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User Equipment (UE) performance requirements
for RAT-Independent positioning enhancements
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Contents

Foreword

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1 Scope

The present document establishes the minimum performance requirements for RAT-Independent Positioning Enhancements for FDD or TDD mode of UTRA and E-UTRA for the User Equipment (UE).

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
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[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 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".

[3] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

[4] 3GPP TS 36.509: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Special conformance testing functions for User Equipment (UE)".

[5] 3GPP TS 36.942: Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Frequency (RF) system scenarios".

[6] 3GPP TS 25.331: "Radio Resource Control (RRC); Protocol specification".

[7] ATIS-0500027: "Recommendations for Establishing Wide Scale Indoor Location Performance", May 2015.

[8] 3GPP TS 34.109: "Terminal logical test interface; Special conformance testing functions ".

[9] 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 ".

[10] 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 "

[11] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[12] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

[13] Specification of the Bluetooth System version 4.2.

[14] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".

[15] IEEE Standard 802.11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications.

3 Definitions, abbreviations and test tolerances

3.1 Definitions

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

3.2 Abbreviations

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

AWGN	Additive White Gaussian Noise
EPA	Extended Pedestrian A
E-UTRA	Evolved UMTS Terrestrial Radio Access
FDD	Frequency Division Duplex
LPP	LTE Positioning Protocol
MBS	Metropolitan Beacon System
RRC	Radio Resource Control
RSSI	Received Signal Strength Indicator
TDD	Time Division Duplex
UE	User Equipment
UTRA	UMTS Terrestrial Radio Access
WLAN	Wireless Local Area Network

3.3 Test tolerances

The requirements given in the present document make no allowance for measurement uncertainty. The test specification 3GPP TS 37.571 -1 [9] will define test tolerances. These test tolerances are individually calculated for each test. The test tolerances are then added to the limits in the present document to create test limits. The measurement results are compared against the test limits as defined by the shared risk principle.

Shared Risk is defined in ETSI TR 102 273-1-2 [2], subclause 6.5.

4 General

4.1 Introduction

The present document defines the minimum performance requirements for UEs that support RAT Independent positioning technologies.

4.2 MBS Measurements

4.2.1 General

Clause 4.2 describes the measurements performed by the UE for MBS positioning.

4.2.2 MBS measurement parameters

The measurement parameters are the MBS code phase measurements contained in the *TBS-MeasurementInformation* IE provided in the LPP message of type PROVIDE LOCATION INFORMATION [3] for LTE, and the *UE Positioning AddPos measured results* IE in the MEASUREMENT REPORT message for UTRA [6].

4.2.3 MBS Measurement time

For LTE, MBS measurement 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. For tests that involve sending MBS assistance data to the UE, the assistance data is sent prior to the PROVIDE LOCATION INFORMATION message. The response times specified for all test cases are based on new measurements unless otherwise stated, i.e. the UE shall not re use any information on measurements 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 [4] clause 6.9 for the purpose of deleting this information.

For UTRA, MBS measurement 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 MBS measured results, and ending when the UE starts sending the measurement report containing the measured result on the Uu interface. The response times specified for all test cases are based on new measurements unless otherwise stated, i.e. the UE shall not re use any information on measurements 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 34.109 [8] clause 5.4 for the purpose of deleting this information.

The measurements for n MBS beacons, enabled across the slots of an MBS transmission period [7], shall be available at the UE by T_{MBS_meas}, where T_{MBS_meas} can be expressed as:

$$T_{MBS\_meas} = \tau + 10 \times ceil(n/10) \times T_{MBS\_TP} + T_{Proc} \quad \text{ms}$$

where

T_{MBS_meas} is the total time for detecting and measuring n beacons

τ is the elapsed time from the trigger of the measurement to the start of the first MBS transmission period

T_{MBS_TP} is the MBS transmission period (1 second)

T_{Proc} is the processing time, an upper-bound for which can be given as $10 \times ceil(n/10) \times T_{MBS\_slot}$ where T_{MBS_slot} is the duration of a MBS slot (100 ms) with continuous MBS transmissions

