and report the RSTD measurement for Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 2. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for Cell 3 within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with the *rstd* field included within the response time then the number of failure tests is increased by one.

For Test 2 the UE shall perform and report the RSTD measurements for Cell 1 with respect to the reference cell in the OTDOA assistance data, Cell 2 or with respect to Cell 3, and also Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 2. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for Cell 1 (with respect to Cell 2 or Cell 3) and Cell 3 (with respect to Cell 2) within the response time then the number of successful tests is increased by one. If the UE fails to report the

OTDOA-ProvideLocationInformation IE with both the *rstd* fields included within the response time then the number of failure tests is increased by one.

15. If the UE message at step 14 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
16. Repeat steps 5-15 until the confidence level according to Annex D is achieved. For each iteration, at step 10 change the random positions of the Cell 3 and Cell 1(for Test 2 only) in the relevant sequence in the *OTDOA-NeighbourCellInfoList*.
17. Repeat from clause 10.1.4.1 for Test 2.

10.1.4.3 Message contents

Table 10.1.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 10.1.4.3-2: MAC-MainConfig-RBC: FDD RSTD Measurement Reporting Delay for Carrier Aggregation

| Derivation Path: TS 36.508 [18] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | sf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf320 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |

Table 10.1.4.3-2a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 10.1.4.3-3: LPP RequestLocationInformation

| Derivation Path: 36.355 clause 6.2 | | | |
|--|--------------------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | Test 1: 3 Test 2: 6 | See clause 10.1.5 | |
| velocityRequest | FALSE | | |
| } | | | |
| environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation SEQUENCE { | | | |
| assistanceAvailability | FALSE | | |
| } | | | |
| ecid-RequestLocationInformation | Not present | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.1.4.3-4: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.1.4.3-5: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 2 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbour | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | With respect to Cell 2 | |
| rstd-Quality | | | |
| } | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbour | Cell 1 | Test 2 only | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | Test 2 only With respect to Cell 2 or Cell 3 | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

10.1.5 Test requirement

Table 10.1.5-1 and 10.1.5-2 define the primary level settings including test tolerances for the tests.

Table 10.1.5-1: Cell-specific test parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions during T1 for Carrier Aggregation

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|-------------|-----------|-----------|-----------|
| E-UTRA RF Channel Number | | 1 | N/A | N/A |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.5 FDD | N/A | N/A |
| PBCH_RA | dB | 0 | N/A | N/A |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| N_{oc} ^{Note 3} | dBm/ 15 kHz | -95 | N/A | N/A |
| $PRS \hat{E}_s / N_{oc}$ | dB | -Infinity | -Infinity | -Infinity |
| I_o ^{Note 4} | dBm/ 9 MHz | -67.22 | N/A | N/A |
| \hat{E}_s / N_{oc} | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | | ETU30 | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 4: I_o levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

Table 10.1.5-2: Cell-specific test parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions during T2 and T3 for Carrier Aggregation

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|--|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| E-UTRA RF Channel Number | | 1 | | 2 | | 2 | |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | | 1x2 Low | | 1x2 Low | |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.5 FDD | | OP.6 FDD | | OP.6 FDD | N/A |
| PBCH_RA | dB | 0 | | 0 | | 0 | N/A |
| PBCH_RB | | | | | | | |
| PSS_RA | | | | | | | |
| SSS_RA | | | | | | | |
| PCFICH_RB | | | | | | | |
| PHICH_RA | | | | | | | |
| PHICH_RB | | | | | | | |
| PDCCH_RA | | | | | | | |
| PDCCH_RB | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | |
| PRS_RA | dB | -6 | N/A | N/A | 0 | 0 | N/A |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -98 | -98 | -95 | -98 | -95 |
| $PRS \hat{E}_s / N_{oc}$ | dB | -4 + TT | -Infinity | -Infinity | -10 + TT | -11 + TT | -Infinity |
| $PRS \hat{E}_s / I_{ot}$ ^{Note 4} | dB | -4 + TT | -Infinity | -Infinity | -10 + TT | -11 + TT | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -69.94 | N/A | N/A | -67.15 | -70.16 | N/A |
| PRP ^{Note 4} | dBm/15 kHz | -102 + TT | -Infinity | -Infinity | -105 + TT | -109 + TT | -Infinity |
| RSRP ^{Note 4} | dBm/15 kHz | -96 + TT | -96 + TT | -105 + TT | -105 + TT | -109 + TT | -Infinity |
| \hat{E}_s / N_{oc} ^{Note 4} | dB | 2 | 2 | -7 | -10 | -11 | -Infinity |
| Propagation Condition | | ETU30 | | | | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. | | | | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | |
| Note 4: If PRS_RA is not “N/A”, \hat{E}_s / N_{oc} , $PRS \hat{E}_s / I_{ot}$, I_o , RSRP and PRP levels have been derived from other parameters and are given for information purpose. If PRS_RA is “N/A”, I_o and RSRP levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. Interference conditions shall be applied to all PRS symbols of DL positioning subframes. | | | | | | | |

The response time including test tolerance is 3.3s for Test 1 and 6.3s for Test 2. The response time is equal to the LPP responseTime IE value plus the test tolerance. The LPP responseTime IE value is derived from the RSTD reporting delay plus ΔT , where $\Delta T = 150$ ms, giving a value of 2710 ms for Test 1 and 5110ms for Test 2. This is rounded up to the next allowed LPP value of 3 seconds for Test 1 and 6 seconds for Test 2.

The RSTD measurement reporting delay in the tests is derived from the following expression,

$T_{PRS} (M - 1) + 160 \left\lceil \frac{n}{M} \right\rceil$, where $M = 8$ and $n = 16$ for Test 1, and $M = 16$ and $n = 16$ for Test 2 are the parameters specified in clause 10.1.3.1 for Test 1 and clause 10.1.3.2 for Test 2.

This gives the total RSTD reporting delay of 2560 ms for Test 1 for the 15 neighbour cells including Cell 3 with respect to the reference cell, Cell 2.

This gives the total RSTD reporting delay of 4960 ms for Test 2 for the 15 neighbour cells including Cell 1 and Cell 3 with respect to the reference cell, Cell 2.

The test tolerances are defined in clauses C.1.3 and C.4.

For the overall test to pass, the rate of successful tests during repeated tests in both Test 1 and Test 2 shall be more than 90% with a confidence level of 95%.

10.1A FDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test system uncertainties applicable to this test are undefined.
- The Test tolerances applicable to this test are undefined.
- The test case design is such that the nominal Cell 2 PRS Es/Iot is specified at 4 dB below the requirement specified in TS36.133 which implies that a requirement change is needed prior to the completion of the test.

10.1A.1 Test purpose

Same as defined in clause 10.1.1.

NOTE: This test verifies the requirement which is independent of channel bandwidth and is performed according to the principle defined in clause 4.7.5.

10.1A.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.1A.3 Minimum conformance requirements

Same as defined in clause 10.1.3.

The normative reference for this requirement is TS 36.133 [23] clause 8.4.3, 8.4.4 and A.8.17.3.

10.1A.4 Test description

10.1A.4.1 Initial conditions

Same as defined in clause 10.1.4.1 except that the values of the parameters in Table 10.1A.4.1-1 will replace the values of the corresponding parameters in Table 10.1.4.1-1.

Channel bandwidth to be tested: 20 MHz.

Table 10.1A.4.1-1: General test parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions for carrier aggregation for 20MHz

| Parameter | Unit | Value | | Comment |
|--|---|--|--------|---|
| | | Test 1 | Test 2 | |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.10 FDD | | As specified in TS 36.521-3 [25] clause A.2.1 |
| Channel Bandwidth (BW _{channel}) | MHz | 20 | | |
| PRS Transmission Bandwidth | RB | 100 | | PRS are transmitted over the system bandwidth |
| Note 1: | See Table 10.1.4.1-1 for the other parameters. | | | |
| Note 2: | This test verifies the requirement which is independent of channel bandwidth and is performed according to the principle defined in clause 4.7.5. | | | |

10.1A.4.2 Test procedure

Same as defined in clause 10.1.4.2.

10.1A.4.3 Message contents

Same as defined in clause 10.1.4.3.

10.1A.5 Test requirement

Same as defined in clause 10.1.5 except that the values of the parameters in Table 10.1A.5-1 and Table 10.1A.5-2 will replace the values of the corresponding parameters in Table 10.1.5-1 and Table 10.1.5-2, respectively.

Table 10.1A.5-1: Cell-specific test parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions during T1 for carrier aggregation for 20MHz

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|--|----------------|-----------|--------|--------|
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.13 FDD | N/A | N/A |
| I _o ^{Note 1} | dBm/ 18 MHz | -64.21 | N/A | N/A |
| Note 1: I _o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 2: See Table 10.1.5-1 for the other parameters. | | | | |

Table 10.1A.5-2: Cell-specific test parameters for E-UTRAN FDD RSTD measurement reporting delay under fading propagation conditions during T2 and T3 for carrier aggregation for 20MHz

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|--|----------------|-----------|-----|-----------|--------|-----------|-----|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| OCNG patterns defined in TS 36.521-3 [25] clause D.1 | | OP.13 FDD | | OP.14 FDD | | OP.14 FDD | N/A |
| I _o ^{Note 1} | dBm/ 18 MHz | -66.93 | N/A | N/A | -64.14 | -67.15 | N/A |
| Note 1: I _o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| Note 2: See Table 10.1.5-2 for the other parameters. | | | | | | | |

10.2 TDD RSTD Measurement Reporting Delay for Carrier Aggregation

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test system uncertainties applicable to this test are undefined.
- The Test tolerances applicable to this test are undefined.
- The test case design is such that the nominal Cell 2 PRS Es/Iot is specified at 4 dB below the requirement specified in TS36.133 which implies that a requirement change is needed prior to the completion of the test.
- The levels defined in Table 10.2.5-2 for Cell 2 and Cell 3 may not be sufficient to pass a compliant UE and are under discussion in RAN 4.

10.2.1 Test purpose

To verify that the RSTD measurement reporting delay meets the requirements in an environment with fading propagation conditions. This test case verifies the measurement period requirements for RSTD measurements performed on the secondary component carrier and also the measurement period requirements for RSTD measurements performed on both the primary and secondary component carriers.

10.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.2.3 Minimum conformance requirements

10.2.3.1 Measurements on the secondary component carrier

The RSTD measurements when all cells are on the configured secondary component carrier shall meet all applicable requirements (TDD) specified in TS 36.133 [23] section 8.1.2.5, i.e., E-UTRAN intra-frequency RSTD measurement period applies, regardless of whether the SCell on the corresponding frequency is activated or deactivated by the MAC-CE commands as specified in 3GPP TS 36.321 [34].

10.2.3.2 Measurements on both primary component carrier and secondary component carrier

The RSTD measurements of cells on both primary component carrier and configured secondary component carrier shall meet all applicable requirements (TDD) specified in TS 36.133 [23] section 8.1.2.6, i.e., E-UTRAN inter-frequency RSTD measurement period applies regardless of whether the SCell on the corresponding frequency is activated or deactivated by the MAC-CE commands as specified in 3GPP TS 36.321 [34], with the following exceptions

- the number of PRS positioning occasions is as specified in Table 10.2.3.2-1 shall apply, and
- TDD uplink-downlink subframes configurations as specified in TS 36.133 [23] section 8.1.2.5.2, Table 8.1.2.5.2-2 shall apply.

Table 10.2.3.2-1: Number of PRS positioning occasions within measurement period

| Positioning subframe configuration period T_{PRS} | Number of PRS positioning occasions M |
|--|---|
| 160 ms | 32 |
| >160 ms | 16 |

The normative reference for this requirement is TS 36.133 [23] clause 8.4.3, 8.4.4 and A.8.17.2.

10.2.4 Test description

10.2.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.2.

Channel bandwidth to be tested: 10 MHz as defined in TS 36.508 [18] clause 4.3.1.

1. Connect the SS, faders and AWGN noise sources to the UE antenna connector or antenna connectors as shown in TS 36.508 [18] Annex A, Figure group A.42 as appropriate.
2. The general test parameter settings are set up according to Table 10.2.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 10.2.4.3.
5. In the tests, there are two configured component carriers: PCC and SCC, and three synchronized cells: Cell 1, Cell 2 and Cell 3. Cell 1 is PCell on the PCC, Cell 2 is an active SCell on the SCC, and Cell 3 is a neighbour cell on the SCC. In both tests, Cell 2 is the OTDOA assistance data reference cell. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 clause 7.3.2) for Test 1 and where 13 of the cells are not simulated for Test 2. PCell (Cell 1) is the cell used for connection setup with the power level and mapping set according to TS 36.521-1 [24] Annex C.0 and C.1 as appropriate for this test. Cell 2 and Cell 3 are powered OFF.
6. The true RSTD (which is the receive time difference for frame 0 between two cells as seen at the UE antenna connector) is set to 0 Ts (0 μ s) between Cell 1 and OTDOA assistance data reference cell, Cell 2; and set to 92 Ts (about 3 μ s) between neighbour Cell 3 and OTDOA assistance data reference cell, Cell 2.

Table 10.2.4.1-1: General test parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions for Carrier Aggregation

| Parameter | Unit | Value | | Comment |
|--|------|--|--------|--|
| | | Test 1 | Test 2 | |
| PCell | | Cell 1 | | PCell is on RF channel 1 (PCC). |
| SCell | | Cell 2 | | SCell on RF channel 2 (SCC). Cell 2 is the assistance data reference cell. |
| Other neighbour cell | | Cell 3 | | Neighbour cell on RF channel 2 (SCC). |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.6 TDD | | As specified in TS 36.521-3 [25] clause A.2.2 |
| Channel Bandwidth (BW _{channel}) | MHz | 10 | | |
| PRS Transmission Bandwidth ^{Note 2} | RB | 50 | | PRS are transmitted over the system bandwidth |
| PRS configuration index ^{Note 2} I_{PRS} | | 174 for all cells on PCC 184 for all cells on SCC | | This corresponds to periodicity of 320 ms and PRS subframe offset of $I_{PRS} - 160$ DL subframes, as defined in 3GPP TS 36.211 [26], Table 6.10.4.3-1 |
| Number of consecutive downlink positioning subframes N_{PRS} ^{Note 2} | | 1 | | As defined in 3GPP TS 36.211 [26]. The number of subframes in a positioning occasion |
| Physical cell ID PCI ^{Note 2} | | (PCI of Cell 2 – PCI of Cell 3) mod 6 = 0 | | The PCI of Cell 1 is selected randomly. PCIs of Cell 2 and Cell 3 are selected randomly such that the relative subcarrier shifts of PRS patterns among these cells are as given by the condition |
| TDD uplink-downlink configuration | | 1 | | As specified in TS 36.211 [26], Section 4.2; corresponds to a configuration with 5 ms switch-point periodicity and two downlink consecutive subframes |
| TDD special subframe configuration | | 6 | | As specified in TS 36.211 [26], Section 4.2; corresponds to DwPTS of $19760 \cdot T_s$ and UpPTS of $4384 \cdot T_s$ |
| CP length ^{Note 2} | | Normal | | |
| DRX | | ON | | DRX parameters are further specified in Table 10.2.4.1-2 |
| Radio frame transmit time offset between Cell 2 and Cell 3 at the UE antenna connector ^{Note 3} | μs | 3 | | Synchronous cells |
| Cell 2 timing offset to Cell 1 ^{Note 3} | μs | 0 | | Synchronous cells |
| Expected RSTD ^{Note 1} | μs | 3 | | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| Expected RSTD uncertainty ^{Note 1} | μs | 5 | | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| Number of cells provided | | 16 cells in total | | The list includes the reference |

| | | | | |
|---|---|---|--|---|
| in OTDOA assistance data | | OTDOA neighbour cells include Cell 3 and other 14 cells on SCC | OTDOA neighbour cells include Cell 1 and other 7 cells on PCC, and Cell 3 and other 6 cells on SCC | cell and 15 other cells. Cell 1 (when included) appears at random places in the first half of the neighbour cell list in the OTDOA assistance data. Cell 3 always appears at random places in the second half of the list |
| prs-SubframeOffset ^{Note2} | | Cells on PCC: 310 Cells on SCC, except reference cell: 0 | | Subframe offset, counted in full subframes. The corresponding parameter in the OTDOA assistance data is prs-SubframeOffset specified in TS 36.355 [4] |
| slotNumberOffset ^{Note 2} | | Cells on PCC: 0 Cells on SCC, except reference cell: 0 | | The slot number offset at the transmitter between a neighbour cell and the assistance data reference cell. The corresponding parameter in the OTDOA assistance data is slotNumberOffset specified in TS 36.355 [4]. |
| PRS muting info ^{Note 2} | | Cell 1: '11110000' Cell 2: '00001111' Cell 3: '11110000' | Cell 1: '1111111100000000' Cell 2: '0000000011111111' Cell 3: '1111111100000000' | Corresponds to prs-MutingInfo defined in TS 36.355 [4] |
| T1 | s | 3 | | The length of the time interval from the beginning of each test |
| T2 | s | 1.28 | 2.48 | The length of the time interval that follows immediately after time interval T1 |
| T3 | s | 1.28 | 2.48 | The length of the time interval that follows immediately after time interval T2 |
| <p>Note 1: Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 10.2.4.3-4 and TS 37.571-5 [20], clause 7.3.2.</p> <p>Note 2: Parameters "PRS Transmission Bandwidth", "PRS configuration index", "Number of consecutive downlink positioning subframes", "Physical cell ID PCI", "CP length", "prs-SubframeOffset", "slotNumberOffset" and "PRS muting info" are settable parameters and also parameters signalled in LPP. The values to be used for "Physical cell ID PCI" are as follows: Cell 1: 0, Cell 2: 6, Cell 3: 12. For the values to be used in LPP see Table 10.2.4.3-4 and TS 37.571-5 [20], clause 7.3.2.</p> <p>Note 3: The parameters "Radio frame transmit time offset between Cell 2 and Cell 3 at the UE antenna connector" and "Cell 2 timing offset to Cell 1" are used to set the "true RSTD" values in step 6 of clause 10.2.4.1.</p> | | | | |

Table 10.2.4.1-2: DRX parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions for Carrier Aggregation

| Field | Value | Comment |
|--------------------------|---------|--|
| onDurationTimer | psf1 | As specified in 3GPP TS 36.331 [22], clause 6.3.2. |
| drx-InactivityTimer | psf1 | |
| drx-RetransmissionTimer | sf1 | |
| longDRX-CycleStartOffset | sf320 | |
| shortDRX | disable | |

10.2.4.2 Test procedure

The test case includes two tests. Test 1 is designed for the scenario where the UE receives OTDOA assistance data with cells on SCC, and the UE is expected to report RSTD measurements performed on SCC only. Test 2 is designed for the scenario where the UE receives OTDOA assistance data with cells on PCC and SCC, and the UE is expected to report RSTD measurements performed on PCC and on SCC.

Each test consists of three consecutive time intervals, with duration of T1, T2 and T3 defined in Table 10.2.4-1. Cell 1 is active in T1, T2 and T3, whilst Cell 2 and Cell 3 are activated only in the beginning of T2. Cell 2 is active until the end of T3, and Cell 3 is active until the end of T2. The beginning of the time interval T2 shall be aligned 5 ms before the first PRS positioning subframe of a positioning occasion in the reference cell, where 5 ms is the necessary test tolerance. Cell 1 transmits PRS in T2, while Cell 2 transmits PRS only in T3, and Cell 3 transmits PRS only in T2.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 10.2.4.3 shall be provided to the UE during T1. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of T2, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. Configure Cell 2 and Cell 3 on the SCC according to TS 36.521-1 [24] Annex C.0 and C.1 for all downlink physical channels except PHICH.
3. The SS shall configure the SCell (Cell 2) on the SCC as per TS 36.508 [18] clause 5.2A.4.
4. The SS activates the SCell (Cell 2) by sending the Activation/Deactivation MAC control element according to TS 36.321 [34] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [23] clause 8.3.3.2.
5. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
6. Set the parameters according to Table 10.2.5-1. Propagation conditions are set according to clause 4.7.2.2 (ETU30).
7. T1 starts.
8. The SS shall transmit an RRCConnectionReconfiguration message with the DRX configuration.
9. The UE shall transmit RRCConnectionReconfigurationComplete message.
- 9a. The SS shall transmit an LPP REQUEST CAPABILITIES message.
- 9b. The UE shall transmit an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
10. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. The position of neighbour Cell 3 in the *OTDOA-NeighbourCellInfoList* is randomly selected to be in the last 8 elements of the sequence for Test 1 and in the 7 elements of the relevant sequence for Test 2, and the position of neighbour Cell 1 is randomly selected to be in the first 7 elements of the relevant sequence for Test 2, as described in 3GPP TS 37.571-5 [20], clause 7.3.2. If the UE message at step 9b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
11. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of T2, where $\Delta T = 150$ ms.
12. When T1 expires, the SS shall switch the power setting from T1 to T2 as specified in Table 10.2.5-3.
13. When T2 expires, the SS shall switch the power setting from T2 to T3 as specified in Table 10.2.5-3.
14. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION including the *OTDOA-ProvideLocationInformation* IE within the response time (see clause 4.7.3) specified in clause 10.2.5.

For Test 1 the UE shall perform and report the RSTD measurement for Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 2. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for Cell 3 within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with the *rstd* field included within the response time then the number of failure tests is increased by one.

For Test 2 the UE shall perform and report the RSTD measurements for Cell 1 with respect to the reference cell in the OTDOA assistance data, Cell 2 or with respect to Cell 3, and also Cell 3 with respect to the reference cell in the OTDOA assistance data, Cell 2. If the UE transmits an *OTDOA-ProvideLocationInformation* IE including the *rstd* field for Cell 1 (with respect to Cell 2 or Cell 3) and Cell 3 (with respect to Cell 2) within the response time then the number of successful tests is increased by one. If the UE fails to report the *OTDOA-ProvideLocationInformation* IE with both the *rstd* fields included within the response time then the number of failure tests is increased by one.

15. If the UE message at step 14 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
16. Repeat steps 5-15 until the confidence level according to Annex D is achieved. For each iteration, at step 10 change the random positions of the Cell 3 and Cell 1 (for Test 2 only) in the relevant sequence in the *OTDOA-NeighbourCellInfoList*.
17. Repeat from clause 10.2.4.1 for Test 2.

10.2.4.3 Message contents

Table 10.2.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 10.2.4.3-2: MAC-MainConfig-RBC: TDD RSTD Measurement Reporting Delay for Carrier Aggregation

| Derivation Path: TS 36.508 [18] clause 4.8.2.1.5, Table 4.8.2.1.5-1 MAC-MainConfig-RBC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig-RBC ::= SEQUENCE { | | | |
| drx-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| onDurationTimer | psf1 | | |
| drx-InactivityTimer | psf1 | | |
| drx-RetransmissionTimer | sf1 | | |
| longDRX-CycleStartOffset CHOICE { | | | |
| sf320 | 0 | | |
| } | | | |
| shortDRX | Not present | | |
| } | | | |
| } | | | |

Table 10.2.4.3-2a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 10.2.4.3-3: LPP RequestLocationInformation

| Derivation Path: 36.355 clause 6.2 | | | |
|--|--------------------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | Test 1: 3 Test 2: 6 | See clause 10.2.5 | |
| velocityRequest | FALSE | | |
| } | | | |
| Environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation SEQUENCE { | | | |
| assistanceAvailability | FALSE | | |
| } | | | |
| ecid-RequestLocationInformation | Not present | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.2.4.3-4: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.2.4.3-5: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 2 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbour | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | With respect to Cell 2 | |
| rstd-Quality | | | |
| } | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(n)) { | | | |
| physCellIdNeighbour | Cell 1 | Test 2 only | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Present | Test 2 only With respect to Cell 2 or Cell 3 | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

10.2.5 Test requirement

Table 10.2.5-1 and 10.2.5-2 define the primary level settings including test tolerances for the test.

Table 10.2.5-1: Cell-specific test parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions during T1 for Carrier Aggregation

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|------------|-----------|-----------|-----------|
| E-UTRA RF Channel Number | | 1 | N/A | N/A |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.1 TDD | N/A | N/A |
| PBCH_RA | dB | 0 | N/A | N/A |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| N_{oc} ^{Note 3} | dBm/15 kHz | -95 | N/A | N/A |
| $PRS \hat{E}_s / N_{oc}$ | dB | -Infinity | -Infinity | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -67.22 | N/A | N/A |
| \hat{E}_s / N_{oc} | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | | ETU30 | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 4: I_o levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

Table 10.2.5-2: Cell-specific test parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions during T2 and T3 for Carrier Aggregation

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|--|------------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| E-UTRA RF Channel Number | | 1 | | 2 | | 2 | |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | | 1x2 Low | | 1x2 Low | |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.1 TDD | | OP.2 TDD | | OP.2 TDD | N/A |
| PBCH_RA | dB | 0 | | 0 | | 0 | N/A |
| PBCH_RB | | | | | | | |
| PSS_RA | | | | | | | |
| SSS_RA | | | | | | | |
| PCFICH_RB | | | | | | | |
| PHICH_RA | | | | | | | |
| PHICH_RB | | | | | | | |
| PDCCH_RA | | | | | | | |
| PDCCH_RB | | | | | | | |
| OCNG_RA ^{Note 1} | | | | | | | |
| OCNG_RB ^{Note 1} | | | | | | | |
| PRS_RA | dB | -6 | N/A | N/A | 0 | 0 | N/A |
| N_{oc} ^{Note 3} | dBm/15 kHz | -98 | -98 | -98 | -95 | -98 | -95 |
| $PRS \hat{E}_s / N_{oc}$ | dB | -4 + TT | -Infinity | -Infinity | -10 + TT | -11 + TT | -Infinity |
| $PRS \hat{E}_s / I_{ot}$ ^{Note 4} | dB | -4 + TT | -Infinity | -Infinity | -10 + TT | -11 + TT | -Infinity |
| I_o ^{Note 4} | dBm/9 MHz | -69.94 | N/A | N/A | -67.15 | -70.16 | N/A |
| PRP ^{Note 4} | dBm/15 kHz | -102 + TT | -Infinity | -Infinity | -105 + TT | -109 + TT | -Infinity |
| RSRP ^{Note 4} | dBm/15 kHz | -96 + TT | -96 + TT | -105 + TT | -105 + TT | -109 + TT | -Infinity |
| \hat{E}_s / N_{oc} ^{Note 4} | dB | 2 | 2 | -7 | -10 | -11 | -Infinity |
| Propagation Condition | | ETU30 | | | | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS. | | | | | | | |
| Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |
| Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | | | | |
| Note 4: If PRS_RA is not “N/A”, \hat{E}_s / N_{oc} , $PRS \hat{E}_s / I_{ot}$, I_o , RSRP and PRP levels have been derived from other parameters and are given for information purpose. If PRS_RA is “N/A”, I_o and RSRP levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. Interference conditions shall be applied to all PRS symbols of DL positioning subframes. | | | | | | | |

The response time including test tolerance is 3.3s for Test 1 and 6.3s for Test 2. The response time is equal to the LPP responseTime IE value plus the test tolerance. The LPP responseTime IE value is derived from the RSTD reporting delay plus ΔT , where $\Delta T = 150$ ms, giving a value of 2710 ms for Test 1 and 5110ms for Test 2. This is rounded up to the next allowed LPP value of 3 seconds for Test 1 and 6 seconds for Test 2.

The RSTD measurement reporting delay in the tests is derived from the following expression,

$T_{PRS} (M - 1) + 160 \left\lceil \frac{n}{M} \right\rceil$, where $M = 8$ and $n = 16$ for Test 1, and $M = 16$ and $n = 16$ for Test 2 are the parameters specified in clause 10.2.3.1 for Test 1 and clause 10.2.3.2 for Test 2.

This gives the total RSTD reporting delay of 2560 ms for Test 1 for the 15 neighbour cells including Cell 3 with respect to the reference cell, Cell 2.

This gives the total RSTD reporting delay of 4960 ms for Test 2 for the 15 neighbour cells including Cell 1 and Cell 3 with respect to the reference cell, Cell 2.

The test tolerances are defined in clauses C.1.3 and C.4.

For the overall test to pass, the rate of successful tests during repeated tests in both Test 1 and Test 2 shall be more than 90% with a confidence level of 95%.

10.2A TDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

- The Test system uncertainties applicable to this test are undefined.
- The Test tolerances applicable to this test are undefined.
- *The test case design is such that the nominal Cell 2 PRS Es/Iot is specified at 4 dB below the requirement specified in TS36.133 which implies that a requirement change is needed prior to the completion of the test.*

10.2A.1 Test purpose

Same as defined in clause 10.2.1.

NOTE: This test verifies the requirement which is independent of channel bandwidth and is performed according to the principle defined in clause 4.7.5.

10.2A.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.2A.3 Minimum conformance requirements

Same as defined in clause 10.2.3.

The normative reference for this requirement is TS 36.133 [23] clause 8.4.3, 8.4.4 and A.8.17.4.

10.2A.4 Test description

10.2A.4.1 Initial conditions

Same as defined in clause 10.2.4.1 except that the values of the parameters in Table 10.2A.4.1-1 will replace the values of the corresponding parameters in Table 10.2.4.1-1.

Channel bandwidth to be tested: 20 MHz.

Table 10.2A.4.1-1: General test parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions for carrier aggregation for 20MHz

| Parameter | Unit | Value | | Comment |
|--|---|--|--------|---|
| | | Test 1 | Test 2 | |
| PCFICH/PDCCH/PHICH parameters | | DL Reference Measurement Channel R.10 TDD | | As specified in TS 36.521-3 [25] clause A.2.2 |
| Channel Bandwidth (BW _{channel}) | MHz | 20 | | |
| PRS Transmission Bandwidth | RB | 100 | | PRS are transmitted over the system bandwidth |
| Note 1: | See Table 10.2.4.1-1 for the other parameters. | | | |
| Note 2: | This test verifies the requirement which is independent of channel bandwidth and is performed according to the principle defined in clause 4.7.5. | | | |

10.2A.4.2 Test procedure

Same as defined in clause 10.2.4.2.

10.2A.4.3 Message contents

Same as defined in clause 10.2.4.3.

10.2A.5 Test requirement

Same as defined in clause 10.2.5 except that the values of the parameters in Table 10.2A.5-1 and Table 10.2A.5-2 will replace the values of the corresponding parameters in Table 10.2.5-1 and Table 10.2.5-2, respectively.

Table 10.2A.5-1: Cell-specific test parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions during T1 for carrier aggregation for 20MHz

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|--|----------------|----------|--------|--------|
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.7 TDD | N/A | N/A |
| I _o ^{Note 1} | dBm/ 18 MHz | -64.21 | N/A | N/A |
| Note 1: I _o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |
| Note 2: See Table 10.2.5-1 for the other parameters. | | | | |

Table 10.2A.5-2: Cell-specific test parameters for E-UTRAN TDD RSTD measurement reporting delay under fading propagation conditions during T2 and T3 for carrier aggregation for 20MHz

| Parameter | Unit | Cell 1 | | Cell 2 | | Cell 3 | |
|--|----------------|----------|-----|----------|--------|----------|-----|
| | | T2 | T3 | T2 | T3 | T2 | T3 |
| OCNG patterns defined in TS 36.521-3 [25] clause D.2 | | OP.7 TDD | | OP.8 TDD | | OP.8 TDD | N/A |
| I _o ^{Note 1} | dBm/ 18 MHz | -66.93 | N/A | N/A | -64.14 | -67.15 | N/A |
| Note 1: I _o levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |
| Note 2: See Table 10.2.5-2 for the other parameters. | | | | | | | |

10.3 FDD RSTD Measurement Accuracy for Carrier Aggregation

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

10.3.1 Test purpose

To verify that the FDD RSTD measurement accuracy is within the specified limits when both the reference cell and neighbouring cell belong to the secondary component carrier.

10.3.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.3.3 Minimum conformance requirements

The UE may operate in either E-UTRA inter-band or intra-band carrier aggregation mode. The requirements in this section shall apply regardless whether the configured downlink secondary cell is activated or deactivated by the MAC-CE command (3GPP TS 36.321 [34]). The requirements apply for bandwidths defined in the bandwidth combination set for the CA configurations supported by the UE [2].

The RSTD measurements, which are obtained when both the reference cell and neighbouring cell belong to the secondary component carrier, shall meet the intra-frequency RSTD accuracy requirements defined in TS 36.133 [23] section 9.1.3.3.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.12 and A.9.8.5.

10.3.4 Test description

10.3.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.1.

Channel bandwidth to be tested: 10 MHz.

1. Connect the SS and AWGN noise sources to the UE antenna connector or antenna connectors as shown in TS 36.508 [18] Annex A, Figure group A.41 as appropriate.
2. The general test parameter settings are set up according to Table 10.3.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 10.3.4.3.
5. There are three synchronized cells on two different carrier frequencies. Cell 1 is the PCell on primary component carrier F1 (RF channel number 1), Cell 2 is the SCell and OTDOA assistance data reference cell on secondary component carrier F2 (RF channel number 2), and Cell 3 is the neighbour cell on F2. PCell (Cell 1) is the cell used for connection setup with the power level and mapping set according to TS 36.521-1 [24] Annex C.0 and C.1 as appropriate for this test. Cell 2 and Cell 3 are powered OFF.

Cell 3 is included in the OTDOA assistance data neighbour cell list, whilst Cell 1 is not included in the OTDOA assistance data. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 [20], clause 7.3.2).

Note that the measurement gap is not configured in the test because of UE carrier aggregation capability.

6. The true RSTD (which is the receive time difference for frame 0 between the two cells as seen at the UE antenna connector) is set to 92 Ts (about 3 μ s) between neighbour Cell 3 and OTDOA assistance data reference cell, Cell 2.

Note that the related expectedRSTD value to be signalled over LPP is defined in Table 10.3.4.1-1.

Table 10.3.4.1-1: General Test Parameters for RSTD Test for E-UTRAN FDD for Carrier Aggregation

| Parameter | Unit | Value | Comment |
|--|------|--|---|
| PCFICH/PDCCH/PHICH parameters | | R.6 FDD | As specified in TS 36.521-3 [25] clause A.2.1 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.1 | | OP.6 FDD | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Assistance data reference cell | | Cell 2 | Cell 2 is the SCell on RF channel number 2 |
| PCell | | Cell 1 | Cell 1 on RF channel number 1 |
| Neighbour cell | | Cell 3 | Cell 3 on RF channel number 2 |
| E-UTRA RF Channel Number | | 1,2 | Two FDD carrier frequencies are used. |
| Channel Bandwidth (BW_{channel}) | MHz | 10 | |
| PRS Transmission Bandwidth ^{Note 2} | RB | 50 | PRS Bandwidth: bandwidth is as indicated in <i>prs-Bandwidth</i> in the OTDOA assistance data defined in 3GPP TS 36.355 [4]. |
| PRS configuration Index I_{PRS} ^{Note 2} | | 2 | As defined in 3GPP TS 36.211 [26] |
| Number of consecutive positioning downlink subframes N_{PRS} ^{Note 2} | | 1 | As defined in 3GPP TS 36.211 [26] |
| prs-MutingInfo ^{Note 2} | | Cell 1: '11110000' Cell 2: '11110000' Cell 3: '11110000' | See section 6.5.1.2 in 3GPP TS 36.355 [4] for more information |
| Cell ID ^{Note 2} | | (Cell ID of cell 2 – Cell ID of cell 3) mod 6 = 3 | PCI of cell 1 is selected randomly. |
| expectedRSTD ^{Note 1} | μs | 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| expectedRSTDUncertainty ^{Note 1} | μs | 5 | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| CP length ^{Note 2} | | Normal | |
| DRX | | OFF | |
| Radio frame transmit time difference between Cell 2 and Cell 3 ^{Note 3} | μs | 3 | Synchronous cells |
| Cell 2 timing offset to Cell 1 | μs | 0 | Synchronous cells |
| Number of cells provided in OTDOA assistance data | | 16 | The list includes the assistance-data-reference cell and 15 other cells. All cells provided in OTDOA assistance data are on RF channel 2. |
| $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ ^{Note 4} | ms | 2560 | Derived according to the RSTD measurement requirements specified in Section 10.1.3 |
| <p>NOTE 1: Parameters "Expected RSTD" and "Expected RSTD uncertainty" are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 10.3.4.3-3 and TS 37.571-5 [20], clause 7.3.2.</p> <p>NOTE 2: Parameters "PRS Transmission Bandwidth", "PRS configuration index", "Number of consecutive positioning downlink subframes", "prs-MutingInfo", "Cell ID" and "CP length" are settable parameters and also parameters signalled in LPP. The values to be used for "Cell ID" are as follows: Cell 1: 0, Cell 2: 7, Cell 3: 10. For the values to be used in LPP see Table 10.3.4.3-3 and TS 37.571-5 [20], clause 7.3.2.</p> <p>NOTE 3: The parameter "Radio frame transmit time difference between Cell 2 and Cell 3" is used to set the "true RSTD" value in step 6 of clause 10.3.4.1.</p> <p>NOTE 4: The parameter "$T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$" is not a settable parameter but is used to set the LPP "responseTime" value in Table 10.3.4.3-2. The value of the LPP responseTime IE is set to $T_{\text{RSTD IntraFreqFDD, E-UTRAN}} + \Delta T$ ms, where $\Delta T = 150$ ms, giving a value of 2710 ms. This is rounded up to the next allowed LPP value of 3 seconds.</p> | | | |

10.3.4.2 Test procedure

The RSTD measurements are performed between Cell 2 and Cell 3 to verify that when both the reference cell and neighbouring cell belong to the secondary component carrier the RSTD measurement accuracy can meet the intra-frequency RSTD accuracy requirements defined in section 10.3.3.

The test consists of a set-up period and a measurement period. All cells are active during the complete test. The beginning of the measurement period shall be aligned with the first PRS positioning subframe of a positioning occasion in the reference cell.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 10.3.4.3 shall be provided to the UE during the set-up period. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of the measurement period, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the UE.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. Configure Cell 2 and Cell 3 on the SCC according to TS 36.521-1 [24] Annex C.0 and C.1 for all downlink physical channels except PHICH.
3. The SS shall configure the SCell (Cell 2) on the SCC as per TS 36.508 [18] clause 5.2A.4.
4. The SS activates the SCell (Cell 2) by sending the Activation/Deactivation MAC control element according to TS 36.321 [34] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [23] clause 8.3.3.2.
5. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
6. Set the parameters according to Table 10.3.5-1 as appropriate. Propagation conditions are set according to clause 4.7.2.1.
- 6a. The SS shall send an LPP REQUEST CAPABILITIES message.
- 6b. The UE shall send an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE
7. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. If the UE message at step 6b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
8. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of measurement period, where $\Delta T = 150$ ms.
9. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message, including the *OTDOA-ProvideLocationInformation* IE.
10. If the UE message at step 9 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
11. The SS shall check the *rstd* value for Cell 3 in the *OTDOA-SignalMeasurementInformation* IE according to Table 10.3.5-2.
12. Repeat step 5-11 until the confidence level according to Annex D is achieved.

10.3.4.3 Message contents

Table 10.3.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 10.3.4.3-1a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 10.3.4.3-2: LPP RequestLocationInformation

| Derivation Path: 36.355 clause 6.2 | | | |
|--|--------------------------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 3 | See Note 5 of Table 10.3.4.1-1 | |
| velocityRequest | FALSE | | |
| } | | | |
| environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation SEQUENCE { | | | |
| assistanceAvailability | FALSE | | |
| } | | | |
| ecid-RequestLocationInformation | Not present | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.3.4.3-3: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.3.4.3-4: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 2 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(1)) { | | | |
| physCellIdNeighbour | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| Rstd | Set according to Table 10.3.5-2 | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

10.3.5 Test requirement

Table 10.3.5-1 defines the primary level settings including test tolerances for the test.

The FDD RSTD accuracy test shall meet the reported values in Table 10.3.5-2.

Table 10.3.5-1: Cell Specific Test Parameters for RSTD Test for E-UTRAN FDD for Carrier Aggregation

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|------------|-----------|-------------------|-------------------|
| E-UTRA RF Channel Number | | 1 | 2 | 2 |
| PBCH_RA | dB | 0 | 0 | 0 |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| PRS_RA | dB | -3 | 0.3 | 0.3 |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | | |
| PRS \hat{E}_s/N_{oc} | dB | -6 | -5.7 | -12.7 |
| PRS \hat{E}_s/I_{ot} ^{Note 3} | dB | -6 | -5.7 | -12.7 |
| I_o ^{Note 3} | dBm/9 MHz | -70.04 | -69.99, -70.01 | -69.99, -70.01 |
| PRP ^{Note 3} | dBm/15kHz | -104 + TT | -103.7 | -110.7 |
| \hat{E}_s/N_{oc} ^{Note 3} | dB | -3 | -6 | -13 |
| RSRP ^{Note 3} | dBm/15kHz | -101 | -104 | -111 |
| Propagation condition | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 3: \hat{E}_s/N_{oc} , PRS \hat{E}_s/I_{ot} , I_o , RSRP and PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. I_o values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS. | | | | |

Table 10.3.5-2: RSTD FDD accuracy requirements for the reported values for Carrier Aggregation

| | Value |
|------------------------|-----------|
| Lowest reported value | RSTD_6441 |
| Highest reported value | RSTD_6453 |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

10.3A FDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz

10.3A.1 Test purpose

Same as defined in clause 10.3.1.

10.3A.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.3A.3 Minimum conformance requirements

Same as defined in clause 10.3.3.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.12 and A.9.8.7.

10.3A.4 Test description

10.3A.4.1 Initial conditions

Same as defined in clause 10.3.4.1 except that the values of the parameters in Table 10.3A.4.1-1 will replace the values of the corresponding parameters in Table 10.3.4.1-1.

Channel bandwidth to be tested: 20 MHz.

Table 10.3A.4.1-1: General Test Parameters for RSTD Test for E-UTRAN FDD for Carrier Aggregation for 20MHz

| Parameter | Unit | Value | Comment |
|---|------|-----------|---|
| PCFICH/PDCCH/PHICH parameters | | R.10 FDD | As specified in clause TS 36.521-3 [25] clause A.2.1 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.1 | | OP.14 FDD | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Channel Bandwidth ($BW_{channel}$) | MHz | 20 | |
| PRS Bandwidth | RB | 100 | PRS Bandwidth bandwidth is as indicated in <i>prs-Bandwidth</i> in the OTDOA assistance data defined in 3GPP TS 36.355 [4]. |
| Note 1: See Table 10.3.4.1-1 for other general test parameters. | | | |
| Note 2: This test verifies the requirement which is independent of channel bandwidth and is performed according to the principle defined in clause 4.7.5. | | | |

10.3A.4.2 Test procedure

Same as defined in clause 10.3.4.2.