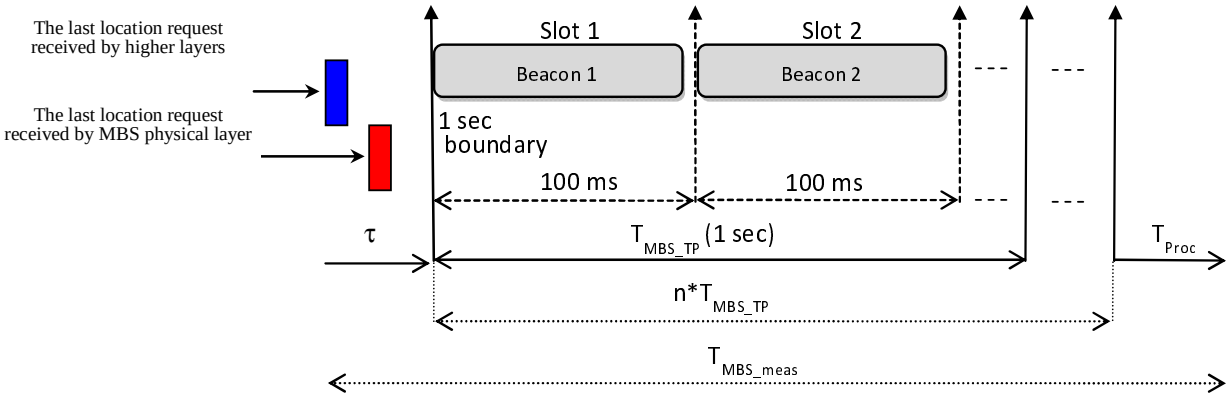

Figure 4.2.3-1: MBS Measurement Time

For this requirement, the assumption is that there is zero frequency offset for the beacons and the UEs have a minimum of 13 parallel correlators.

The test case requirements for MBS Measurement time can be found in clause A.3.

4.2.4 RRC states for MBS measurements

For LTE, the minimum MBS performance requirements are specified in clause 5 for RRC_CONNECTED state.

For UTRA, the minimum MBS performance requirements are specified in clause 5 for different RRC states that include Cell_DCH and Cell_FACH.

4.2.5 MBS Measurement Error Definitions

The code phase measurement error is defined as the difference between the actual code phase for a given MBS beacon, and the estimated code phase for that beacon, as reported in the LPP message of type PROVIDE LOCATION INFORMATION for LTE [3], and the *UE Positioning AddPos measured results* IE in the MEASUREMENT REPORT message for UTRA [6]. This difference has to then be adjusted for the measurement bias introduced by the UE clock to provide the final code phase measurement error.

4.3 WLAN Measurements

4.3.1 General

Clause 4.3 defines the measurement requirements for the measurements performed by the UE for WLAN based positioning.

4.3.2 WLAN Access Point Measurements

4.3.2.1 E-UTRAN FDD-WLAN Access Point Measurements

4.3.2.1.1 Introduction

The requirements defined in section 4.3.2.1 shall apply provided the E-UTRA FDD UE has received WLAN-RequestLocationInformation message from E-SMLC via LPP requesting the UE to report WLAN measurement for one or more WLAN Access Points [12].

4.3.2.1.2 Measurement Requirements

The measurement delay reporting requirements for WLAN are defined in section 4.3.2.1.3. The WLAN Access Point identification minimum performance requirements are defined in clause 7.

4.3.2.1.3 Measurement Reporting Delay

For LTE, WLAN measurement 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 based on new measurements unless otherwise stated, i.e. the UE shall not re use any information on measurements 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 [4] clause 6.9 for the purpose of deleting this information. No WLAN assistance data is provided to the UE.

The signals from the WLAN APs shall be available at the UE for the duration of the measurement time. Each WLAN AP transmits a beacon signal with a beacon interval smaller or equal to 102.4 ms. The beacon frames from different access points shall be transmitted in different time slots or non-overlapping frequency channels. The beacon frames have variable time duration of ~1ms.

The WLAN Measurement Reporting Delay is given as:

$$T_{WLAN\_meas} = \tau + 20 \text{ sec}$$

where

T_{WLAN_meas} is the total time for detecting and measuring the WLAN Access Points

τ is the elapsed time from the trigger of the measurement to the start of the first WLAN transmission period and is shown in Figure 4.3.2.1.3-1.