10.3A.4.3 Message contents

Same as defined in clause 10.3.4.3.

10.3A.5 Test requirement

Same as defined in clause 10.3.5 except that the value of the parameter in Table 10.3A.5-1 will replace the value of the corresponding parameter in Table 10.3.5-1.

Table 10.3A.5-1: Cell Specific Test Parameters for RSTD Test for E-UTRAN FDD for Carrier Aggregation for 20MHz bandwidth

| Parameter | Unit | Cell1 | Cell2 | Cell3 |
|---|------------|--------|--------|--------|
| I_0 ^{Note1} | dBm/18 MHz | -67.03 | -66.98 | -66.98 |
| Note 1: I_0 level has been derived from other parameters for information purposes. It is not settable parameter itself. I_0 values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS | | | | |
| Note 2: See Table 10.3.5-1 for other cell specific test parameters. | | | | |

10.4 TDD RSTD Measurement Accuracy for Carrier Aggregation

Editor's note: This test case is incomplete. The following aspects are either missing or not yet determined:

10.4.1 Test purpose

To verify that the TDD RSTD measurement accuracy is within the specified limits when both the reference cell and neighbouring cell belong to the secondary component carrier.

10.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.4.3 Minimum conformance requirements

The UE may operate in either E-UTRA inter-band or intra-band carrier aggregation mode. The requirements in this section shall apply regardless whether the configured downlink secondary cell is activated or deactivated by the MAC-CE command (3GPP TS 36.321 [34]). The requirements apply for bandwidths defined in the bandwidth combination set for the CA configurations supported by the UE [2].

The RSTD measurements, which are obtained when both the reference cell and neighbouring cell belong to the secondary component carrier, shall meet the intra-frequency RSTD accuracy requirements defined in TS 36.133 [23] section 9.1.3.3.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.12 and A.9.8.6.

10.4.4 Test description

10.4.4.1 Initial conditions

Test Environment: Normal; as defined in TS 36.508 [18] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [18] clause 4.3.1.2.

Channel bandwidth to be tested: 10 MHz.

1. Connect the SS and AWGN noise sources to the UE antenna connector or antenna connectors as shown in TS 36.508 [18] Annex A, Figure group A.41 as appropriate.
2. The general test parameter settings are set up according to Table 10.4.4.1-1.
3. Propagation conditions are set according to clause 4.7.2.1.
4. Message contents are defined in clause 10.4.4.3.
5. There are three synchronized cells on two different carrier frequencies. Cell 1 is the PCell on primary component carrier F1 (RF channel number 1), Cell 2 is the SCell and OTDOA assistance data reference cell on secondary component carrier F2 (RF channel number 2), and Cell 3 is the neighbour cell on F2. PCell (Cell 1) is the cell used for connection setup with the power level and mapping set according to TS 36.521-1 [24] Annex C.0 and C.1 as appropriate for this test. Cell 2 and Cell 3 are powered OFF.

Cell 3 is included in the OTDOA assistance data neighbour cell list, whilst Cell 1 is not included in the OTDOA assistance data. The assistance data neighbour cell list includes in total 15 cells, where 14 of the cells are not simulated (dummy cells; as defined in 3GPP TS 37.571-5 [20], clause 7.3.2).

Note that the measurement gap is not configured in the test because of UE carrier aggregation capability.

6. The true RSTD (which is the receive time difference for frame 0 between the two cells as seen at the UE antenna connector) is set to 92 Ts (about 3 μ s) between neighbour Cell 3 and OTDOA assistance data reference cell, Cell 2.

Note that the related expectedRSTD value to be signalled over LPP is defined in Table 10.4.4.1-1.

Table 10.4.4.1-1: General Test Parameters for RSTD Test for E-UTRAN TDD for Carrier Aggregation

| Parameter | Unit | Value | Comment |
|--|------|--|---|
| PCFICH/PDCCH/PHICH parameters | | R.6 TDD | As specified in TS 36.521-3 [25] clause A.2.2 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.2 | | OP.2 TDD | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Assistance data reference cell | | Cell 2 | Cell 2 is the SCell on RF channel number 2 |
| PCell | | Cell 1 | Cell 1 on RF channel number 1 |
| Neighbour cell | | Cell 3 | Cell 3 on RF channel number 2 |
| E-UTRA RF Channel Number | | 1,2 | Two TDD carrier frequencies are used. |
| Channel Bandwidth (BW_{channel}) | MHz | 10 | |
| Special subframe configuration | | 6 | As specified in table 4.2-1 in TS 36.211 [26]. The same configuration in both cells. |
| Uplink-downlink configuration | | 1 | As specified in table 4.2-2 in TS 36.211 [26] and table 8.1.2.5.2-2 in TS 36.133 [23]. The same configuration in both cells. |
| PRS Transmission Bandwidth ^{Note 2} | RB | 50 | PRS Bandwidth: bandwidth is as indicated in <i>prs-Bandwidth</i> in the OTDOA assistance data defined in 3GPP TS 36.355 [4]. |
| PRS configuration Index I_{PRS} ^{Note 2} | | Cell 1: 14 Cell 2: 14 Cell 3: 14 | As defined in 3GPP TS 36.211 [26] |
| Number of consecutive positioning downlink subframes N_{PRS} ^{Note 2} | | 1 | As defined in 3GPP TS 36.211 [26] |
| prs-MutingInfo ^{Note 2} | | Cell 1: '11110000' Cell 2: '11110000' Cell 3: '11110000' | See section 6.5.1.2 in 3GPP TS 36.355 [4] for more information |
| Cell ID ^{Note 2} | | (Cell ID of cell 2 – Cell ID of cell 3) mod 6 = 3 | PCI of cell 1 is selected randomly. |
| expectedRSTD ^{Note 1} | μs | 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD indicator |
| expectedRSTDUncertainty ^{Note 1} | μs | 5 | The corresponding parameter in the OTDOA assistance data specified in TS 36.355 [4] is the expectedRSTD-Uncertainty index |
| CP length ^{Note 2} | | Normal | |
| DRX | | OFF | |
| Radio frame transmit time difference between Cell 2 and Cell 3 ^{Note 3} | μs | 3 | Synchronous cells |
| Cell 2 timing offset to Cell 1 | μs | 0 | Synchronous cells |
| Number of cells provided in OTDOA assistance data | | 16 | The list includes the assistance-data-reference cell and 15 other cells. All cells provided in OTDOA assistance data are on RF channel 2. |
| $T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$ ^{Note 4} | ms | 2560 | Derived according to the RSTD measurement requirements specified in Section 10.2.3 |
| <p>NOTE 1: Parameters “Expected RSTD” and “Expected RSTD uncertainty” are not settable parameters. These are parameters signalled in LPP only. For the values to be used in LPP see Table 10.4.4.3-3 and TS 37.571-5 [20], clause 7.3.2.</p> <p>NOTE 2: Parameters “PRS Transmission Bandwidth”, “PRS configuration index”, “Number of consecutive positioning downlink subframes”, “prs-MutingInfo”, “Cell ID” and “CP length” are settable parameters and also parameters signalled in LPP. The values to be used for “Cell ID” are as follows: Cell 1: 0, Cell 2: 7, Cell 3: 10. For the values to be used in LPP see Table 10.4.4.3-3 and TS 37.571-5 [20], clause 7.3.2.</p> <p>NOTE 3: The parameter “Radio frame transmit time difference between Cell 2 and Cell 3” is used to set the “true RSTD” value in step 6 of clause 10.4.4.1.</p> <p>NOTE 4: The parameter “$T_{\text{RSTD IntraFreqFDD, E-UTRAN}}$” is not a settable parameter but is used to set the LPP “responseTime” value in Table 10.4.4.3-2. The value of the LPP responseTime IE is set to $T_{\text{RSTD IntraFreqFDD, E-UTRAN}} + \Delta T$ ms, where $\Delta T = 150$ ms, giving a value of 2710 ms. This is rounded up to the next allowed LPP value of 3 seconds.</p> | | | |

10.4.4.2 Test procedure

The RSTD measurements are performed between Cell 2 and Cell 3 to verify that when both the reference cell and neighbouring cell belong to the secondary component carrier the RSTD measurement accuracy can meet the intra-frequency RSTD accuracy requirements defined in section 10.4.3.

The test consists of a set-up period and a measurement period. All Cells are active during the complete test. The beginning of the measurement period shall be aligned with the first PRS positioning subframe of a positioning occasion in the reference cell.

NOTE: The information on when PRS is muted is conveyed to the UE using PRS muting information in the OTDOA assistance data.

The OTDOA-RequestLocationInformation message and the OTDOA assistance data as defined in clause 10.4.4.3 shall be provided to the UE during the set-up period. The last TTI containing the OTDOA-RequestLocationInformation message shall be provided to the UE ΔT ms before the start of the measurement period, where $\Delta T = 150$ ms is the maximum processing time of the OTDOA-RequestLocationInformation message and the OTDOA assistance data in the UE.

1. Ensure that the UE is in state Generic RB Established State 3A-RF according to 3GPP TS 36.508 [18] clause 7.2A.3.
2. Configure Cell 2 and Cell 3 on the SCC according to TS 36.521-1 [24] Annex C.0 and C.1 for all downlink physical channels except PHICH.
3. The SS shall configure the SCell (Cell 2) on the SCC as per TS 36.508 [18] clause 5.2A.
4. The SS activates the SCell (Cell 2) by sending the Activation/Deactivation MAC control element according to TS 36.321 [34] clauses 5.13 and 6.1.3.8. Wait for at least 2 seconds as per TS 36.133 [23] clause 8.3.3.2.
5. The SS shall send a RESET UE POSITIONING STORED INFORMATION message.
6. Set the parameters according to Table 10.4.5-1 as appropriate. Propagation conditions are set according to clause 4.7.2.1.
- 6a. The SS shall send an LPP REQUEST CAPABILITIES message.
- 6b. The UE shall send an LPP PROVIDE CAPABILITIES message indicating the OTDOA capabilities supported by the UE in the *OTDOA-ProvideCapabilities* IE.
7. The SS shall send a LPP PROVIDE ASSISTANCE DATA message, including the *OTDOA-ProvideAssistanceData* IE. If the UE message at step 6b includes the *ackRequested* IE set to TRUE, then the SS shall send an acknowledgment in the LPP PROVIDE ASSISTANCE DATA message.
8. The SS shall send a LPP REQUEST LOCATION INFORMATION message, including the *OTDOA-RequestLocationInformation* IE such that the UE receives the message ΔT ms before the start of measurement period, where $\Delta T = 150$ ms.
9. The UE shall transmit a LPP PROVIDE LOCATION INFORMATION message, including the *OTDOA-ProvideLocationInformation* IE.
10. If the UE message at step 9 includes the *ackRequested* IE set to TRUE, the SS shall send a LPP acknowledgement message.
11. The SS shall check the *rstd* value for Cell 3 in the *OTDOA-SignalMeasurementInformation* IE according to Table 10.4.5-2.
12. Repeat step 5-11 until the confidence level according to Annex D is achieved.

10.4.4.3 Message contents

Table 10.4.4.3-1: RESET UE POSITIONING STORED INFORMATION

| Derivation Path: 36.509 clause 6.9 | | | |
|------------------------------------|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE Positioning Technology | 0 0 0 0 0 0 1 | OTDOA | |

Table 10.4.4.3-1a: LPP Request Capabilities

| Information Element | Value/remark |
|----------------------------------|--------------|
| <i>otdoa-RequestCapabilities</i> | TRUE |

Table 10.4.4.3-2: LPP RequestLocationInformation

| Derivation Path: 36.355 clause 6.2 | | | |
|--|--------------------------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | FALSE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| requestLocationInformation-r9 SEQUENCE { | | | |
| commonIEsRequestLocationInformation SEQUENCE { | | | |
| locationInformationType | locationMeasurementsRequired | | |
| triggeredReporting | Not present | | |
| periodicalReporting | Not present | | |
| additionalInformation | onlyReturnInformationRequested | | |
| qos SEQUENCE { | | | |
| horizontalAccuracy | Not present | | |
| verticalCoordinateRequest | FALSE | | |
| verticalAccuracy | Not present | | |
| responseTime | 3 | See Note 5 of Table 10.4.4.1-1 | |
| velocityRequest | FALSE | | |
| } | | | |
| Environment | Not present | | |
| locationCoordinateTypes | Not present | | |
| velocityTypes | Not present | | |
| } | | | |
| a-gnss-RequestLocationInformation | Not present | | |
| otdoa-RequestLocationInformation SEQUENCE { | | | |
| assistanceAvailability | FALSE | | |
| } | | | |
| ecid-RequestLocationInformation | Not present | | |
| epdu-RequestLocationInformation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.4.4.3-3: LPP ProvideAssistanceData

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| Initiator | locationServer | | |
| transactionNumber | (0..255) | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | Not present | | |
| acknowledgement | Not present | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideAssistanceData-r9 SEQUENCE { | | | |
| commonIEsProvideAssistanceData | Not present | | |
| a-gnss-ProvideAssistanceData | Not present | | |
| otdoa-ProvideAssistanceData SEQUENCE { | | | |
| otdoa-ReferenceCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-NeighbourCellInfo | As defined in TS 37.571-5 [20], clause 7.3.2. | | |
| otdoa-Error | Not present | | |
| } | | | |
| epdu-ProvideAssistanceData | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 10.4.4.3-4: LPP ProvideLocation Information

| Derivation Path: 36.355 clause 6.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| LPP-Message ::= SEQUENCE { | | | |
| transactionID SEQUENCE { | | | |
| initiator | locationServer | | |
| transactionNumber | 1 | | |
| } | | | |
| endTransaction | TRUE | | |
| sequenceNumber | (0..255) | | |
| acknowledgement | | | |
| lpp-MessageBody CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| provideLocationInformation-r9 SEQUENCE { | | | |
| commonIEsProvideLocationInformation | Not present. | | |
| a-gnss-ProvideLocationInformation | Not present | | |
| otdoa-ProvideLocationInformation | | | |
| SEQUENCE { | | | |
| otdoaSignalMeasurementInformation | | | |
| SEQUENCE { | | | |
| systemFrameNumber | | | |
| physCellIdRef | Cell 2 | | |
| cellGlobalIdRef | | | |
| earfcnRef | | | |
| referenceQuality | | | |
| neighbourMeasurementList | | | |
| SEQUENCE (SIZE(1)) { | | | |
| physCellIdNeighbour | Cell 3 | | |
| cellGlobalIdNeighbour | | | |
| earfcnNeighbour | | | |
| rstd | Set according to Table 10.4.5-2 | | |
| rstd-Quality | | | |
| } | | | |
| } | | | |
| } | | | |
| otdoa-Error | May be present with error reason 'undefined' or 'attemptedButUnableToMeasureSomeNeighbourCells' | | |
| } | | | |
| ecid-ProvideLocationInformation | Not present | | |
| epdu-ProvideLocationInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

10.4.5 Test requirement

Table 10.4.5-1 defines the primary level settings including test tolerances for the test.

The TDD RSTD accuracy test shall meet the reported values in Table 10.4.5-2.

Table 10.4.5-1: Cell Specific Test Parameters for RSTD Test for E-UTRAN TDD for Carrier Aggregation

| Parameter | Unit | Cell 1 | Cell 2 | Cell 3 |
|---|------------|--------|-------------------|-------------------|
| E-UTRA RF Channel Number | | 1 | 2 | 2 |
| PBCH_RA | dB | 0 | 0 | 0 |
| PBCH_RB | | | | |
| PSS_RA | | | | |
| SSS_RA | | | | |
| PCFICH_RB | | | | |
| PHICH_RA | | | | |
| PHICH_RB | | | | |
| PDCCH_RA | | | | |
| PDCCH_RB | | | | |
| OCNG_RA ^{Note 1} | | | | |
| OCNG_RB ^{Note 1} | | | | |
| PRS_RA | dB | -3 | 0.3 | 0.3 |
| N_{oc} ^{Note 2} | dBm/15 kHz | -98 | | |
| PRS \hat{E}_s/N_{oc} | dB | -6 | -5.7 | -12.7 |
| PRS \hat{E}_s/I_{ot} ^{Note 3} | dB | -6 | -5.7 | -12.7 |
| I_o ^{Note 3} | dBm/9 MHz | -70.04 | -69.99, -70.01 | -69.99, -70.01 |
| PRP ^{Note 3} | dBm/15kHz | -104 | -103.7 | -110.7 |
| \hat{E}_s/N_{oc} ^{Note 3} | dB | -3 | -6 | -13 |
| RSRP ^{Note 3} | dBm/15kHz | -101 | -104 | -111 |
| Propagation condition | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). | | | | |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for N_{oc} to be fulfilled. | | | | |
| Note 3: \hat{E}_s/N_{oc} , PRS \hat{E}_s/I_{ot} , I_o , RSRP and PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. I_o values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS. | | | | |

Table 10.4.5-2: RSTD TDD accuracy requirements for the reported values for Carrier Aggregation

| | Value |
|------------------------|-----------|
| Lowest reported value | RSTD_6441 |
| Highest reported value | RSTD_6453 |

For the test to pass, the ratio of successful reported values shall be more than 90% with a confidence level of 95%.

10.4A TDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz

10.4A.1 Test purpose

Same as defined in clause 10.4.1.

10.4A.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 10 and forward that supports UE-assisted OTDOA for Carrier Aggregation.

10.4A.3 Minimum conformance requirements

Same as defined in clause 10.4.3.

The normative reference for this requirement is TS 36.133 [23] clause 9.1.12 and A.9.8.8.

10.4A.4 Test description

10.4A.4.1 Initial conditions

Same as defined in clause 10.4.4.1 except that the values of the parameters in Table 10.4A.4.1-1 will replace the values of the corresponding parameters in Table 10.4.4.1-1.

Channel bandwidth to be tested: 20 MHz.

Table 10.4A.4.1-1: General Test Parameters for RSTD Test for E-UTRAN TDD for Carrier Aggregation for 20MHz

| Parameter | Unit | Value | Comment |
|---|------|----------|---|
| PCFICH/PDCCH/PHICH parameters | | R.10 TDD | As specified in clause TS 36.521-3 [25] clause A.2.2 |
| OCNG Patterns defined in TS 36.521-3 [25] clause D.2 | | OP.8 TDD | OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols (other than those in the PRS subframes). |
| Channel Bandwidth ($BW_{channel}$) | MHz | 20 | |
| PRS Bandwidth | RB | 100 | PRS Bandwidth: bandwidth is as indicated in <i>prs-Bandwidth</i> in the OTDOA assistance data defined in 3GPP TS 36.355 [4]. |
| Note 1: See Table 10.4.4.1-1 for other general test parameters. | | | |
| Note 2: This test verifies the requirement which is independent of channel bandwidth and is performed according to the principle defined in clause 4.7.5. | | | |

10.4A.4.2 Test procedure

Same as defined in clause 10.4.4.2.

10.4A.4.3 Message contents

Same as defined in clause 10.4.4.3.

10.4A.5 Test requirement

Same as defined in clause 10.4.5 except that the value of the parameter in Table 10.4A.5-1 will replace the value of the corresponding parameter in Table 10.4.5-1.

Table 10.4A.5-1: Cell Specific Test Parameters for RSTD Test for E-UTRAN TDD for Carrier Aggregation for 20MHz bandwidth

| Parameter | Unit | Cell1 | Cell2 | Cell3 |
|---|-----------|--------|--------|--------|
| I_0 ^{Note1} | dBm/9 MHz | -67.03 | -66.98 | -66.98 |
| Note 1: I_0 level has been derived from other parameters for information purposes. It is not settable parameter itself. I_0 values are derived in the case that there is no PBCH, PSS or SSS in the OFDM symbols carrying PRS | | | | |
| Note 2: See Table 10.4.5-1 for other cell specific test parameters. | | | | |

Annex A (informative): Connection Diagrams

Definition of Terms

GNSS: In this clause the term GNSS also includes the case where the only satellite system used is GPS.

System Simulator or SS: A device or system, that is capable of generating simulated Node B and/or eNode B signalling and analysing UE signalling responses on one RF channel, in order to create the required test environment for the UE under test. It will also include the following capabilities:

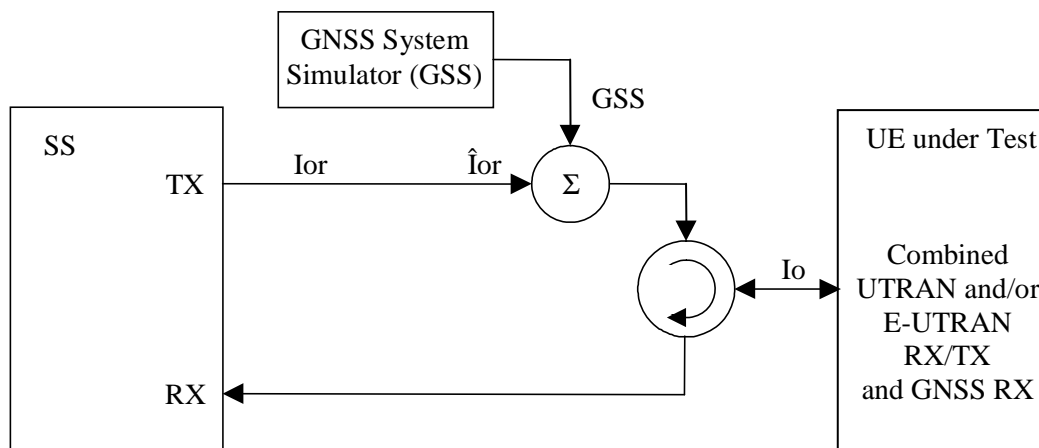
1. Control of the UE Tx output power through TPC commands.
2. Measurement of signalling timing and delays.
3. Ability to simulate UTRAN and/or E-UTRAN signalling.

GNSS System Simulator or GSS: A device or system, that is capable of generating simulated GNSS satellite transmissions in order to create the required test environment for the UE under test. It will also include the following capabilities:

1. Control of the output power of individual satellites and the simulation of atmospheric delays and multi-path.
2. Generation of appropriate assistance data to be transmitted to the UE via the SS.
3. Ability to synchronize with UTRAN and/or E-UTRAN timing in the SS.

Test System: A combination of devices brought together into a system for the purpose of making one or more measurements on a UE in accordance with the test case requirements. The following diagrams are all examples of Test Systems.

NOTE: The above terms are logical definitions to be used to describe the test methods used in the present document, in practice, real devices called "System Simulators" may also include additional measurement capabilities or may only support those features required for the test cases they are designed to perform.



**Figure A.1: Connection for A-GNSS Minimum Performance requirements tests
for UE with combined UTRAN and/or E-UTRAN / GNSS antenna**

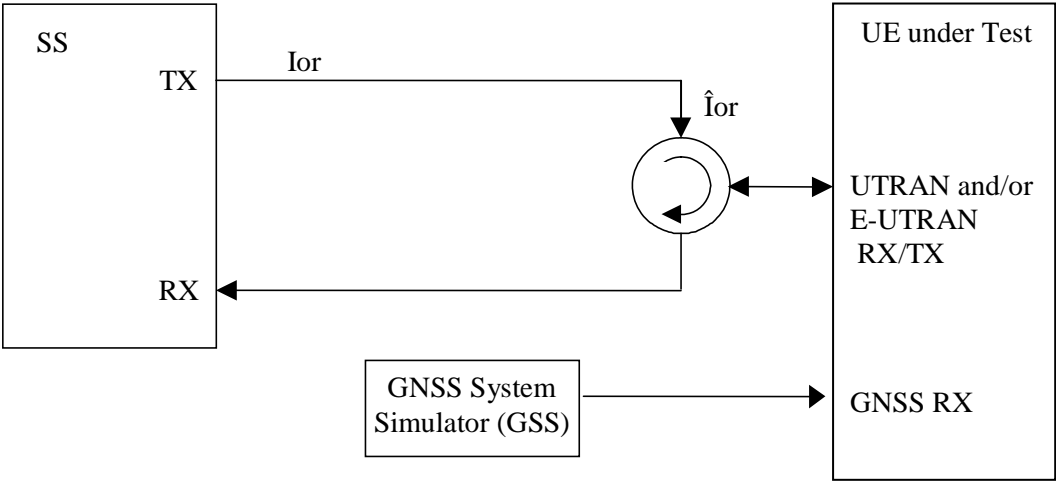


Figure A.2: Connection for A-GNSS Minimum Performance requirements tests for UE with separate UTRAN and/or E-UTRAN and GNSS antennas

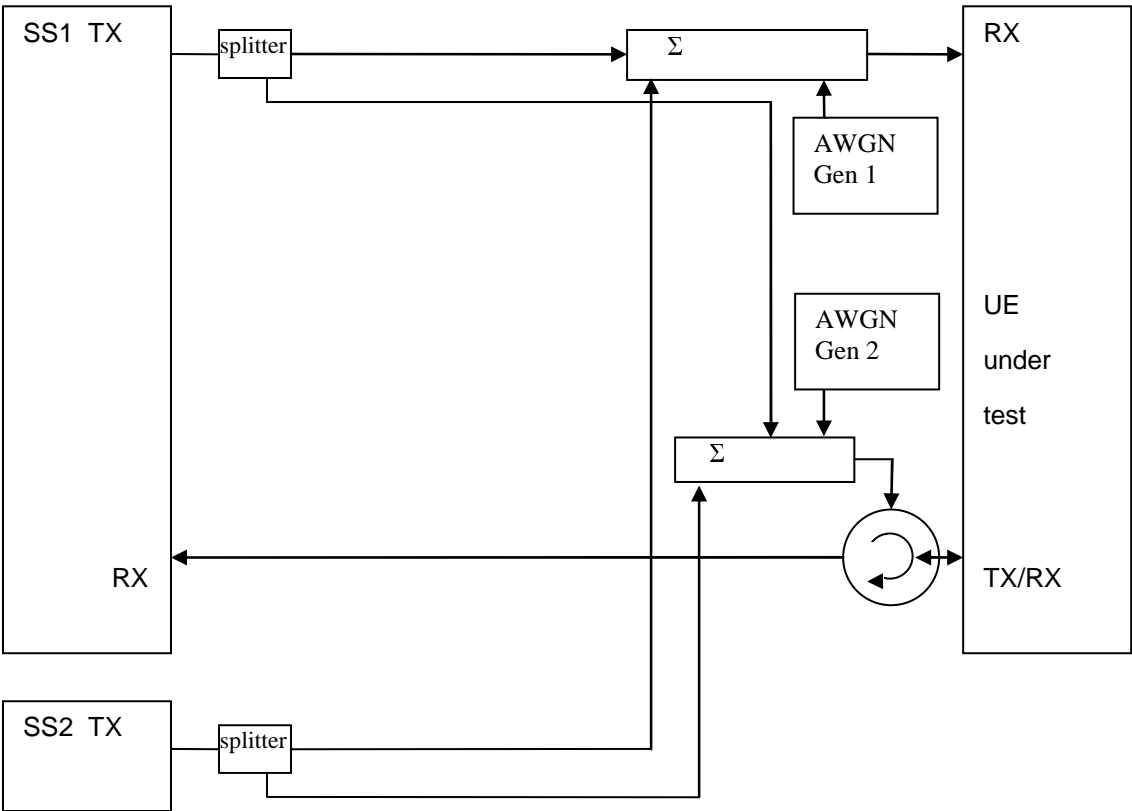


Figure A.3: Connection for 2 cells OTDOA tests with static propagation

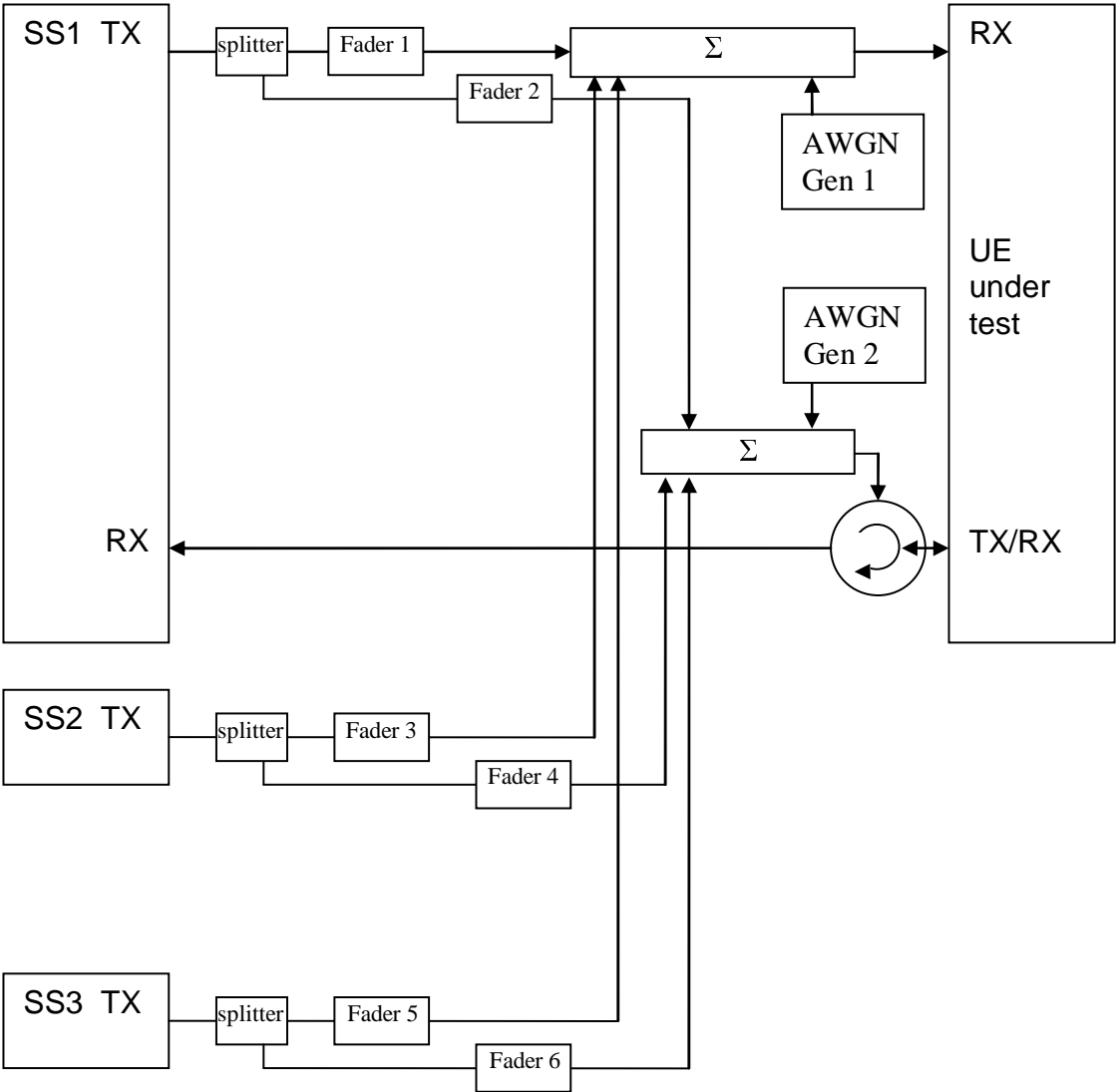


Figure A.4: Connection for 3 cells OTDOA tests with multipath fading propagation conditions

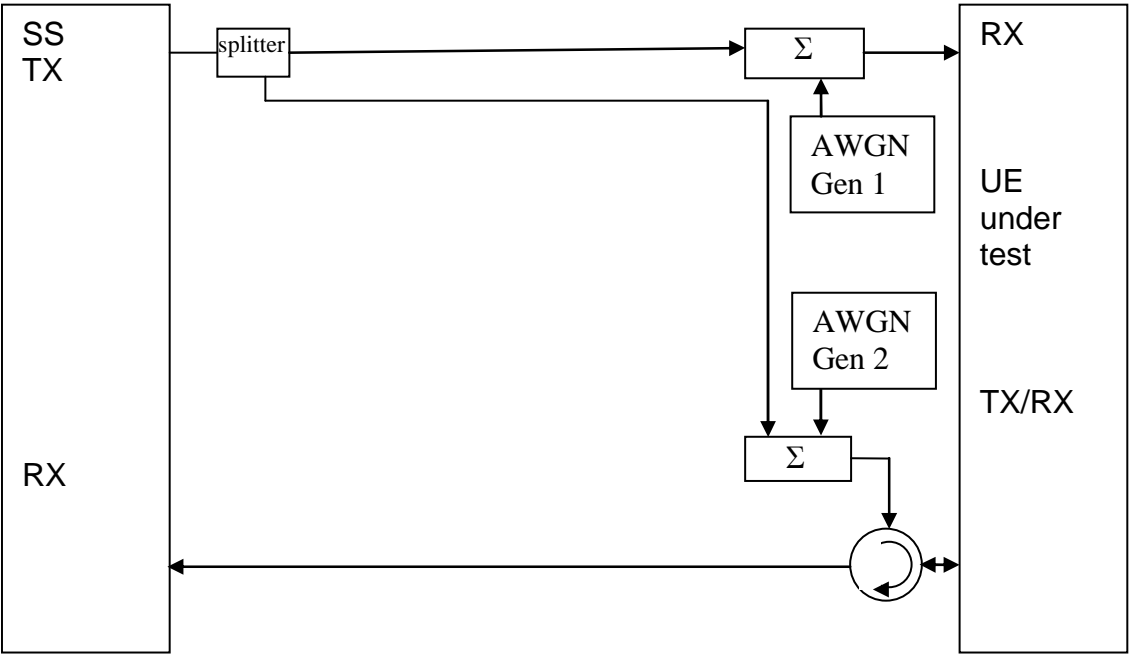


Figure A.5: Connection for 1 cell ECID tests with static propagation conditions

Annex B (normative): Converting A-GNSS UE-assisted measurement reports into position estimates

B.1 Introduction

In this clause the terms GNSS and A-GNSS also include the cases where the only satellite system used is GPS unless otherwise stated.

To convert the A-GNSS UE measurement reports in case of UE-assisted mode of A-GNSS into position errors, a transformation between the "measurement domain" (code-phases, etc.) into the "state" domain (position estimate) is necessary. Such a transformation procedure is outlined in the following clauses. The details can be found in [8-10] and [12-17].

B.2 UTRAN UE measurement reports for A-GPS L1 C/A only

In case of UTRAN UE-assisted A-GPS L1 C/A only, the measurement parameters are contained in the RRC UE POSITIONING GPS MEASURED RESULTS IE (clause 10.3.7.93 in 3GPP TS 25.331 [30]). The measurement parameters required for calculating the UE position are:

1) Reference Time: The UE has two choices for the Reference Time:

- a) "UE GPS timing of cell frames";
- b) "GPS TOW msec".

2) Measurement Parameters: 1 to <maxSat>:

- a) "Satellite ID (SV PRN)";
- b) "Whole GPS chips";
- c) "Fractional GPS Chips";
- d) "Pseudorange RMS Error".

Additional information required at the system simulator:

- 1) "UE positioning GPS reference UE position" (clause 10.3.8.4c in 3GPP TS 25.331 [30]):
Used for initial approximate receiver coordinates.
- 2) "UE positioning GPS navigation model" (clause 10.3.7.94 in 3GPP TS 25.331 [30]):
Contains the GPS ephemeris and clock correction parameters as specified in [8]; used for calculating the satellite positions and clock corrections.
- 3) "UE positioning GPS ionospheric model" (clause 10.3.7.92 in 3GPP TS 25.331 [30]):
Contains the ionospheric parameters which allow the single frequency user to utilize the ionospheric model as specified in [8] for computation of the ionospheric delay.

B.3 UTRAN UE measurement reports for A-GNSS

In case of UTRAN UE-assisted A-GNSS, the measurement parameters are contained in the RRC UE POSITIONING GANSS MEASURED RESULTS IE (clause 10.3.7.93a in 3GPP TS 25.331 [30]). In case the UE provides also measurements on the GPS L1 C/A signal, the measurement parameters are contained in the RRC UE POSITIONING GPS MEASURED RESULTS IE (clause 10.3.7.93 in 3GPP TS 25.331 [30]). The measurement parameters required for calculating the UE position are:

1) Reference Time: The UE has two choices for the Reference Time:

- a) "UE GANSS Timing of Cell Frames" and/or "UE GPS Timing of Cell Frames";
- b) "GANSS TOD msec" and/or "GPS TOW msec" if GPS L1 C/A signal measurements are also provided.

NOTE: It is not expected that an UE will ever report both a GANSS TOD and a GPS TOW. However if two time stamps are provided and they derive from different user times, be aware that no compensation is made for this difference and this could affect the location accuracy.

- 2) Measurement Parameters for each GANSS and GANSS Signal: 1 to <maxGANSSSat>:
 - a) "Satellite ID"; mapping according to table 10.3.7.88b in 3GPP TS 25.331 [30];
 - b) "GANSS Code Phase";
 - c) "GANSS Integer Code Phase";
 - d) "GANSS Integer Code Phase Extension";
 - e) "Code Phase RMS Error";
- 3) Additional Measurement Parameters in case of GPS L1 C/A signal measurements are also provided: 1 to <maxSat>:
 - a) "Satellite ID (SV PRN)";
 - b) "Whole GPS chips";
 - c) "Fractional GPS Chips";
 - d) "Pseudorange RMS Error".

Additional information required at the system simulator:

- 1) "UE Positioning GANSS Reference UE Position" or "UE Positioning GPS Reference UE Position" (clause 10.3.8.4c in 3GPP TS 25.331 [30]):
Used for initial approximate receiver coordinates.
- 2) "UE Positioning GANSS Navigation Model" and "UE Positioning GANSS Additional Navigation Models" (clauses 10.3.7.94a and 10.3.7.94b in 3GPP TS 25.331 [30]):
Contains the ephemeris and clock correction parameters as specified in the relevant ICD of each supported GANSS; used for calculating the satellite positions and clock corrections.
- 3) "UE Positioning GANSS Ionospheric Model" (clause 10.3.7.92a in 3GPP TS 25.331 [30]):
Contains the ionospheric parameters which allow the single frequency user to utilize the ionospheric model as specified in [21] for computation of the ionospheric delay.
- 4) "UE Positioning GANSS Additional Ionospheric Model" (clause 10.3.7.92b in 3GPP TS 25.331 [30]):
Contains the ionospheric parameters which allow the single frequency user to utilize the ionospheric model as specified in [20] for computation of the ionospheric delay.
- 5) "UE Positioning GANSS Time Model" (clause 10.3.7.97a in 3GPP TS 25.331 [30]):
Contains the GNSS-GNSS Time Offset for each supported GANSS. Note, that "UE Positioning GANSS Time Model" IE contains only the sub-ms part of the offset. Any potential integer seconds offset may be obtained from "UE Positioning GPS UTC Model" (clause 10.3.7.97 in 3GPP TS 25.331 [30]), "UE Positioning GANSS UTC Model" (clause 10.3.7.97c in 3GPP TS 25.331 [30]), or "UE Positioning GANSS Additional UTC Models" (clause 10.3.7.97d in 3GPP TS 25.331 [30]).
- 6) "UE Positioning GPS Navigation Model" (clause 10.3.7.94 in 3GPP TS 25.331 [30]):
Contains the GPS ephemeris and clock correction parameters as specified in [8]; used for calculating the GPS satellite positions and clock corrections in case of GPS L1 C/A signal measurements are the only GPS measurements provided in addition to GANSS measurements.
- 7) "UE Positioning GPS Ionospheric Model" (clause 10.3.7.92 in 3GPP TS 25.331 [30]):
Contains the ionospheric parameters which allow the single frequency user to utilize the ionospheric model as specified in [8] for computation of the ionospheric delay.

B.4 E-UTRAN UE measurement reports

In case of E-UTRAN UE-assisted A-GNSS, the measurement parameters are contained in the LPP GNSS-SignalMeasurementInformation IE (clause 6.5.2.6 in 3GPP TS 36.355 [4]). The measurement parameters required for calculating the UE position are:

- 1) Reference Time: The UE has two choices for the Reference Time:
 - a) "networkTime";
 - b) "gnss-TOD-msec".
- 2) Measurement Parameters for each GNSS and GNSS signal: 1 to 64:
 - a) "svID";
 - b) "codePhase";
 - c) "integerCodePhase";
 - d) "codePhaseRMSError".

Additional information required at the system simulator:

- 1) "GNSS-ReferenceLocation" (clause 6.5.2.2 in 3GPP TS 36.355 [4]):
Used for initial approximate receiver coordinates.
- 2) "GNSS-NavigationModel" (clause 6.5.2.2 in 3GPP TS 36.355 [4]):
Contains the GNSS ephemeris and clock correction parameters as specified in the relevant ICD of each supported GNSS; used for calculating the satellite positions and clock corrections.
- 3) "GNSS-IonosphericModel" (clause 6.5.2.2 in 3GPP TS 36.355 [4]):
Contains the ionospheric parameters which allow the single frequency user to utilize the ionospheric model as specified in the relevant ICD of each supported GNSS for computation of the ionospheric delay.

B.5 WLS position solution

The WLS position solution problem is concerned with the task of solving for four unknowns; x_u , y_u , z_u the receiver coordinates in a suitable frame of reference (usually ECEF) and b_u the receiver clock bias. It typically requires the following steps:

Step 1: Formation of pseudo-ranges

The observation of code phase reported by the UE for each satellite SV_i is related to the pseudo-range/c modulo the "GNSS Code Phase Ambiguity" (UTRAN), or "gnss-CodePhaseAmbiguity" (E-UTRAN), or modulo 1 ms (the length of the C/A code period) in case of GPS L1 C/A signal measurements. For the formation of pseudo-ranges, the integer number of milliseconds to be added to each code-phase measurement has to be determined first. Since 1 ms corresponds to a travelled distance of 300 km, the number of integer ms can be found with the help of reference location and satellite ephemeris. The distance between the reference location and each satellite SV_i is calculated and the integer number of milliseconds to be added to the UE code phase measurements is obtained.

Step 2: Correction of pseudo-ranges for the GNSS-GNSS time offsets

In the case that the UE reports measurements for more than a single GNSS, the pseudo-ranges are corrected for the time offsets between the GNSSs relative to the selected reference time using the GNSS-GNSS time offsets available at the system simulator:

$$\rho_{GNSS_m,i} \equiv \rho_{GNSS_m,i} - c \cdot (t_{GNSS_k} - t_{GNSS_m}),$$

where $\rho_{GNSS_m,i}$ is the measured pseudo-range of satellite i of GNSS_m. The system time t_{GNSS_k} of GNSS_k is the reference time frame, and $(t_{GNSS_k} - t_{GNSS_m})$ is the available GNSS-GNSS time offset, and c is the speed of light.