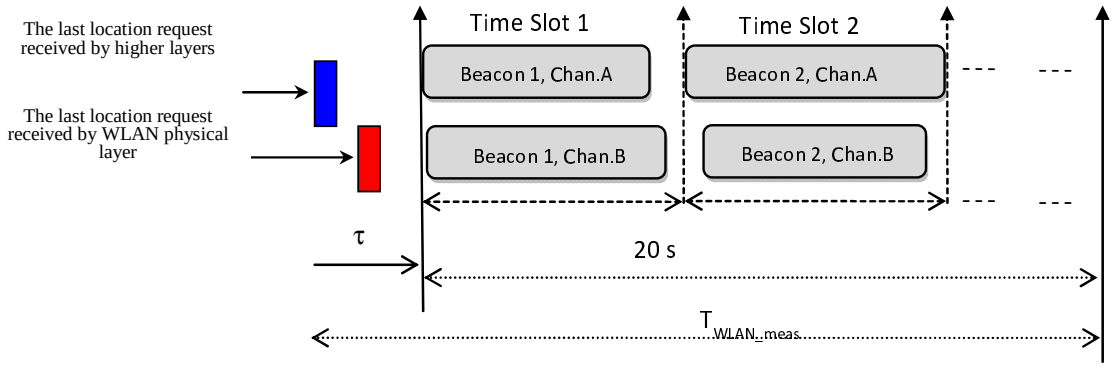

Figure 4.3.2.1.3-1: WLAN Measurement Time

4.3.2.2 E-UTRAN TDD-WLAN Access Point Measurements

4.3.2.2.1 Introduction

The requirements defined in section 4.3.2.2 shall apply provided the E-UTRA TDD UE has received WLAN-ProvideLocationInformation message from E-SMLC via LPP requesting the UE to report WLAN measurement for one or more WLAN Access Points [12].

4.3.2.2.2 Measurement Requirements

The measurement reporting delay requirements for WLAN are defined in section 4.3.2.2.3. The WLAN Access Point identification minimum performance requirements are defined in clause 7.

4.3.2.2.3 Measurement Reporting Delay

Same as 4.3.2.1.3.

4.4 Bluetooth Measurements

4.4.1 General

Clause 4.4 defines the measurement requirements for the measurements performed by the UE for Bluetooth based positioning.

4.4.2 Bluetooth Access Point Measurements

4.4.2.1 Introduction

The requirements defined in section 4.4.2.1 shall apply provided the UE has received BT-RequestLocationInformation message from E-SMLC via LPP requesting the UE to report Bluetooth measurement for one or more Bluetooth Access Points [12].

4.4.2.2 Measurement Requirements

In the RRC_CONNECTED state the measurement period for Bluetooth Access Point identification shall be T_{BT_meas}. The value of T_{BT_meas} is 10.24 s, and can be extended to 40.96 s if extended inquiry is allowed, provided that the following conditions are met [13]:

- At least one Bluetooth beacon signal is transmitted on one of the Bluetooth advertising channels with a broadcast interval of 100 ms.

T_{BT_meas} defined in this section shall apply when no DRX cycle is configured or when any DRX cycle defined in [14] is configured.

The UE physical layer shall be capable of reporting Bluetooth Access Point(s) measurements to higher layers within the measurement period of T_{BT_meas}.

The Bluetooth RSSI measurement accuracy for all measured access points shall be fulfilled according to the accuracy as specified in the clause 6.

4.4.2.3 Measurement Reporting Delay

This requirement assumes that 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 x TTI_{DCCH}. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

5 MBS minimum performance requirements

5.1 General

The minimum performance requirements specified in clause 5 apply for UEs that support MBS. This section applies to requirements for both for UTRA and E-UTRA.

The code phase accuracy requirements in this clause are statistical in nature and pertain to the 90th percentile of the distribution.

The measurement time for each requirement shall be T_{MBS_meas} as described in clause 4.2.3. This clause does not include nor consider delays occurring in the various signalling interfaces of the network.