Step 3: Formation of weighting matrix

The UE reported "codePhaseRMSError" (E-UTRAN) or "Code Phase RMS Error" and/or "Pseudorange RMS Error" (UTRAN) values are used to calculate the weighting matrix for the WLS algorithm [9]. According to 3GPP TS 25.331 [30] and 3GPP TS 36.355 [4], the encoding for this field is a 6 bit value that consists of a 3 bit mantissa, X_i and a 3 bit exponent, Y_i for each SV_i :

$$w_i = RMSError = 0.5 \times \left(1 + \frac{X_i}{8} \right) \times 2^{Y_i}$$

The weighting Matrix \mathbf{W} is defined as a diagonal matrix containing the estimated variances calculated from the "codePhaseRMSError" (E-UTRAN) or "Code Phase RMS Error" and/or "Pseudorange RMS Error" (UTRAN) values:

$$\mathbf{W} = \text{diag} \left\{ 1/w_{GNSS_{1,1}}^2, 1/w_{GNSS_{1,2}}^2, \dots, 1/w_{GNSS_{1,n}}^2, \dots, 1/w_{GNSS_{m,1}}^2, 1/w_{GNSS_{m,2}}^2, \dots, 1/w_{GNSS_{m,l}}^2 \right\}$$

Step 4: WLS position solution

The WLS position solution is described in reference [9] and usually requires the following steps:

- 1) Computation of satellite locations at time of transmission using the ephemeris parameters and user algorithms defined in the relevant ICD of the particular GNSS. The satellite locations are transformed into WGS-84 reference frame, if needed.
- 2) Computation of clock correction parameters using the parameters and algorithms as defined in the relevant ICD of the particular GNSS.
- 3) Computation of atmospheric delay corrections using the parameters and algorithms defined in the relevant ICD of the particular GNSS for the ionospheric delay, and using the Gupta model in reference [10] p. 121 equation (2) for the tropospheric delay. For GNSSs which do not natively provide ionospheric correction models (e.g., GLONASS), the ionospheric delay is determined using the available ionospheric model adapted to the particular GNSS frequency.
- 4) The WLS position solution starts with an initial estimate of the user state (position and clock offset). The Reference Location is used as initial position estimate. The following steps are required:
 - a) Calculate geometric range (corrected for Earth rotation) between initial location estimate and each satellite included in the UE measurement report.
 - b) Predict pseudo-ranges for each measurement including clock and atmospheric biases as calculated in 1) to 3) above and defined in the relevant ICD of the particular GNSS and [9].
 - c) Calculate difference between predicted and measured pseudo-ranges Δp
 - d) Calculate the "Geometry Matrix" \mathbf{G} as defined in [9]:

$$\mathbf{G} \equiv \begin{bmatrix} -\hat{\mathbf{1}}_{GNSS_{1,1}}^T & 1 \\ -\hat{\mathbf{1}}_{GNSS_{1,2}}^T & 1 \\ \vdots & \vdots \\ -\hat{\mathbf{1}}_{GNSS_{1,n}}^T & 1 \\ \vdots & \vdots \\ -\hat{\mathbf{1}}_{GNSS_{m,1}}^T & 1 \\ -\hat{\mathbf{1}}_{GNSS_{m,2}}^T & 1 \\ \vdots & \vdots \\ -\hat{\mathbf{1}}_{GNSS_{m,l}}^T & 1 \end{bmatrix} \quad \text{with } \hat{\mathbf{1}}_{GNSS_{m,i}} \equiv \frac{\mathbf{r}_{GNSS_{m,i}} - \hat{\mathbf{r}}_u}{\left| \mathbf{r}_{GNSS_{m,i}} - \hat{\mathbf{r}}_u \right|} \quad \text{where } \mathbf{r}_{GNSS_{m,i}} \text{ is the satellite position vector for } SV_i \text{ of } GNSS_m$$

(calculated in 1) above), and $\hat{\mathbf{r}}_u$ is the estimate of the user location.

- e) Calculate the WLS solution according to [9]:

$$\Delta \hat{\mathbf{x}} = \left(\mathbf{G}^T \mathbf{W} \mathbf{G} \right)^{-1} \mathbf{G}^T \mathbf{W} \Delta \mathbf{p}$$

f) Adding the $\Delta \hat{\mathbf{x}}$ to the initial state estimate gives an improved estimate of the state vector:

$$\hat{\mathbf{x}} \rightarrow \hat{\mathbf{x}} + \Delta \hat{\mathbf{x}} .$$

5) This new state vector $\hat{\mathbf{x}}$ can be used as new initial estimate and the procedure is repeated until the change in $\hat{\mathbf{x}}$ is sufficiently small.

Step 5: Transformation from Cartesian coordinate system to Geodetic coordinate system

The state vector $\hat{\mathbf{x}}$ calculated in Step 4 contains the UE position in ECEF Cartesian coordinates together with the UE receiver clock bias relative to the selected GNSS system time. Only the user position is of further interest. It is usually desirable to convert from ECEF coordinates x_u, y_u, z_u to geodetic latitude φ , longitude λ and altitude h on the WGS84 reference ellipsoid.

Step 6: Calculation of "2-D Position Errors"

The latitude φ / longitude λ obtained after Step 5 is used to calculate the 2-D position error.

Annex C (normative): General test conditions and declarations

The requirements of this clause apply to all applicable tests in the present document.

In all the relevant clauses in this clause all 2D position error measurements shall be carried out according to the general rules for statistical testing in Annex D.

In this clause the terms GNSS and A-GNSS also include the cases where the only satellite system used is GPS unless otherwise stated.

For operating bands 22, 42 and 43, the Test Tolerances may not be valid since some Test System uncertainties are changed for frequencies above 3000MHz. The Test Tolerances for those specific bands are therefore For Further Study [FFS].

C.1 Acceptable uncertainty of Test System

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

It should be noted that the uncertainties in clause C.1 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

C.1.1 Measurement of test environments

The measurement accuracy of the UE environmental test conditions, defined in Annex G or TS 36.508 [18] clause 4.1, shall be:

| | |
|---------------------|------------|
| Pressure | ±5 kPa |
| Temperature | ±2 degrees |
| Relative Humidity | ±5 % |
| DC Voltage | ±1.0 % |
| AC Voltage | ±1.5 % |
| Vibration | 10 % |
| Vibration frequency | 0.1 Hz |

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

C.1.2 A-GNSS Minimum Performance requirements

Table C.1.1: Maximum Test System Uncertainty for A-GNSS Minimum Performance tests

| Clause | Maximum Test System Uncertainty | | Derivation of Test System Uncertainty |
|--|----------------------------------|----------|---|
| 5.2.1, 6.2.1, 7.1.1 Sensitivity Coarse Time Assistance | Coarse Time Assistance | ±200 ms | |
| | Absolute GNSS signal level | ±1 dB | |
| | Position error | ±0.05 m | Position error consists of ±0.05 m system uncertainty. The effect of position reporting resolution of approximately ±1.2 m (see note) is not included in the allowable test system uncertainty but is included in the Test Parameter Relaxations since this resolution limitation limits the reporting capability of the UE. For simplicity the combined Test Parameter Relaxation is given as ±1.3 m |
| | Response time | ± 300 ms | |
| 5.2.2, 6.2.2, 7.1.2 Sensitivity Fine Time Assistance | Coarse Time Assistance | ±200 ms | |
| | Fine Time Assistance | ±1 us | |
| | Absolute GNSS signal level | ±1 dB | |
| | Position error | ±0.05 m | Position error as above |
| | Response time | ± 300 ms | |
| 5.3, 6.3, 7.2 Nominal Accuracy | Coarse Time Assistance | ±200 ms | |
| | Absolute GNSS signal level | ±1 dB | |
| | Position error | ±0.05 m | Position error as above |
| | Response time | ± 300 ms | |
| 5.4, 6.4, 7.3 Dynamic Range | Coarse Time Assistance | ±200 ms | |
| | Absolute GNSS signal level | ±1 dB | |
| | Relative GNSS signal level | ±0.2 dB | |
| | Position error | ±0.05 m | Position error as above |
| | Response time | ± 300 ms | |
| 5.5, 6.5, 7.4 Multi-path scenario | Coarse Time Assistance | ±200 ms | |
| | Absolute GNSS signal level | ±1 dB | |
| | Relative GNSS signal level | ±0.2 dB | |
| | Position error | ±0.05 m | Position error as above |
| | Response time | ± 300 ms | |
| 5.6, 6.6, 7.5 Moving scenario and periodic update | Absolute GNSS signal level ±1 dB | ±1 dB | |
| | Position error ±0.05 m | ±0.05 m | Position error as above |
| | Differential response time | ± 100 ms | |

NOTE: For UE based mode the effect of position reporting resolution is given by:

$$\sqrt{\left(\frac{90 \times 2 \times \pi \times R}{2E23 \times 360}\right)^2 + \left(\frac{360 \times 2 \times \pi \times R \times \cos \phi}{2E24 \times 360}\right)^2} \text{ meters, where } R \text{ is the radius of the earth and } \phi \text{ is the latitude of}$$

the location. For the GNSS scenarios defined in TS 37.571-5 [20] this equates to approximately Editor's note: this needs checking once the GNSS scenarios are agreed [TBD] m. For simplicity this is given as ±1.2 m.

For UE assisted mode it is assumed that the output from the WLS position solution calculation in Annex B is coded using the same position coding method as for UE based mode before being used to calculate position error. Therefore the effect of reporting resolution will be the same as for UE based mode.

C.1.3 ECID and OTDOA Measurement requirements

Table C.1.3-1: Maximum Test System Uncertainty for ECID and OTDOA Measurement Requirements

| Clause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
|--|---|--|
| 8.1.1 E-UTRAN FDD UE Rx – Tx time difference case | $N_{oc} \pm 1.0$ dB averaged over BW_{Config} $\hat{E}_s / N_{oc} \pm 0.3$ dB $\pm 3T_s$ Uplink signal transmit timing relative to downlink | Note: \hat{E}_s / N_{oc} is the ratio of cell 1 signal / AWGN $T_s = 1/(15000 \times 2048)$ seconds, the basic timing unit defined in TS 36.211 [26] |
| 8.1.2 E-UTRAN TDD UE Rx – Tx time difference case | Same as 8.1.1 | Same as 8.1.1 |
| 8.1.5 E-UTRAN FDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (felCIC) | [TBD] | [TBD] |
| 8.1.6 E-UTRAN TDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (felCIC) | [TBD] | [TBD] |
| 9.1.1 FDD RSTD Measurement Reporting Delay | $N_{oc} \pm 1.0$ dB averaged over BW_{Config} PRS $\hat{E}_{s1} / N_{oc} \pm 0.6$ dB averaged over BW_{Config} $\hat{E}_{s1} / N_{oc} \pm 0.6$ dB averaged over BW_{Config} PRS $\hat{E}_{s2} / N_{oc} \pm 0.6$ dB averaged over BW_{Config} $\hat{E}_{s2} / N_{oc} \pm 0.6$ dB averaged over BW_{Config} PRS $\hat{E}_{s3} / N_{oc} \pm 0.6$ dB averaged over BW_{Config} $\hat{E}_{s3} / N_{oc} \pm 0.6$ dB averaged over BW_{Config} Response Time = ± 300 ms | Note: PRS \hat{E}_{s1} / N_{oc} and \hat{E}_{s1} / N_{oc} are the ratios of cell 1 signal / AWGN PRS \hat{E}_{s2} / N_{oc} and \hat{E}_{s2} / N_{oc} are the ratios of cell 2 signal / AWGN PRS \hat{E}_{s3} / N_{oc} and \hat{E}_{s3} / N_{oc} are the ratios of cell 3 signal / AWGN PRS \hat{E}_s / N_{oc} and \hat{E}_s / N_{oc} uncertainty for fading condition comprises two quantities: 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: PRS \hat{E}_s / N_{oc} and \hat{E}_s / N_{oc} uncertainty = $\text{SQRT}(\text{Signal-to-noise ratio uncertainty}^2 + \text{Fading profile power uncertainty}^2)$ Signal-to-noise ratio uncertainty ± 0.3 dB Fading profile power uncertainty ± 0.5 dB |
| 9.1.2 TDD RSTD Measurement Reporting Delay | Same as 9.1.1 | |
| 9.1.3 FDD RSTD Measurement Accuracy | $N_{oc} \pm 1.0$ dB averaged over BW_{Config} PRS $\hat{E}_{s1} / N_{oc} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s1} / N_{oc} \pm 0.3$ dB averaged over BW_{Config} PRS $\hat{E}_{s2} / N_{oc} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s2} / N_{oc} \pm 0.3$ dB averaged over BW_{Config} Cell Timing Difference = $\pm 1 T_s$ | Note: PRS \hat{E}_{s1} / N_{oc} and \hat{E}_{s1} / N_{oc} are the ratios of cell 1 signal / AWGN PRS \hat{E}_{s2} / N_{oc} and \hat{E}_{s2} / N_{oc} are the ratios of cell 2 signal / AWGN |
| 9.1.4 TDD RSTD Measurement Accuracy | Same as 9.1.3 | |

| | | |
|--|--|---|
| 9.2.1 FDD-FDD inter-frequency RSTD measurement reporting delay | $N_{oc1} \pm 1.0$ dB averaged over BW_{Config} $N_{oc2} \pm 1.0$ dB averaged over BW_{Config} $PRS \hat{E}_{s1} / N_{oc1} \pm 0.6$ dB averaged over BW_{Config} $\hat{E}_{s1} / N_{oc1} \pm 0.6$ dB averaged over BW_{Config} $PRS \hat{E}_{s2} / N_{oc2} \pm 0.6$ dB averaged over BW_{Config} $\hat{E}_{s2} / N_{oc2} \pm 0.6$ dB averaged over BW_{Config} $PRS \hat{E}_{s3} / N_{oc2} \pm 0.6$ dB averaged over BW_{Config} $\hat{E}_{s3} / N_{oc2} \pm 0.6$ dB averaged over BW_{Config} Response Time = ± 300 ms | <p>Note:</p> $PRS \hat{E}_{s1} / N_{oc1}$ and \hat{E}_{s1} / N_{oc1} are the ratios of cell 1 signal / AWGN for frequency 1 $PRS \hat{E}_{s2} / N_{oc2}$ and \hat{E}_{s2} / N_{oc2} are the ratios of cell 2 signal / AWGN for frequency 2 $PRS \hat{E}_{s3} / N_{oc2}$ and \hat{E}_{s3} / N_{oc2} are the ratios of cell 3 signal / AWGN for frequency 2 <p>$PRS \hat{E}_s / N_{oc}$ and \hat{E}_s / N_{oc} uncertainty for fading condition comprises two quantities:</p> <ol style="list-style-type: none"> 1. Signal-to-noise ratio uncertainty 2. Fading profile power uncertainty <p>Items 1 and 2 are assumed to be uncorrelated so can be root sum squared: $PRS \hat{E}_s / N_{oc}$ and \hat{E}_s / N_{oc} uncertainty = $SQRT(\text{Signal-to-noise ratio uncertainty}^2 + \text{Fading profile power uncertainty}^2)$ Signal-to-noise ratio uncertainty ± 0.3 dB Fading profile power uncertainty ± 0.5 dB</p> |
| 9.2.2 TDD-TDD inter-frequency RSTD measurement reporting delay | Same as 9.2.1 | |
| 9.2.4 FDD-FDD inter frequency RSTD Accuracy | $N_{oc1} \pm 1.0$ dB averaged over BW_{Config} $N_{oc2} \pm 1.0$ dB averaged over BW_{Config} $PRS \hat{E}_{s1} / N_{oc1} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s1} / N_{oc1} \pm 0.3$ dB averaged over BW_{Config} $PRS \hat{E}_{s2} / N_{oc2} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s2} / N_{oc2} \pm 0.3$ dB averaged over BW_{Config} Cell Timing Difference = $\pm 2 T_s$ | <p>Note:</p> $PRS \hat{E}_{s1} / N_{oc1}$ and \hat{E}_{s1} / N_{oc1} are the ratios of cell 1 signal / AWGN for frequency 1 $PRS \hat{E}_{s2} / N_{oc2}$ and \hat{E}_{s2} / N_{oc2} are the ratios of cell 2 signal / AWGN for frequency 2 |
| 9.2.5 TDD-TDD inter frequency RSTD Accuracy | Same as 9.2.4 | |
| 10.1 FDD RSTD Measurement Reporting Delay for Carrier Aggregation | | |
| 10.1A FDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz | | |
| 10.2 TDD RSTD Measurement Reporting Delay for Carrier Aggregation | | |
| 10.2A TDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz | | |

| | | |
|--|--|---|
| 10.3 FDD RSTD Measurement Accuracy for Carrier Aggregation | $N_{oc1} \pm 1.0$ dB averaged over BW_{Config} $N_{oc2} \pm 1.0$ dB averaged over BW_{Config} $PRS \hat{E}_{s1} / N_{oc1} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s1} / N_{oc1} \pm 0.3$ dB averaged over BW_{Config} $PRS \hat{E}_{s2} / N_{oc2} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s2} / N_{oc2} \pm 0.3$ dB averaged over BW_{Config} $PRS \hat{E}_{s3} / N_{oc2} \pm 0.3$ dB averaged over BW_{Config} $\hat{E}_{s3} / N_{oc2} \pm 0.3$ dB averaged over BW_{Config} Cell Timing Difference = $\pm 1 T_s$ | Note: $PRS \hat{E}_{s1} / N_{oc1}$ and \hat{E}_{s1} / N_{oc1} are the ratios of cell 1 signal / AWGN for frequency 1 $PRS \hat{E}_{s2} / N_{oc2}$ and \hat{E}_{s2} / N_{oc2} are the ratios of cell 2 signal / AWGN for frequency 2 $PRS \hat{E}_{s3} / N_{oc2}$ and \hat{E}_{s3} / N_{oc2} are the ratios of cell 3 signal / AWGN for frequency 2 |
| 10.3A FDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz | Same as 10.3 | |
| 10.4 TDD RSTD Measurement Accuracy for Carrier Aggregation | Same as 10.3 | |
| 10.4A TDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz | Same as 10.3 | |
| In addition, the following Test System uncertainties and related constraints apply. Any additional constraints are defined in the specific tests. | | |
| AWGN Bandwidth | | $\geq 1.08\text{MHz}, 2.7\text{MHz}, 4.5\text{MHz}, 9\text{MHz}, 13.5\text{MHz}, 18\text{MHz};$ $N_{RB} \times 180\text{kHz}$ according to BW_{Config} |
| AWGN absolute power uncertainty | | Test-specific |
| AWGN flatness and signal flatness, max deviation for any Resource Block, relative to average over BW_{Config} | | ± 2 dB |
| AWGN peak to average ratio | | ≥ 10 dB @0.001% |
| Signal-to noise ratio uncertainty | | Test-specific |
| Fading profile power uncertainty | | ± 0.5 dB |
| Fading profile delay uncertainty, relative to frame timing | | ± 5 ns (excludes absolute errors related to baseband timing) |

C.2 Test Parameter Relaxations (This clause is informative)

The Test Parameter Relaxations defined in this clause have been used to relax the Conformance requirement to derive the Test Requirements.

The Test Parameter Relaxations are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Parameter Relaxations may sometimes be set to zero.