5.2 Sensitivity

A Sensitivity requirement is essential for verifying the performance of MBS receiver in weak signal conditions. In order to test the most stringent signal levels for the beacons the Sensitivity test case is performed in AWGN channel. This test case verifies the UE MBS performance at the lowest expected signal levels.

In MBS deployments, target sensitivity levels of -130 dBm (at the UE antenna connector, across the signal bandwidth) are used.

The minimum requirements for Sensitivity are shown in Table 5.2-1.

Table 5.2-1: Requirements for Sensitivity

MBS Configuration	Signal Strength (dBm)	Code phase measurement accuracy (ms)
TB1 (2 MHz) [7]	-130	1.66×10^{-4}
TB1 (5 MHz) [7]	-130	6.64×10^{-5} (Release 14 onwards)

The test case requirements for Sensitivity measurement accuracy can be found in clause A.4.2.

5.3 Nominal Accuracy

The Nominal Accuracy requirement verifies the UE MBS performance under ideal conditions. The primary aim of the test is to ensure good accuracy when the MBS signal conditions allow it.

In this requirement AWGN channel model is used and the signal level is above the noise floor.

The minimum requirements for Nominal are shown in Table 5.3-1.

Table 5.3-1: Requirements for Nominal Accuracy

MBS Configuration	Signal Strength (dBm)	Code phase measurement accuracy (ms)
TB1 (2 MHz) [7]	-30	5.0×10^{-5}
TB2 (5 MHz) [7]	-30	2.0×10^{-5} (Release 14 onwards)

The test case requirements for Nominal measurement accuracy can be found in clause A.4.2.

5.4 Dynamic Range

The Dynamic Range requirement is targeted at testing the performance of the MBS receiver under time varying signal conditions. This test case is important for a system such as MBS where the time slotting of beacons is used.

The maximum signal level of a MBS beacon is expected to be -30 dBm (at the UE antenna connector). This can be shown theoretically by assuming a TX power of +40 dBm and a minimum coupling loss between the transmitter and the UE of 70 dB [5].

For this requirement, the power level of the MBS beacons shall be alternated between the strongest and the weakest expected levels across consecutive slots in the MBS transmission period.

The minimum requirements for Dynamic Range are shown in Table 5.4-1.

Table 5.4-1: Requirements for Dynamic Range

MBS Configuration	Signal Strength (dBm)	Code phase measurement accuracy (ms)
TB1 (2 MHz) [7]	-30	5.0×10^{-5}
	-130	1.66×10^{-4}
TB2 (5 MHz) [7]	-30	2.0×10^{-5} (Release 14 onwards)
	-130	6.64×10^{-5} (Release 14 onwards)

The test case requirements for Dynamic Range measurement accuracy can be found in clause A.4.2.

5.5 Multipath

The purpose of the test case is to verify the receiver's tolerance to multipath.

The pedestrian channel model used in TS 37.571-1 [9], captured in Annex B of TS 36.521-1 [10] is used for assessing the MBS performance under the multipath scenario, specifically the Extended Pedestrian A (EPA) with a maximum Doppler frequency of 5 Hz (EPA 5Hz).

The minimum requirements for the Multipath scenario are shown in Table 5.5-1.

Table 5.5-1: Requirements for Multipath scenario

MBS Configuration	Direct Path Signal Strength (dBm)	Code phase measurement accuracy (ms)
TB1 (2 MHz) [7]	-30	1.66×10^{-4}

The test case requirements for Multipath measurement accuracy can be found in clause A.4.3.

6 Bluetooth performance requirements

6.1 Introduction

The requirements in this clause are valid for terminals capable of Bluetooth.

6.1.1 Bluetooth RSSI Measurement

6.1.1.1 Measurement Accuracy

The Bluetooth RSSI metric is an absolute receiver signal strength value in dBm. The measured Bluetooth RSSI shall be accurate within ±6 dB as defined in [13].

The reporting range of Bluetooth RSSI is defined in section 6.5.7.2 [12].

7 WLAN Access Point Identification minimum performance requirements

7.1 General

The minimum performance requirements specified in clause 7 apply for UEs that support WLAN positioning. This section applies to requirements for E-UTRA.

The measurement requirements in this clause are statistical in nature and pertain to the 90th percentile of the distribution.