The Test Parameter Relaxations should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

C.2.1 A-GNSS Minimum Performance requirements

Table C.2.1: Test Parameter Relaxations for A-GNSS Minimum Performance tests

| Clause | Test Parameter Relaxation | |
|---|----------------------------|--------|
| 5.2.1, 6.2.1, 7.1.1 Sensitivity Coarse Time Assistance | Coarse Time Assistance | 200 ms |
| | Absolute GNSS signal level | 1 dB |
| | Position error | 1.3 m |
| | Response time | 300 ms |
| 5.2.2, 6.2.2, 7.1.2 Sensitivity Fine Time Assistance | Coarse Time Assistance | 200 ms |
| | Fine Time Assistance | 1 us |
| | Absolute GNSS signal level | 1 dB |
| | Position error | 1.3 m |
| 5.3, 6.3, 7.2 Nominal Accuracy | Coarse Time Assistance | 200 ms |
| | Absolute GNSS signal level | 0 dB |
| | Position error | 1.3 m |
| | Response time | 300 ms |
| 5.4, 6.4, 7.3 Dynamic Range | Coarse Time Assistance | 200 ms |
| | Absolute GNSS signal level | 0 dB |
| | Relative GNSS signal level | 0.2 dB |
| | Position error | 1.3 m |
| 5.5, 6.5, 7.4 Multi-path scenario | Coarse Time Assistance | 200 ms |
| | Absolute GNSS signal level | 0 dB |
| | Relative GNSS signal level | 0.2 dB |
| | Position error | 1.3 m |
| 5.6, 6.6, 7.5 Moving scenario and periodic update | Response time | 300 ms |
| | Absolute GNSS signal level | 0 dB |
| | Position error | 1.3 m |
| | Differential Response Time | 100 ms |

C.2.2 ECID and OTDOA Measurement requirements

Table C.2.2: Test Parameter Relaxations for ECID and OTDOA Measurement requirements

| Clause | Test Parameter Relaxation | |
|--|---|---------------|
| 8.1.1 E-UTRAN FDD UE Rx – Tx time difference case | | |
| 8.1.2 E-UTRAN TDD UE Rx – Tx time difference case | | |
| 8.1.5 E-UTRAN FDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (feICIC) | [TBD] | [TBD] |
| 8.1.6 E-UTRAN TDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (feICIC) | [TBD] | [TBD] |
| 9.1.1 FDD RSTD Measurement Reporting Delay | Response time | 300 ms |
| 9.1.2 TDD RSTD Measurement Reporting Delay | Response time | 300 ms |
| 9.1.3 FDD RSTD Measurement Accuracy | For Test 2 and Test 4: PRS \hat{E}_{s1} / N_{oc} averaged over BW_{Config} | +0.3 dB |
| | PRS \hat{E}_{s2} / N_{oc} averaged over BW_{Config} | +0.3 dB |
| | For all tests: Cell Timing Difference | $\pm 1 T_s$ |
| 9.1.4 TDD RSTD Measurement Accuracy | Same as 9.1.3 | Same as 9.1.3 |
| 9.2.1 FDD-FDD inter-frequency RSTD measurement reporting delay | Response time | 300 ms |
| 9.2.2 TDD-TDD inter-frequency RSTD measurement reporting delay | Response time | 300 ms |
| 9.2.4 FDD-FDD inter frequency RSTD Accuracy | PRS \hat{E}_{s1} / N_{oc1} averaged over BW_{Config} | +0.3 dB |
| | PRS \hat{E}_{s2} / N_{oc2} averaged over BW_{Config} | +0.3 dB |
| | Cell Timing Difference | $\pm 2 T_s$ |
| 9.2.5 TDD-TDD inter frequency RSTD Accuracy | Same as 9.1.3 | Same as 9.1.3 |
| 10.1 FDD RSTD Measurement Reporting Delay for Carrier Aggregation | Response time | 300 ms |
| 10.1A FDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz | Response time | 300 ms |
| 10.2 TDD RSTD Measurement Reporting Delay for Carrier Aggregation | Response time | 300 ms |
| 10.2A TDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz | Response time | 300 ms |
| 10.3 FDD RSTD Measurement Accuracy for Carrier Aggregation | PRS \hat{E}_{s2} / N_{oc2} averaged over BW_{Config} | +0.3 dB |
| | PRS \hat{E}_{s3} / N_{oc2} averaged over BW_{Config} | +0.3 dB |
| | Cell Timing Difference | $\pm 1 T_s$ |
| 10.3A FDD RSTD Measurement Accuracy for Carrier Aggregation for | Same as 10.3 | Same as 10.3 |

| | | |
|---|--------------|--------------|
| 20MHz | | |
| 10.4 TDD RSTD Measurement Accuracy for Carrier Aggregation | Same as 10.3 | Same as 10.3 |
| 10.4A TDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz | Same as 10.3 | Same as 10.3 |

C.3 Interpretation of measurement results

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in TR 102 273-1-2 [14], clause 6.5.

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause C.1.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in clause C.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows.

Any additional uncertainty in the Test System over and above that specified in clause C.1 shall be used to tighten the Test Requirement - making the test harder to pass. (This may require modification of stimulus signals). This procedure will ensure that a Test System not compliant with clause C.1 does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause C.1 had been used.

C.4 Derivation of Test Requirements (This clause is informative)

The Test Requirements have been calculated by relaxing the Conformance requirement of the core specification using the Test Parameter Relaxations defined in clause C.2. When the Test Parameter Relaxation is zero, the Test Requirement will be the same as the Conformance requirement. When the Test Parameter Relaxation is non-zero, the Test Requirements will differ from the Conformance requirement, and the formula used for this relaxation is given in table C.4.1 and C.4.2.

Table C.4.1: Derivation of Test Requirements for A-GNSS Minimum Performance tests

| Test | Conformance requirement in 3GPP TS 25.171 or 3GPP TS 25.172 or 3GPP TS 36.171 | | Test Parameter Relaxation (TPR) | Test Requirement |
|---|---|--------------------|--|---------------------------------------|
| 5.2.1, 6.2.1, 7.1.1 Sensitivity Coarse Time Assistance | Coarse Time Assistance | ± 2 s | 200 ms | Formulas: UL-TPR, LL+TPR: ± 1.8 s |
| | Absolute GPS L1 C/A signal level (test 5.2.1 and test 7.1.1 sub-test 1) -142, -147 dBm | -142, -147 dBm | 1 dB | Level + TPR: -141, -146 dBm |
| | Absolute GNSS signal level (Galileo) | -142, -147 dBm | 1 dB | Level + TPR: -141, -146 dBm |
| | Absolute GNSS signal level (GPS) (test 6.2.1 and test 7.1.1 sub-tests 2 to 5) | -142, -147 dBm | 1 dB | Level + TPR: -141, -146 dBm |
| | Absolute GNSS signal level (GLONASS) | -142, -147 dBm | 1 dB | Level + TPR: -141, -146 dBm |
| | Position error | 100 m | 1.3 m | Error +TPR: 101.3 m |
| | Response time | 20 s | 300 ms | Time + TPR: 20.3 s |
| 5.2.2, 6.2.2, 7.1.2 Sensitivity Fine Time Assistance | Coarse Time Assistance | ± 2 s | 200 ms | Formulas: UL-TPR, LL+TPR: ± 1.8 s |
| | Fine Time Assistance | ± 10 μ s | 1 μ s | UL-TPR, LL+TPR: ± 9 μ s |
| | Absolute GPS L1 C/A signal level (test 5.2.2 and test 7.1.2 sub-test 1) -142, -147 dBm | -147 dBm | 1 dB | Level + TPR: -146 dBm |
| | Absolute GNSS signal level (Galileo) | -147 dBm | 1 dB | Level + TPR: -146 dBm |
| | Absolute GNSS signal level (GPS) (test 6.2.2 and test 7.1.2 sub-tests 2 to 5) | -147 dBm | 1 dB | Level + TPR: -146 dBm |
| | Absolute GNSS signal level (GLONASS) | -147 dBm | 1 dB | Level + TPR: -146 dBm |
| | Position error | 100 m | 1.3 m | Error +TPR: 101.3 m |
| 5.3, 6.3, 7.2 Nominal Accuracy | Response time | 20 s | 300 ms | Time + TPR: 20.3 s |
| | Coarse Time Assistance | ± 2 s | 200 ms | Formulas: UL-TPR, LL+TPR: ± 1.8 s |
| | Absolute GPS L1 C/A signal level (test 5.3 and test 7.2 sub-test 1) -142, -147 dBm | -130 dBm | 0 dB | Formulas: Level + TPR: -130 dBm |
| | Absolute GNSS signal level (Galileo) | -127 dBm | 0 dB | Level + TPR: -127 dBm |
| | Absolute GNSS signal level (GPS) (test 6.3 and test 7.2 sub-tests 2 to 5) | -128.5 dBm | 0 dB | Level + TPR: -128.5 dBm |
| | Absolute GNSS signal level (GLONASS) | -131 dBm | 0 dB | Level + TPR: -131 dBm |
| | Absolute GNSS signal level (QZSS) | -128.5 dBm | 0 dB | Level + TPR: -128.5 dBm |
| | Absolute GNSS signal level (SBAS) | -131 dBm | 0 dB | Level + TPR: -131 dBm |
| | Position error | 30 m | 1.3 m | Error +TPR: 31.3 m |
| 5.4, 6.4, 7.3 Dynamic Range | Response time | 20 s | 300 ms | Time + TPR: 20.3 s |
| | Coarse Time Assistance | ± 2 s | 200 ms | Formulas: UL-TPR, LL+TPR: ± 1.8 s |
| | Absolute GPS L1 C/A signal level (test 5.4 and test 7.3 sub-test 1) -142, -147 dBm | -129 to -147 dBm | 1 dB | Level + TPR: each level +1 dBm |
| | Absolute GNSS signal level (Galileo) | -127.5 to -147 dBm | 1 dB | Level + TPR: each level +1 dBm |
| | Absolute GNSS signal level (GPS) (test 6.4 and test 7.3 sub-tests 2 to 5) | -129 to -147 dBm | 1 dB | Level + TPR: each level +1 dBm |

| Test | Conformance requirement in 3GPP TS 25.171 or 3GPP TS 25.172 or 3GPP TS 36.171 | | Test Parameter Relaxation (TPR) | Test Requirement |
|---|---|--|--|--|
| | Absolute GNSS signal level (GLONASS) | -131.5 to -147 dBm | 1 dB | Level + TPR: each level +1 dBm |
| | Relative GPS L1 C/A signal level (test 5.4 and test 7.3 sub-test 1) -142, -147 dBm | 18 dB | 0.2 dB | Level - TPR: highest level -0.2 dB: -128.2 dBm |
| | Relative GNSS signal level (Galileo) | 19.5 dB | 0.2 dB | Level - TPR: highest level -0.2 dB: -126.7 dBm |
| | Relative GNSS signal level (GPS) (test 6.4 and test 7.3 sub-tests 2 to 5) | 18 dB | 0.2 dB | Level - TPR: highest level -0.2 dB: -128.2 dBm |
| | Relative GNSS signal level (GLONASS) | 15.5 dB | 0.2 dB | Level - TPR: highest level -0.2 dB: -130.7 dBm |
| | Position error | 100 m | 1.3 m | Error +TPR: 101.3 m |
| | Response time | 20 s | 300 ms | Time + TPR: 20.3 s |
| | | | | |
| 5.5, 6.5, 7.4 Multi-path scenario | Coarse Time Assistance | ±2 s | 200 ms | Formulas: UL-TPR, LL+TPR: ±1.8 s |
| | Absolute GPS L1 C/A signal level (test 5.5 and test 7.4 sub-test 1) -142, -147 dBm | -130 dBm | 0 dB | Formulas: Level + TPR: -130 dBm |
| | Absolute GNSS signal level (Galileo) | -127 dBm | 0 dB | Level + TPR: -127 dBm |
| | Absolute GNSS signal level (GPS) (test 6.5 and test 7.4 sub-tests 2 to 5) | -128.5 dBm | 0 dB | Level + TPR: -128.5 dBm |
| | Absolute GNSS signal level (GLONASS) | -131 dBm | 0 dB | Level + TPR: -131 dBm |
| | Relative GPS L1 C/A signal level (test 5.5 and test 7.4 sub-test 1) -142, -147 dBm | 6 dB | 0.2 dB | Relative level + TPR: relative level + 0.2dB: 6.2 dB |
| | Relative GNSS signal level (all GNSSs) (test 6.5 and test 7.4 sub-tests 2 to 5) | Y dB where "Y" is given in Table 70.16.2.1 | 0.2 dB | Relative level + TPR: relative level + 0.2dB: Y + 0.2 dB |
| | Position error | 100 m | 1.3 m | Error +TPR: 101.3 m |
| | Response time | 20 s | 300 ms | Time + TPR: 20.3 s |
| 5.6, 6.6, 7.5 Moving scenario and periodic update | Absolute GPS L1 C/A Signal level (test 5.6 and test 7.5 sub-test 1) -130 dBm | -130 dBm | 0 dB | Formulas: Level + TPR: -130 dBm |
| | Absolute GNSS signal level (Galileo) | -127 dBm | 0 dB | Level + TPR: -127 dBm |
| | Absolute GNSS signal level (GPS) (test 6.6 and test 7.5 sub-tests 2 to 5) | -128.5 dBm | 0 dB | Level + TPR: -128.5 dBm |
| | Absolute GNSS signal level (GLONASS) | -131 dBm | 0 dB | Level + TPR: -131 dBm |
| | Position error 100 m | 100 m | 1.3 m | Error +TPR: 101.3 m |
| | Differential response time | 2s +/- 20 % | 100 ms | Time +TPR: 1.5 s and 2.5 s |
| | | | | |

Table C.4.2: Derivation of Test Requirements for ECID and OTDOA Measurement tests

| Test | Minimum Requirement in TS 36.133 | Test Parameter Relaxation (TPR) | Test Requirement in TS 36.571-1 |
|--|---|---|--|
| 8.1.1 E-UTRAN FDD UE Rx – Tx time difference case | <p><u>Test 1:</u> N_{oc}: -98dBm/15kHz \hat{E}_s / N_{oc}: -3.0dB <u>Reported RxTx time difference value:</u> Measured value converted to RX-TX_TIME_DIFFERENCE according to Table 8.1.1.3-2</p> <p><u>Test 2:</u> N_{oc}: -98dBm/15kHz \hat{E}_s / N_{oc}: -3.0dB <u>Reported RxTx time difference value:</u> Measured value converted to RX-TX_TIME_DIFFERENCE according to Table 8.1.1.3-2</p> | <p><u>Test 1:</u> 0dB 0.3dB Via mapping</p> <p><u>Test 2:</u> 0dB 0.3dB Via mapping</p> | <p><u>Test 1:</u> N_{oc}: -98dBm/15kHz \hat{E}_s / N_{oc}: -2.7.0dB (Measured value from step 7 - 23) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 <u>To</u> (Measured value from step 7 +23) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1</p> <p><u>Test 2:</u> N_{oc}: -88dBm/15kHz \hat{E}_{s1} / N_{oc}: +6.0dB \hat{E}_{s2} / N_{oc}: +2.0dB Measured value from step 7 -13) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1 <u>To</u> (Measured value from step 7 +13) T_s converted to RX-TX_TIME_DIFFERENCE according to Table 4.6.3-1</p> |
| 8.1.2 E-UTRAN TDD UE Rx – Tx time difference case | Same as 8.1.1 | Same as 8.1.1 | Same as 8.1.1 |
| 8.1.5 E-UTRAN FDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (felCIC) | [TBD] | [TBD] | [TBD] |
| 8.1.6 E-UTRAN TDD UE Rx–Tx time difference under Time Domain Measurement Resource Restriction with CRS Assistance Information and Non-MBSFN ABS (felCIC) | [TBD] | [TBD] | [TBD] |
| 9.1.1 FDD RSTD Measurement Reporting Delay | Response Time = 3 s | 300 ms | Time + TPR: 3.3 s |
| 9.1.2 TDD RSTD Measurement Reporting Delay | Response Time = 3 s | 300 ms | Time + TPR: 3.3 s |
| 9.1.3 FDD RSTD Measurement Accuracy | <p>For Test 2 and Test 4: $\text{PRS } \hat{E}_{s1} / N_{oc} = -6\text{dB}$ $\text{PRS } \hat{E}_{s2} / N_{oc} = -13\text{dB}$</p> <p>For All Tests: See Table 9.1.3.3-1 for measurement accuracy.</p> | <p>+0.3 dB +0.3 dB</p> <p>$\pm 1 T_s$</p> | <p>Level + TPR, -5.7 dB Level + TPR, -12.7 dB</p> <p>See Table 9.1.3.5-2.</p> |
| 9.1.4 TDD RSTD Measurement Accuracy | Same as 9.1.3 | | |
| 9.2.1 FDD-FDD inter-frequency RSTD measurement reporting delay | Response Time = 6 s | 300 ms | Time + TPR: 6.3 s |

| | | | |
|--|--|---------------------------------------|---|
| 9.2.2 TDD-TDD inter-frequency RSTD measurement reporting delay | Response Time = 6 s | 300 ms | Time + TPR: 6.3 s |
| 9.2.4 FDD-FDD inter-frequency RSTD Accuracy | $\text{PRS } \hat{E}_{s1} / N_{oc1} = -6\text{dB}$ $\text{PRS } \hat{E}_{s2} / N_{oc2} = -13\text{dB}$ See TS 36.133 [23] Table 9.1.10.3-1 for measurement accuracy. | +0.3 dB +0.3 dB $\pm 2 T_s$ | Level + TPR, -5.7 dB Level + TPR, -12.7 dB See Table 9.2.4.5-2. |
| 9.2.5 TDD-TDD inter-frequency RSTD Accuracy | Same as 9.2.4 | | |
| 10.1 FDD RSTD Measurement Reporting Delay for Carrier Aggregation | Test 1: Response Time = 3 s Test 2: Response Time = 6 s | 300 ms 300 ms | Time + TPR: 3.3 s Time + TPR: 6.3 s |
| 10.1A FDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz | Same as 10.1 | | |
| 10.2 TDD RSTD Measurement Reporting Delay for Carrier Aggregation | Same as 10.1 | | |
| 10.2A TDD RSTD Measurement Reporting Delay for Carrier Aggregation for 20MHz | Same as 10.1 | | |
| 10.3 FDD RSTD Measurement Accuracy for Carrier Aggregation | $\text{PRS } \hat{E}_{s2} / N_{oc2} = -6\text{dB}$ $\text{PRS } \hat{E}_{s3} / N_{oc2} = -13\text{dB}$ See TS 36.133 [23] Table 9.1.10.1-1 for measurement accuracy. | +0.3 dB +0.3 dB $\pm 1 T_s$ | Level + TPR, -5.7 dB Level + TPR, -12.7 dB See Table 10.3.5-2. |
| 10.3A FDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz | Same as 10.3 | Same as 10.3 | Same as 10.3 |
| 10.4 TDD RSTD Measurement Accuracy for Carrier Aggregation | Same as 10.3 | Same as 10.3 | Level + TPR, -5.7 dB Level + TPR, -12.7 dB See Table 10.4.5-2. |
| 10.4A TDD RSTD Measurement Accuracy for Carrier Aggregation for 20MHz | Same as 10.3 | Same as 10.3 | Same as 10.4 |

Annex D (normative): Rules for statistical testing

D.1 Test Method

In this clause the terms GNSS and A-GNSS also include the cases where the only satellite system used is GPS unless otherwise stated.

Each test is performed in the following manner:

- a) Setup the required test conditions.
- b) Start each repetition after having applied the message 'RESET UE POSITIONING STORED INFORMATION'. This ensures that each result is independent from the previous one.
- c) Make the required measurement a repeated number of times. The results, measured, are simplified to:

good result, if the measured result is \leq limit.

bad result, if the measured result is $>$ limit

For the relevant A-GNSS test cases measure the 2D position and Time to First Fix (TTFF) a repeated number of times. Measure the 2D position and Time to First Fix (if applicable) repeated times. Start each repetition after having applied the message 'RESET UE POSITIONING STORED INFORMATION'. This ensures that each result is independent from the previous one. The results, measured, are simplified to:

good result, if the 2D position and TTFF are \leq limit.

bad result, if the 2D position or TTFF or both are $>$ limit

- d) Record the number of results (ns) and the number of bad results (ne)
- e) Stop the test at a pass or a fail event.
- f) Once the test is stopped, decide according to the pass fail decision rules (D.4.2)

D.2 Error Ratio (ER)

The Error Ratio (ER) is defined as the ratio of bad results (ne) to all results (ns).
(1-ER is the success ratio)

D.3 Test Design

A statistical test is characterised by:

Test-time, Selectivity and Confidence level

D.3.1 Confidence level

The outcome of a statistical test is a decision. This decision may be correct or in-correct. The Confidence Level CL describes the probability that the decision is a correct one. The complement is the wrong decision probability (risk) $D = 1 - CL$

D.3.2 Introduction: Supplier Risk versus Customer Risk

There are two targets of decision:

- a) A measurement on the pass-limit shows, that the DUT has the specified quality or is better with probability CL (CL e.g.95%) This shall lead to a “pass decision”

The pass-limit is on the good side of the specified DUT-quality. A more stringent CL (CL e.g.99%) shifts the pass-limit further into the good direction. Given that the quality of the DUTs is distributed, a greater CL passes less and better DUTs.

A measurement on the bad side of the pass-limit is simply “not pass” (undecided)

- aa) Complementary:

A measurement on the fail-limit shows, that the DUT is worse than the specified quality with probability CL.

The fail-limit is on the bad side of the specified DUT-quality. A more stringent CL shifts the fail-limit further into the bad direction. Given that the quality of the DUTs is distributed, a greater CL fails less and worse DUTs.

A measurement on the good side of the fail-limit is simply “not fail”.

- b) A DUT, known to have the specified quality, shall be measured and decided pass with probability CL. This leads to the pass limit.

For CL e.g. 95%, the pass limit is on the bad side of the specified DUT-quality. CL e.g.99% shifts the pass-limit further into the bad direction. Given that the DUT-quality is distributed, a greater CL passes more and worse DUTs.

- bb) A DUT, known to be an ($\epsilon \rightarrow 0$) beyond the specified quality, shall be measured and decided fail with probability CL.

For CL e.g.95%, the fail limit is on the good side of the specified DUT-quality.

Note the different sense for CL in (a), (aa) versus (b), (bb).

NOTE: For constant CL in all 4 bullets, (a) is equivalent to (bb) and (aa) is equivalent to (b).

D.3.3 Supplier Risk versus Customer Risk

The table below summarizes the different targets of decision.

Table D.3.3: Equivalent statements

| | Equivalent statements, using different cause-to-effect-directions, and assuming CL = constant >0.5 | |
|----------------------------|---|--|
| cause-to-effect-directions | Known measurement result \rightarrow estimation of the DUT's quality | Known DUT's quality \rightarrow estimation of the measurement's outcome |
| Supplier Risk | A measurement on the pass-limit shows, that the DUT has the specified quality or is better (a) | A DUT, known to have an ($\epsilon \rightarrow 0$) beyond the specified DUT-quality, shall be measured and decided fail (bb) |
| Customer Risk | A measurement on the fail-limit shall shows, that the DUT is worse than the specified quality (aa) | A DUT, known to have the specified quality, shall be measured and decided pass (b) |

NOTE: The bold text shows the obvious interpretation of Supplier Risk and Customer Risk. The same statements can be based on other DUT-quality-definitions.