The measurement time for each requirement shall be T_{WLAN_meas} as described in clause 4.3.2.1.2 for E-UTRA FDD and 4.3.2.2.3 for E-UTRA TDD. This clause does not include nor consider delays occurring in the various signalling interfaces of the network.

7.2 WLAN Access Point Identification under Sensitivity conditions

The sensitivity conditions for a WLAN receiver are defined by IEEE in [15].

The UE shall be able to identify at least 6 WLAN Access Points if the WLAN beacons are received at the sensitivity power level. In order to test the most stringent signal levels for the beacons the Sensitivity test case is performed in AWGN channel. This test case verifies the UE capability to identify and report WLAN AP at the lowest expected signal levels but it does not evaluate measurement accuracy.

Table 7.2-1: Requirements for WLAN Access Point Identification under Sensitivity conditions

Number of WLAN APs	Signal Strength (dBm)	% of reported Access Points
6	See [15]	90

7.3 WLAN Access Point Identification under Nominal conditions

The WLAN Access Point identification under nominal conditions verifies the UE capability to identify and report WLAN APs when the WLAN signal conditions are ideal.

In this requirement AWGN channel model is used and the signal level is above the noise floor.

The minimum requirements for Nominal are shown in Table 7.3-1.

Table 7.3-1: Requirements for WLAN Access Point Identification under Nominal conditions

Number of WLAN APs	Signal Strength (dBm)	% of reported Access Points
6	-60	90

7.4 WLAN Access Point Identification under Dynamic Range conditions

The WLAN Access Point identification under dynamic range conditions verifies the UE capability to identify and report WLAN APs when the received power difference between WLAN APs is large. The power difference between APs follows the adjacent channel rejection criteria defined by IEEE in [15].

The UE shall be able to identify at least 3 WLAN AP located in 3 adjacent channels where the separation between channels is $\geq$ 20 MHz and the middle channel is received with high power and the side channels are received with low power.

Table 7.4-1: Requirements for WLAN Access Point Identification under Dynamic Range conditions

Number of WLAN APs	Signal Strength (dBm)	% of reported Access Points
3	See [15]	100

Annex A (normative): Test Case Requirements

A.1 Purpose of annex

This Annex specifies test specific parameters for some of the functional requirements in clause 5. The tests provide additional information to how the requirements should be interpreted for the purpose of conformance testing. The tests in this Annex are described such that one functional requirement may be tested in one or several tests and one test may verify several requirements. Some requirements may lack a test.

The conformance tests are specified in clauses A.3 and A.4. Statistical interpretation of the requirements is described in clause A.2.

A.2 Requirement classification for statistical testing

Requirements in the present document are either expressed as absolute requirements with a single value stating the requirement, or expressed as a success rate. There are no provisions for the statistical variations that will occur when the parameter is tested.

Annex A outlines the tests in more detail and lists the test parameters needed. The test will result in an outcome of a test variable value for the device under test (DUT) inside or outside the test limit. Overall, the probability of a "good" DUT being inside the test limit(s) and the probability of a "bad" DUT being outside the test limit(s) should be as high as possible. For this reason, when selecting the test variable and the test limit(s), the statistical nature of the test is accounted for.

The statistical nature depends on the type of requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a DUT passing the test actually meets the requirements and determines how many times a test has to be repeated and what the pass and fail criteria are. Those aspects are not covered by TS 37.171. The details of the tests on how many times to run it and how to establish confidence in the tests are described in TS 37.571-1 [9]. This Annex establishes the variable to be used in the test and whether it can be viewed as statistical in nature or not.

A.3 UE Measurement Procedures

A.3.1 MBS Measurement reporting delay test case

A.3.1.1 Test Purpose and Environment

The purpose of the test is to verify that the MBS measurements meet the measurement time requirements specified in clause 4.2.3 in an environment with fading propagation conditions (EPA 5 Hz). This test can be used for both UTRA and E-UTRA testing.