D.3.4 Introduction: Standard test versus early decision concept

In standard statistical tests, a certain number of results (ns) is predefined in advance of the test. After ns results the number of bad results (ne) is counted and the error ratio (ER) is calculated as ne/ns.

Applying statistical theory, a decision limit can be designed, against which the calculated ER is compared to derive the decision. Such a limit is one decision point and is characterised by:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a fixed predefined parameter)
- ne: the number of bad results (the limit based on just ns)

In the formula for the limit, D and ns are parameters and ne is the variable. In the standard test ns and D are constant. The property of such a test is: It discriminates between two states only, depending on the test design:

- pass (with CL) / undecided (undecided in the sense: finally undecided)
- fail (with CL) / undecided (undecided in the sense: finally undecided)
- pass (with CL) / fail (with CL) (however against two limits).

In contrast to the standard statistical tests, the early decision concept predefines a set of (ne, ns) co-ordinates, representing the limit-curve for decision. After each result a preliminary ER is calculated and compared against the limit-curve. After each result one may make the decision or not (undecided for later decision). The parameters and variables in the limit-curve for the early decision concept have a similar but not equal meaning:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a variable parameter)
- ne: the number of bad results (the limit. It varies together with ns)

To avoid a “final undecided” in the standard test, a second limit must be introduced and the single decision co-ordinate (ne, ns) needs a high ne, leading to a fixed (high) test time. In the early decision concept, having the same selectivity and the same confidence level an “undecided” does not need to be avoided, as it can be decided later. A perfect DUT will hit the decision coordinate (ne, ns) with ne=0. This test time is short.

D.3.5 Standard test versus early decision concept

For Supplier Risk:

The wrong decision probability D in the standard test is the probability, to decide a DUT in-correctly in the single decision point. In the early decision concept there is a probability of in-correct decisions d at each point of the limit-curve. The sum of all those wrong decision probabilities accumulate to D. Hence $d < D$

For Customer Risk:

The correct decision probability CL in the standard test is the probability, to decide a DUT correctly in the single decision point. In the early decision concept there is a probability of correct decisions cl at each point of the limit-curve. The sum of all those correct decision probabilities accumulate to CL. Hence $cl < CL$ or $d > D$

D.3.6 Selectivity

There is no statistical test which can discriminate between a limit-DUT-quality and a DUT-quality which is an ($\epsilon \rightarrow 0$) apart from the limit in finite time and confidence level $CL > 1/2$. Either the test discriminates against one limit with the results pass (with CL)/undecided or fail (with CL)/undecided, or the test ends in a result pass (with CL)/fail (with CL) but this requires a second limit.

For $CL > 0.5$, a (measurement-result = specified-DUT-quality), generates undecided in test “supplier risk against pass limit” (a in clause D.3.2) and also in the equivalent test against the fail limit (aa in clause D.3.2)

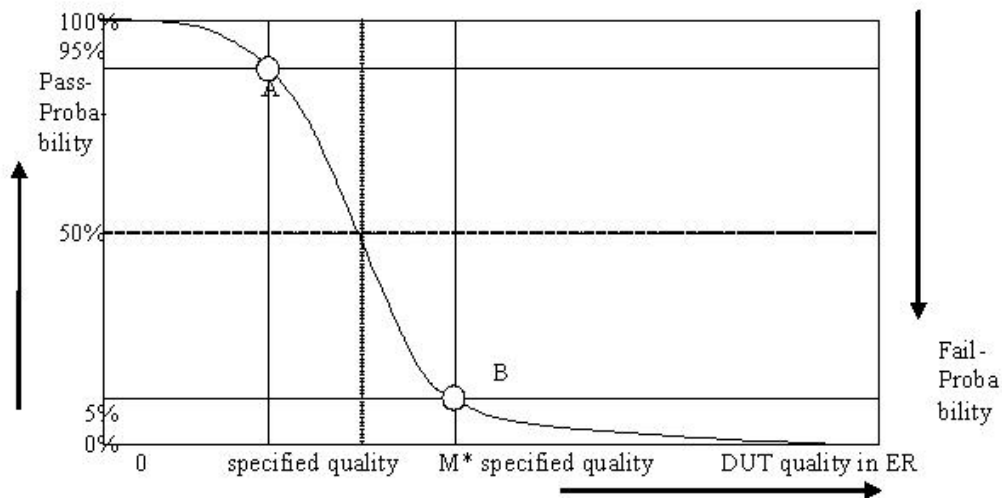
For $CL > 0.5$, a DUT, known to be on the limit, will be decided pass for the test “customer risk against pass limit” (b in clause D.3.2) and also in the equivalent test against fail limit (bb in clause D.3.2).

This overlap or undecided area is not a fault or a contradiction, however it can be avoided by introducing a Bad or a Good DUT quality according to:

- Bad DUT quality: specified DUT-quality * M ($M > 1$)
- Good DUT quality: specified DUT-quality * m ($m < 1$)

Using e.g. $M > 1$ and $CL = 95\%$ the test for different DUT qualities yield different pass probabilities:

Figure D.3.6: Pass probability versus DUT quality



D.3.7 Design of the test

The test is defined according to the following design principles:

1. The early decision concept is applied.
2. A second limit is introduced: Bad DUT factor $M > 1$
3. To decide the test pass:

Supplier risk is applied based on the Bad DUT quality

To decide the test fail

Customer Risk is applied based on the specified DUT quality

The A-GNSS test cases are defined using the following parameters:

1. Specified DUT quality: $ER = 0.05$
2. Bad DUT quality: $M = 1.5$ (selectivity)
3. Confidence level $CL = 95\%$ (for specified DUT and Bad DUT-quality)

The ECID and OTDOA test cases are defined using the following parameters:

1. Specified DUT quality: $ER = 0.1$
2. Bad DUT quality: $M = 1.5$ (selectivity)
3. Confidence level $CL = 95\%$ (for specified DUT and Bad DUT-quality)

This has the following consequences:

- a) A measurement on the fail limit is connected with 2 equivalent statements:

| | |
|---|--|
| A measurement on the fail-limit shows, that the DUT is worse than the specified DUT-quality | A DUT, known to have the specified quality, shall be measured and decided pass |
|---|--|

A measurement on the pass limit is connected with the complementary statements:

| | |
|---|--|
| A measurement on the pass limit shows, that the DUT is better than the Bad DUT-quality. | A DUT, known to have the Bad DUT quality, shall be measured and decided fail |
|---|--|

The left column is used to decide the measurement.

The right column is used to verify the design of the test by simulation.

The simulation is based on the two fulcrums A and B only in Figure D.3.6. There is freedom to shape the remainder of the function.

b) Test time

1. The minimum and maximum test time is fixed.
 2. The average test time is a function of the DUT's quality.
 3. The individual test time is not predictable (except ideal DUT).
- c) The number of decision co-ordinates (ne, ns) in the early decision concept is responsible for the selectivity of the test and the maximum test time. Having fixed the number of decision co-ordinates there is still freedom to select the individual decision co-ordinates in many combinations, all leading to the same confidence level.

D.4 Pass fail decisions

D.4.1 Numerical definition of the pass fail limits for A-GNSS test cases

| ne | ns _p | ns _f | ne | ns _p | ns _f | ne | ns _p | ns _f | ne | ns _p | ns _f |
|----|-----------------|-----------------|----|-----------------|-----------------|-----|-----------------|-----------------|-----|-----------------|-----------------|
| 0 | 77 | NA | 43 | 855 | 576 | 86 | 1525 | 1297 | 129 | 2173 | 2050 |
| 1 | 106 | NA | 44 | 871 | 592 | 87 | 1540 | 1314 | 130 | 2188 | 2067 |
| 2 | 131 | NA | 45 | 887 | 608 | 88 | 1556 | 1331 | 131 | 2203 | 2085 |
| 3 | 154 | NA | 46 | 903 | 625 | 89 | 1571 | 1349 | 132 | 2218 | 2103 |
| 4 | 176 | NA | 47 | 919 | 641 | 90 | 1586 | 1366 | 133 | 2233 | 2121 |
| 5 | 197 | NA | 48 | 935 | 657 | 91 | 1601 | 1383 | 134 | 2248 | 2139 |
| 6 | 218 | 42 | 49 | 951 | 674 | 92 | 1617 | 1401 | 135 | 2263 | 2156 |
| 7 | 238 | 52 | 50 | 967 | 690 | 93 | 1632 | 1418 | 136 | 2277 | 2174 |
| 8 | 257 | 64 | 51 | 982 | 706 | 94 | 1647 | 1435 | 137 | 2292 | 2192 |
| 9 | 277 | 75 | 52 | 998 | 723 | 95 | 1662 | 1453 | 138 | 2307 | 2210 |
| 10 | 295 | 87 | 53 | 1014 | 739 | 96 | 1677 | 1470 | 139 | 2322 | 2227 |
| 11 | 314 | 100 | 54 | 1030 | 756 | 97 | 1692 | 1487 | 140 | 2337 | 2245 |
| 12 | 333 | 112 | 55 | 1046 | 772 | 98 | 1708 | 1505 | 141 | 2352 | 2263 |
| 13 | 351 | 125 | 56 | 1061 | 789 | 99 | 1723 | 1522 | 142 | 2367 | 2281 |
| 14 | 369 | 139 | 57 | 1077 | 805 | 100 | 1738 | 1540 | 143 | 2381 | 2299 |
| 15 | 387 | 152 | 58 | 1093 | 822 | 101 | 1753 | 1557 | 144 | 2396 | 2317 |
| 16 | 405 | 166 | 59 | 1108 | 839 | 102 | 1768 | 1574 | 145 | 2411 | 2335 |
| 17 | 422 | 180 | 60 | 1124 | 855 | 103 | 1783 | 1592 | 146 | 2426 | 2352 |
| 18 | 440 | 194 | 61 | 1140 | 872 | 104 | 1798 | 1609 | 147 | 2441 | 2370 |
| 19 | 457 | 208 | 62 | 1155 | 889 | 105 | 1813 | 1627 | 148 | 2456 | 2388 |
| 20 | 474 | 222 | 63 | 1171 | 906 | 106 | 1828 | 1644 | 149 | 2470 | 2406 |
| 21 | 492 | 237 | 64 | 1186 | 922 | 107 | 1844 | 1662 | 150 | 2485 | 2424 |
| 22 | 509 | 251 | 65 | 1202 | 939 | 108 | 1859 | 1679 | 151 | 2500 | 2442 |
| 23 | 526 | 266 | 66 | 1217 | 956 | 109 | 1874 | 1697 | 152 | 2515 | 2460 |
| 24 | 543 | 281 | 67 | 1233 | 973 | 110 | 1889 | 1714 | 153 | 2530 | 2478 |
| 25 | 560 | 295 | 68 | 1248 | 990 | 111 | 1904 | 1732 | 154 | 2544 | 2496 |
| 26 | 577 | 310 | 69 | 1264 | 1007 | 112 | 1919 | 1750 | 155 | 2559 | 2513 |
| 27 | 593 | 325 | 70 | 1279 | 1024 | 113 | 1934 | 1767 | 156 | 2574 | 2531 |
| 28 | 610 | 341 | 71 | 1295 | 1040 | 114 | 1949 | 1785 | 157 | 2589 | 2549 |
| 29 | 627 | 356 | 72 | 1310 | 1057 | 115 | 1964 | 1802 | 158 | 2603 | 2567 |
| 30 | 643 | 371 | 73 | 1326 | 1074 | 116 | 1979 | 1820 | 159 | 2618 | 2585 |
| 31 | 660 | 387 | 74 | 1341 | 1091 | 117 | 1994 | 1838 | 160 | 2633 | 2603 |
| 32 | 676 | 402 | 75 | 1357 | 1108 | 118 | 2009 | 1855 | 161 | 2648 | 2621 |
| 33 | 693 | 418 | 76 | 1372 | 1126 | 119 | 2024 | 1873 | 162 | 2662 | 2639 |
| 34 | 709 | 433 | 77 | 1387 | 1143 | 120 | 2039 | 1890 | 163 | 2677 | 2657 |
| 35 | 725 | 449 | 78 | 1403 | 1160 | 121 | 2054 | 1908 | 164 | 2692 | 2675 |
| 36 | 742 | 465 | 79 | 1418 | 1177 | 122 | 2069 | 1926 | 165 | 2707 | 2693 |
| 37 | 758 | 480 | 80 | 1433 | 1194 | 123 | 2084 | 1943 | 166 | 2721 | 2711 |
| 38 | 774 | 496 | 81 | 1449 | 1211 | 124 | 2099 | 1961 | 167 | 2736 | 2729 |
| 39 | 790 | 512 | 82 | 1464 | 1228 | 125 | 2114 | 1979 | 168 | 2751 | 2747 |
| 40 | 807 | 528 | 83 | 1479 | 1245 | 126 | 2128 | 1997 | 169 | 2765 | NA |
| 41 | 823 | 544 | 84 | 1495 | 1263 | 127 | 2143 | 2014 | | | |
| 42 | 839 | 560 | 85 | 1510 | 1280 | 128 | 2158 | 2032 | | | |

NOTE: The first column is the number of bad results (ne)
The second column is the number of results for the pass limit (ns_p)
The third column is the number of results for the fail limit (ns_f)

D.4.2 Pass fail decision rules for A-GNSS test cases

Having observed 0 bad results, pass the test at ≥ 77 results, otherwise continue

Having observed 1 bad result, pass the test at ≥ 106 results, otherwise continue

Having observed 2 bad results, pass the test at ≥ 131 results, otherwise continue

etc. until

Having observed 6 bad results, pass the test at ≥ 218 results, fail the test at ≤ 42 results, otherwise continue

Having observed 7 bad results, pass the test at ≥ 238 results, fail the test at ≤ 52 results, otherwise continue

etc. until

Having observed 168 bad results, pass the test at ≥ 2751 results, fail the test at ≤ 2747 results, otherwise continue

Having observed 169 bad results, pass the test at ≥ 2765 results, otherwise fail

NOTE: an ideal DUT passes after 77 results. The maximum test time is 2765 results.

D.4.3 Numerical definition of the pass fail limits for ECID and OTDOA test cases

| ne | ns _p | ns _f | ne | ns _p | ns _f | ne | ns _p | ns _f | ne | ns _p | ns _f |
|----|-----------------|-----------------|----|-----------------|-----------------|-----|-----------------|-----------------|-----|-----------------|-----------------|
| 0 | 33 | NA | 43 | 408 | 283 | 86 | 737 | 644 | 129 | 1056 | 1021 |
| 1 | 46 | NA | 44 | 416 | 291 | 87 | 745 | 653 | 130 | 1064 | 1030 |
| 2 | 58 | 2 | 45 | 424 | 299 | 88 | 752 | 661 | 131 | 1071 | 1039 |
| 3 | 69 | 5 | 46 | 432 | 307 | 89 | 760 | 670 | 132 | 1078 | 1048 |
| 4 | 79 | 8 | 47 | 440 | 315 | 90 | 767 | 679 | 133 | 1086 | 1057 |
| 5 | 89 | 12 | 48 | 447 | 324 | 91 | 775 | 687 | 134 | 1093 | 1066 |
| 6 | 99 | 17 | 49 | 455 | 332 | 92 | 782 | 696 | 135 | 1100 | 1074 |
| 7 | 109 | 22 | 50 | 463 | 340 | 93 | 790 | 705 | 136 | 1108 | 1083 |
| 8 | 118 | 27 | 51 | 471 | 348 | 94 | 797 | 713 | 137 | 1115 | 1092 |
| 9 | 127 | 33 | 52 | 478 | 356 | 95 | 804 | 722 | 138 | 1122 | 1101 |
| 10 | 136 | 39 | 53 | 486 | 365 | 96 | 812 | 731 | 139 | 1130 | 1110 |
| 11 | 145 | 45 | 54 | 494 | 373 | 97 | 819 | 739 | 140 | 1137 | 1119 |
| 12 | 154 | 51 | 55 | 502 | 381 | 98 | 827 | 748 | 141 | 1144 | 1128 |
| 13 | 163 | 58 | 56 | 509 | 389 | 99 | 834 | 757 | 142 | 1152 | 1137 |
| 14 | 172 | 64 | 57 | 517 | 398 | 100 | 842 | 766 | 143 | 1159 | 1147 |
| 15 | 180 | 71 | 58 | 525 | 406 | 101 | 849 | 774 | 144 | 1166 | 1155 |
| 16 | 189 | 78 | 59 | 532 | 414 | 102 | 857 | 783 | 145 | 1174 | 1164 |
| 17 | 197 | 85 | 60 | 540 | 423 | 103 | 864 | 792 | 146 | 1181 | 1173 |
| 18 | 206 | 92 | 61 | 548 | 431 | 104 | 871 | 801 | 147 | NA | 1182 |
| 19 | 214 | 99 | 62 | 555 | 440 | 105 | 879 | 809 | 148 | | |
| 20 | 223 | 106 | 63 | 563 | 448 | 106 | 886 | 818 | 149 | | |
| 21 | 231 | 113 | 64 | 571 | 456 | 107 | 894 | 827 | 150 | | |
| 22 | 239 | 120 | 65 | 578 | 465 | 108 | 901 | 836 | 151 | | |
| 23 | 248 | 128 | 66 | 586 | 473 | 109 | 909 | 844 | 152 | | |
| 24 | 256 | 135 | 67 | 594 | 482 | 110 | 916 | 853 | 153 | | |
| 25 | 264 | 142 | 68 | 601 | 490 | 111 | 923 | 862 | 154 | | |
| 26 | 272 | 150 | 69 | 609 | 499 | 112 | 931 | 871 | 155 | | |
| 27 | 281 | 157 | 70 | 616 | 507 | 113 | 938 | 880 | 156 | | |
| 28 | 289 | 165 | 71 | 624 | 516 | 114 | 946 | 888 | 157 | | |
| 29 | 297 | 173 | 72 | 632 | 524 | 115 | 953 | 897 | 158 | | |
| 30 | 305 | 180 | 73 | 639 | 533 | 116 | 960 | 906 | 159 | | |
| 31 | 313 | 188 | 74 | 647 | 541 | 117 | 968 | 915 | 160 | | |
| 32 | 321 | 196 | 75 | 654 | 550 | 118 | 975 | 924 | 161 | | |
| 33 | 329 | 204 | 76 | 662 | 558 | 119 | 983 | 933 | 162 | | |
| 34 | 337 | 211 | 77 | 669 | 567 | 120 | 990 | 941 | 163 | | |
| 35 | 345 | 219 | 78 | 677 | 575 | 121 | 997 | 950 | 164 | | |
| 36 | 353 | 227 | 79 | 684 | 584 | 122 | 1005 | 959 | 165 | | |
| 37 | 361 | 235 | 80 | 692 | 592 | 123 | 1012 | 968 | 166 | | |
| 38 | 369 | 243 | 81 | 700 | 601 | 124 | 1019 | 977 | 167 | | |
| 39 | 377 | 251 | 82 | 707 | 610 | 125 | 1027 | 986 | 168 | | |
| 40 | 385 | 259 | 83 | 715 | 618 | 126 | 1034 | 994 | 169 | | |
| 41 | 393 | 267 | 84 | 722 | 627 | 127 | 1042 | 1003 | | | |
| 42 | 400 | 275 | 85 | 730 | 635 | 128 | 1049 | 1012 | | | |

The first column is the number of errors (ne = number of exceeded delays or number of wrong reports)

The second column is the number of samples for the pass limit (ns_p, ns=Number of samples= number of successes + number of exceedings or number of reports)

The third column is the number of samples for the fail limit (ns_f)

D.4.4 Pass fail decision rules for ECID and OTDOA test cases

Having observed 0 errors, pass the test at 33+ samples, otherwise continue

Having observed 1 error, pass the test at 46+ samples, otherwise continue

Having observed 2 errors, pass the test at 58+ samples, fail the test at 2 samples, otherwise continue

Having observed 146 errors, pass the test at 1181+ samples, fail the test at 1173- samples, otherwise continue

Having observed 147 errors, fail the test at 1182- samples,

Where x+ means: x or more, x- means x or less

NOTE: an ideal DUT passes after 33 samples. The maximum test time is 1181 samples.

D.4.5 Background information to the pass fail limits

There is freedom to design the decision co-ordinates (ne, ns).

The binomial distribution and its inverse is used to design the pass and fail limits. Note that this method is not unique and that other methods exist.

$$\text{fail}(\text{ne}, \text{d}_f) := \frac{\text{ne}}{(\text{ne} + \text{qnbino}(\text{d}_f, \text{ne}, \text{ER}))}$$

$$\text{pass}(\text{ne}, \text{cl}_p, \text{M}) := \frac{\text{ne}}{(\text{ne} + \text{qnbino}(\text{cl}_p, \text{ne}, \text{ER} \cdot \text{M}))}$$

Where

fail(..) is the error ratio for the fail limit

pass(..) is the error ratio for the pass limit

ER is the specified error ratio e.g. 0.05

ne is the number of bad results. This is the variable in both equations

M is the Bad DUT factor M=1.5

d_f is the wrong decision probability of a single (ne, ns) co-ordinate for the fail limit.
It is found by simulation to be d_f = 0.004

cl_p is the confidence level of a single (ne, ns) co-ordinate for the pass limit.
It is found by simulation to be cl_p = 0.9975

qnbino(..): The inverse cumulative function of the negative binomial distribution

The simulation works as follows:

A large population of limit DUTs with true ER = 0.05 is decided against the pass and fail limits.

cl_p and d_f are tuned such that CL (95%) of the population passes and D (5%) of the population fails.

A population of Bad DUTs with true ER = M*0.05 is decided against the same pass and fail limits.

cl_p and d_f are tuned such that CL (95%) of the population fails and D (5%) of the population passes.

This procedure and the relationship to the measurement is justified in clause D.3.7. The number of DUTs decreases during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 169 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (n_e , n_s), which can be achieved with other formulas or methods as well.

Annex E (normative): Conditions for ECID and OTDOA requirements applicability for operating bands

E.1 Conditions for E-CID UE Rx – Tx time difference Measurements

This clause defines the E-UTRAN RSRP applicable for a corresponding operating band

The conditions for E-UTRAN ECID UE Rx-Tx time difference measurements are defined in Table E.1-1.

Table E.1-1: Intra-frequency absolute RSRP and RSRQ Accuracy Requirements

| Parameter | E-UTRA operating band groups ^{Note 3} | Minimum RSRP ^{Note 1} |
|---|--|--------------------------------|
| | | dBm/15kHz |
| Conditions | FDD_A, TDD_A | -127 |
| | FDD_C, TDD_C | -126 |
| | FDD_D | -125.5 |
| | FDD_E, TDD_E | -125 |
| | FDD_F | -124.5 ^{Note 2} |
| | FDD_G | -124 |
| | FDD_H | -123.5 |
| | FDD_N | -120.5 |
| NOTE 1: This condition level is increased by $\Delta > 0$, when applicable, as described in Sections B.4.2 and B.4.3 of TS 36.133. | | |
| NOTE 2: The condition is -125 dBm/15kHz when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz. | | |
| NOTE 3: E-UTRA operating band groups are as defined in clause 4.4.2. | | |

E.2 Conditions for OTDOA intra-frequency RSTD Measurements

This clause defines the E-UTRAN intra-frequency PRP_{1,2} applicable for a corresponding operating band.

The conditions for E-UTRAN OTDOA intra-frequency RSTD measurements are defined in Table E.2-1

Table E.2-1: E-UTRAN OTDOA intra-frequency RSTD measurements

| Parameter | E-UTRA operating band group s ^{Note 3} | Minimum PRP _{1,2} ^{Note 1} |
|-------------------|---|--|
| | | dBm/15kHz |
| Conditions | FDD_A, TDD_A | -127 |
| | FDD_C, TDD_C | -126 |
| | FDD_D | -125.5 |
| | FDD_E, TDD_E | -125 |
| | FDD_F | -124.5 ^{Note 2} |
| | FDD_G | -124 |
| | FDD_H | -123.5 |
| | FDD_N | -120.5 |

| | |
|---------|--|
| NOTE 1: | For a UE supporting a band combination of E-UTRA carrier aggregation with one uplink carrier configuration, if there is a relaxation of receiver sensitivity $\Delta RIB,c$ as defined in TS 36.101 [2] due to the CA configuration, the PRP measurement side condition shall be increased by the amount $\Delta RIB,c$ defined for the corresponding downlink band. |
| NOTE 2: | The condition is -125 dBm/15kHz when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz. |
| NOTE 3: | E-UTRA operating band groups are as defined in clause 4.4.2. |

E.3 Conditions for OTDOA inter-frequency RSTD Measurements

This clause defines the E-UTRAN inter-frequency PRP_1,2 applicable for a corresponding operating band.

The conditions for E-UTRAN OTDOA inter-frequency RSTD measurements are defined in Table E.2-1.

Annex F (normative): UTRAN Generic procedures

F.1 General

This normative annex specifies the set up and release procedure that shall be used for each UTRAN test case.

In this clause the terms GNSS and A-GNSS also include the cases where the only satellite system used is GPS unless otherwise stated.

F.2 UTRAN connection set up

F.2.1 Initial conditions

System Simulator:

- 1 cell, default parameters. The default system information, as specified in clause 6.1 of TS 34.108 [28], is broadcast with the exceptions of SIB15, SIB15.1, SIB15.2 and SIB15.3 which are not broadcast.

User Equipment:

- The UE shall be operated in Normal Propagation Conditions as specified in clause 5.2.1 of TS 34.108 [28].
- The UE is in state "MM idle" state with valid TMSI and CKSN.
- The UE is in state "PMM idle" with valid P-TMSI.

F.2.2 Procedures

CS Domain

| Step | Direction | | Message | Comments |
|------|-----------|----|--------------------------------------|--------------------------|
| | UE | SS | | |
| 1 | <-- | | SYSTEM INFORMATION (BCCH) | Broadcast |
| 2 | <-- | | PAGING TYPE1 (PCCH) | Paging (CS domain, TMSI) |
| 3 | --> | | RRC CONNECTION REQUEST (CCCH) | RRC |
| 4 | <-- | | RRC CONNECTION SETUP (CCCH) | RRC |
| 5 | --> | | RRC CONNECTION SETUP COMPLETE (DCCH) | RRC |
| 6 | --> | | PAGING RESPONSE | RR |
| 7 | <-- | | AUTHENTICATION REQUEST | MM |
| 8 | --> | | AUTHENTICATION RESPONSE | MM |
| 9 | <-- | | SECURITY MODE COMMAND | RRC |
| 10 | --> | | SECURITY MODE COMPLETE | RRC |

PS Domain

| Step | Direction | | Message | Comments |
|------|-----------|----|--------------------------------------|--------------------------------------|
| | UE | SS | | |
| 1 | <-- | | PAGING TYPE1 (PCCH) | Paging (PS domain, PMSI or IMSI) |
| 2 | --> | | RRC CONNECTION REQUEST (CCCH) | RRC |
| 3 | <-- | | RRC CONNECTION SETUP (CCCH) | RRC |
| 4 | --> | | RRC CONNECTION SETUP COMPLETE (DCCH) | RRC (Transport Channel: DCH or FACH) |
| 5 | --> | | SERVICE REQUEST | GMM |
| 6 | <-- | | AUTHENTICATION REQUEST | GMM |
| 7 | --> | | AUTHENTICATION RESPONSE | GMM |
| 8 | <-- | | SECURITY MODE COMMAND | RRC |
| 9 | --> | | SECURITY MODE COMPLETE | RRC |

F.2.3 Specific message contents

The default message contents specified in clause 9.1 of TS 34.108 [28] will be used for the Moving Scenario and Periodic Update test. For all Minimum Performance TTFF Tests the default message contents specified in clause 9.1 of TS 34.108 [28] will be used with the following exception.

Contents of PAGING TYPE1:

| Information Element | Value/remark |
|---------------------|--------------------------------------|
| Paging Cause | Terminating High Priority Signalling |

Contents of RRC CONNECTION SETUP:

For A-GNSS performance testing in CELL_DCH state: The RRC Connection Setup is defined in clause 9.1.1 of TS 34.108 [28] "Contents of RRC CONNECTION SETUP message: UM (Transition to CELL_DCH)".

For A-GNSS performance testing in CELL_FACH state: The RRC Connection Setup is defined in clause 9.1.1 of TS 34.108 [28] "Contents of RRC CONNECTION SETUP message: UM (Transition to CELL_FACH)".

Contents of RRC CONNECTION SETUP COMPLETE:

| Information Element | Value/remark |
|---|---|
| UE radio access capability - UE positioning capability | Defines the A-GNSS mode the UE supports (UE-based, UE-assisted, or both). UE shall be tested for all modes it supports. |

F.3 UTRAN connection release

F.3.1 Procedure

| Step | Direction | | Message | Comments |
|------|-----------|----|---------------------------------|----------|
| | UE | SS | | |
| 1 | <-- | | RRC CONNECTION RELEASE | RRC |
| 2 | --> | | RRC CONNECTION RELEASE COMPLETE | RRC |

F.3.2 Specific message contents

The default message contents specified in clause 9.1 of TS 34.108 [28] are used.

Annex G (normative): Environmental conditions

G.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

G.2 Environmental requirements

The requirements in this clause apply to all types of UE(s).

G.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table G.2.1.1

| | |
|----------------|---|
| +15°C to +35°C | for normal conditions (with relative humidity up to 75 %) |
|----------------|---|

G.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table G.2.2.1

| Power source | Normal conditions voltage |
|------------------------------|---------------------------|
| AC mains | nominal |
| Regulated lead acid battery | 1.1 × nominal |
| Non regulated batteries: | |
| - Leclanché / lithium | Nominal |
| - Mercury/nickel and cadmium | Nominal |

Annex H (informative): Change history

| Change history | | | | | | | |
|----------------|---------|-----------|------|------|---|--------|--------|
| Date | TSG # | TSG Doc. | CR | R ev | Subject/Comment TS 36.571-1 | Old | New |
| 2010-08 | RAN5#48 | R5-104316 | | | Initial draft TS 36.571-1 created | | 0.0.0 |
| 2010-11 | RAN5#49 | R5-106613 | | | V1.0.0 created for presentation to RAN Plenary | 0.0.0 | 1.0.0 |
| 2011-02 | RAN5#50 | R5-110124 | | | Various values and corrections added | 1.0.0 | 1.1.0 |
| 2011-08 | RAN5#52 | R5-113133 | | | Text changes from R5-112139, R5-112386, R5-112837, R5-112838, R5-112839 added | 1.1.0 | 1.2.0 |
| 2011-08 | RAN5#53 | | | | Text changes from R5-113135, R5-113150, R5-114066, R5-113587 added | 1.2.0 | - |
| 2011-11 | RAN5#53 | R5-115206 | | | Initial draft TS 37.571-1 created from TS 36.571-1, TS 34.171 and TS 34.172 | - | 1.0.0 |
| 2011-11 | RAN5#53 | R5-115207 | | | V2.0.0 created for presentation to RAN Plenary with additions from R5-115246, R5-115247, R5-115248, R5-115809 | 1.0.0 | 2.0.0 |
| 2011-12 | RAN#54 | - | - | - | Moved to Rel-9 with editorial changes only | 2.0.0 | 9.0.0 |
| 2012-03 | RAN#55 | R5-120087 | 0001 | - | Modify OTDOA connection diagrams | 9.0.0 | 9.1.0 |
| 2012-03 | RAN#55 | R5-120089 | 0002 | - | OTDOA parameter corrections | 9.0.0 | 9.1.0 |
| 2012-03 | RAN#55 | R5-120414 | 0003 | - | Adding ECID test cases to Annexes in TS37.571-1 | 9.0.0 | 9.1.0 |
| 2012-03 | RAN#55 | R5-120822 | 0004 | - | Correct A-GNSS signalling | 9.0.0 | 9.1.0 |
| 2012-03 | RAN#55 | R5-120823 | 0005 | - | ECID procedure modifications | 9.0.0 | 9.1.0 |
| 2012-03 | RAN#55 | R5-120893 | 0006 | - | OTDOA procedure updates | 9.0.0 | 9.1.0 |
| 2012-06 | RAN#56 | R5-121126 | 0007 | - | Update to Figure 9.1.1.3-1 | 9.1.0 | 9.2.0 |
| 2012-06 | RAN#56 | R5-121127 | 0008 | - | Clarification to notes in tests 9.1.3 & 9.1.4 | 9.1.0 | 9.2.0 |
| 2012-06 | RAN#56 | R5-121128 | 0009 | - | Clarifications to frequencies and bandwidths to be used | 9.1.0 | 9.2.0 |
| 2012-06 | RAN#56 | R5-121129 | 0010 | - | Setting responseTime in ECID test cases | 9.1.0 | 9.2.0 |
| 2012-06 | RAN#56 | R5-121130 | 0011 | - | Modifications to signalling used in OTDOA test cases | 9.1.0 | 9.2.0 |
| 2012-06 | RAN#56 | R5-121908 | 0012 | - | Adding operating band 26 to TS 37.571-1 | 9.1.0 | 9.2.0 |
| 2012-06 | RAN#56 | - | - | - | Added missing contents from R5-121126, R5-121127, R5-121128 | 9.2.0 | 9.2.1 |
| 2012-06 | RAN#56 | - | - | - | Upgraded to v10.0.0 with no change. | 9.2.1 | 10.0.0 |
| 2012-09 | RAN#57 | R5-123066 | 0013 | - | Correction to RSTD Measurement Accuracy Tests 9.1.3 and 9.1.4 | 10.0.0 | 10.1.0 |
| 2012-09 | RAN#57 | R5-123913 | 0014 | - | Addition of RRM Test Case 9.8.4 TDD inter-frequency RSTD Accuracy | 10.0.0 | 10.1.0 |
| 2012-12 | RAN#58 | R5-125136 | 0015 | - | Corrections to references | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125188 | 0016 | - | Correction to LPP Message Content for GNSS Moving Scenario Test | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125806 | 0018 | - | New test case 10.1 FDD RSTD Measurement Reporting Delay for Carrier Aggregation | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125807 | 0019 | - | New test case 10.2 TDD RSTD Measurement Reporting Delay for Carrier Aggregation | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125808 | 0020 | - | New test case 10.3 FDD RSTD Measurement Accuracy for Carrier Aggregation | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125809 | 0021 | - | New test case 10.4.TDD RSTD Measurement Accuracy for Carrier Aggregation | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125831 | 0022 | - | Adding bands 28 and 44 to TS 37.571-1 | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125847 | 0023 | - | Corrections to procedures for RSTD tests | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125848 | 0024 | - | Correction of OCNG Patterns for UE Rx - Tx Time Difference Test Cases | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-125916 | 0025 | - | Add editor's note for value of lprs for test case 9.1.4 | 10.1.0 | 10.2.0 |
| 2012-12 | RAN#58 | R5-124120 | 0026 | - | New common text for test cases 10.1 - 10.4 for RSTD for Carrier Aggregation | 10.1.0 | 10.2.0 |
| 2013-03 | RAN#59 | R5-130959 | 0027 | - | LBS Perf: Corrections to TCs 8.1.1 and 8.1.2 | 10.2.0 | 10.3.0 |
| 2013-06 | RAN#60 | R5-131097 | 0028 | - | Removal of Note 1 from OTDOA parameter tables | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131176 | 0029 | - | Clarification to RSTD Delay Test procedures | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131943 | 0030 | - | New Test Case for FDD-FDD inter-frequency RSTD Accuracy | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131944 | 0031 | - | New Test Case for FDD-FDD inter-frequency RSTD measurement reporting delay | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131945 | 0032 | - | OTDOA test case alignment with RAN 4 | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131946 | 0033 | - | Corrections to ECID and OTDOA tests Note: same contents as R5-131945 was submitted by accident. | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131947 | 0034 | - | RSTD test parameter updates | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131993 | 0035 | - | Test Description for TDD inter-frequency accuracy test case | 10.3.0 | 10.4.0 |
| 2013-06 | RAN#60 | R5-131994 | 0036 | - | New test case for TDD inter-frequency RSTD reporting delay 9.2.2 | 10.3.0 | 10.4.0 |
| 2013-09 | RAN#61 | R5-133173 | 0037 | - | Tidy up of Table 9.2.1.4.1-1 | 10.4.0 | 10.5.0 |

| | | | | | | | |
|---------|--------|-----------|------|---|---|--------|--------|
| 2013-09 | RAN#61 | R5-133174 | 0038 | - | Corrections to ECID and OTDOA tests | 10.4.0 | 10.5.0 |
| 2013-09 | RAN#61 | R5-133375 | 0039 | - | Uncertainties and Test Tolerances for RSTD test cases 9.1.1 and 9.1.2 | 10.4.0 | 10.5.0 |
| 2013-09 | RAN#61 | R5-133378 | 0040 | - | Uncertainties and Test Tolerances for RSTD test cases 9.1.3 and 9.1.4 | 10.4.0 | 10.5.0 |
| 2013-09 | RAN#61 | R5-133848 | 0041 | - | LBS Perf: Uncertainties and test tolerances for TCs 8.1.1 and 8.1.2 | 10.4.0 | 10.5.0 |
| 2013-09 | RAN#61 | R5-133885 | 0042 | - | LBS Perf: Revision of test procedure for TC-s 8.1.1-2 | 10.4.0 | 10.5.0 |
| 2013-12 | RAN#62 | R5-134200 | 0043 | - | Updates to ECID and RSTD tests following RAN 4 updates | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134202 | 0044 | - | Addition of Capability exchange in ECID and RSTD tests | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134205 | 0045 | - | Addition of Applicabilities for 9.2.1 - 9.2.5 | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134849 | 0046 | - | Addition of missing acknowledgements in ECID tests | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134850 | 0047 | - | Corrections to references for OCNG and RMC | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134899 | 0048 | - | Introduction 8.1.3 E-UTRAN FDD UE Rx-Tx time difference (felCIC) | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134970 | 0049 | - | Introduction 8.1.4 E-UTRAN TDD UE Rx-Tx time difference (felCIC) | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134979 | 0050 | - | Addition of new tests 10.1a, 10.2a, 10.3a and 10.4a for 20MHz CA | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-134980 | 0051 | - | LBS Perf: Corrections to RSTD reporting tests | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-135016 | 0052 | - | Uncertainties and Test Tolerances for RSTD test cases 9.2.1 and 9.2.2 | 10.5.0 | 10.6.0 |
| 2013-12 | RAN#62 | R5-135018 | 0053 | - | Uncertainties and Test Tolerances for RSTD test cases 9.2.4 and 9.2.5 | 10.5.0 | 10.6.0 |
| 2014-03 | RAN#63 | R5-140107 | 0054 | - | Corrections to PRS_RA in RSTD tests | 10.6.0 | 10.7.0 |
| 2014-03 | RAN#63 | R5-140278 | 0055 | - | Addition of E-UTRA band groups | 10.6.0 | 10.7.0 |
| 2014-03 | RAN#63 | R5-140308 | 0056 | - | LBS RF: Aperiodic CQI configuration for 1.4 MHz bandwidth subtests | 10.6.0 | 10.7.0 |
| 2014-03 | RAN#63 | R5-141033 | 0057 | - | RSTD test case updates | 10.6.0 | 10.7.0 |
| 2014-03 | RAN#63 | R5-140875 | 0058 | - | Additions to TC 8.1.6 E-UTRAN TDD UE Rx-Tx time difference (felCIC) | 10.7.0 | 11.0.0 |
| 2014-03 | RAN#63 | R5-141010 | 0059 | - | Additions to TC 8.1.5 E-UTRAN FDD UE Rx-Tx time difference (felCIC) | 10.7.0 | 11.0.0 |
| 2014-06 | RAN#64 | R5-142098 | 0060 | - | Corrections for OCNG patterns defined in RSTD Tables | 11.0.0 | 11.1.0 |
| 2014-06 | RAN#64 | R5-142211 | 0061 | - | Additions to felCIC UE Rx-Tx test cases in Annex C | 11.0.0 | 11.1.0 |
| 2014-06 | RAN#64 | R5-142302 | 0062 | - | LBS RF: Aperiodic CQI configuration for 1.4 MHz bandwidth tests | 11.0.0 | 11.1.0 |
| 2014-06 | RAN#64 | R5-143109 | 0063 | - | Additions to TC 8.1.6 E-UTRAN TDD UE Rx-Tx time difference (felCIC) | 11.0.0 | 11.1.0 |
| 2014-06 | RAN#64 | R5-143111 | 0064 | - | Additions to FDD interruption requirements for SCell | 11.0.0 | 11.1.0 |
| 2014-06 | RAN#64 | R5-143180 | 0065 | - | Additions to TC 8.1.5 E-UTRAN FDD UE Rx-Tx time difference (felCIC) | 11.0.0 | 11.1.0 |
| 2014-06 | RAN#64 | R5-143211 | 0066 | - | LBS RF: Update of RSTD tests | 11.0.0 | 11.1.0 |
| 2014-09 | RAN#65 | R5-144080 | 0068 | - | Corrections to RSTD Measurement Reporting Delay for Carrier Aggregation tests | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144125 | 0069 | - | Corrections to Physical Cell Id (PCI) Configuration Conditions in UE Rx-Tx time difference felCIC | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144193 | 0072 | - | Cell-specific test parameters for E-UTRAN | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144215 | 0081 | - | Clarification to RSTD Reporting Delay tests | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144409 | 0083 | - | Update to initial conditions and measurement procedure in for UTRA A-GPS and A-GNSS tests | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144553 | 0084 | - | Removal of editors note in TC 9.1.4 | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144620 | 0085 | - | Updates OTDOA Neighbour Cell Info List | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144763 | 0086 | - | Correction for RSTD Measurement Accuracy in CA requirements in RRM | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144789 | 0070 | - | Uncertainties and Test Tolerances for RSTD test cases 10.1, 10.1A, 10.2 and 10.2A | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144790 | 0071 | - | Uncertainties and Test Tolerances for RSTD test cases 10.3, 10.3A, 10.4 and 10.4A | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144791 | 0082 | - | Updates to Annex E of TS 37.571-1 | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144792 | 0087 | - | RSTD tests RAN 4 alignment | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144865 | 0088 | - | Editor's note to PRS levels with fading | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144870 | 0089 | - | Corrections to Note 3 for RSTD CA tests | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144914 | 0090 | - | Corrections to TDD RSTD Measurement Reporting Delay for Carrier Aggregation | 11.1.0 | 11.2.0 |
| 2014-09 | RAN#65 | R5-144915 | 0091 | - | RSTD CA Measurement Accuracy connection diagrams | 11.1.0 | 11.2.0 |

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