In this test case there is one beacon transmitted in one beacon slots in the MBS beacon transmission period (see Figure 4.2.3-1). The position of the beacon in the beacon transmission period is static for the duration of the test. In other slots there are no simulated beacons. The beacon has centre frequency of 925.977 MHz or set using the network assistance data in Release 14. The beacon has transmitted signal strength of -30 dBm. The beacon is transmitted with code phase (delay) of 1.6678×10^{-4} ms, corresponding to 50 m.

The UE shall perform and report the MBS measurements for the beacon within 12000 ms, starting from the receipt of the location request.

NOTE: The MBS measurement time in the test is derived from the following expression: $T_{MBS\_meas} = \tau + 10 \times ceil(n/10) \times T_{MBS\_TP} + T_{Proc}$ ms, where n=1, τ is one second, T_{MBS_TP} is one second and T_{Proc} is one second.

The beacon is of type TB1 (2 MHz) specified in clause 9 of the MBS ICD [7] and the data transmitted is in Type 2 packets specified in clause 9.6.3 of the MBS ICD [7] with the following data fields: The MBS Transmitter ID and the Slot Index shall be set to the MBS slot number; All other beacon payload data shall be populated with zeros [7].

The beacon shall use a PN code chosen from the PN code list for TB1 [7].

If the UE supports MBS assistance data, the UE will receive the MBS assistance data for each beacon via LPP, according to Annex A.

Table A.3.1.1-1: General test parameters for measurement reporting delay

Parameter	Unit	Value	Comment
Centre Frequency	MHz	925.977	
RF Channel	N/A	EPA 5 Hz	
MBS Beacon Configuration	N/A	TB1 (2 MHz)	
MBS Data Packet Type	N/A	Type 2	
Beacon PN Code	Integer	Chosen from the PN code list for TB1	
Beacon transmitted Code Phase (delay)	ms	1.6678×10^{-4}	Corresponds to 50 m. Constant per beacon for the duration of the test.
Beacon Signal Strength	dBm	-30	

Table A.3.1.1-2: MBS Beacon Payload fields for measurement reporting delay

Parameter	Unit	Value	Comment
TxID	Integer	Equal to Slot number	
Slot Index	Integer	Equal to Slot number	
All other fields	N/A	0	

A.3.1.2 Test Requirements

The MBS measurement reporting delay shall fulfil the requirements in clause 4.2.3.

A.3.2 WLAN Access Point Identification and Reporting Delay

A.3.2.1 Void

A.3.2.2 LTE-FDD: WLAN AP Identification and reporting delay under nominal conditions test

A.3.2.2.1 Test purpose and Environment

The purpose of this test is to verify the requirements in Clause 7.3 for WLAN AP measurements. The UE shall send wlan-MeasurementInformation IE including WLAN measurements for each AP indicating at least wlan-AP-Identifier (BSSID) and RSSI (if reporting of RSSI is supported by the UE as indicated by the UE in the LPP PROVIDE CAPABILITIES message).

In this test, there are cell1 (E-UTRAN FDD) and 6 WLAN APs transmitting beacon signals at least every 102.4 ms. There is an active LTE connection between the SS and the UE and the measurements are performed in RRC_CONNECTED state. The beacon signals from different APs shall be received at different time slots or in non-overlapping frequency channels. Non-overlapping frequency channels shall be at least 25 MHz apart in the WLAN 2.4 GHz band and at least 20 MHz apart in the WLAN 5 GHz band. The APs are transmitting in 3 non-overlapping frequency channels in the same WLAN Frequency Band. There are 2 APs in every channel. The test consists of two successive time periods, with duration of T1 and T2, respectively. WLAN-RequestLocationInformation message shall be provided to the UE during T1. WLAN Access Points only transmit signal during T2.

Table A.3.2.2.1-1: General WLAN AP test parameters for WLAN AP Identification and reporting delay under nominal conditions test

Parameter	Unit	Value	Comment
Number of Access Points	N/A	6	AP1-AP6
Time Slot 1	ms	1	AP1, AP2
Time Slot 2	ms	1	AP3, AP4
Time Slot 3	ms	1	AP5
Time Slot 4	ms	1	AP6
T1	s	5	During this time the WLAN signal is not transmitted
T2	s	25	UE shall report WLAN measurement information within 20s

Table A.3.2.2.1-2: E-UTRAN TDD Cell specific and WLAN AP specific test parameters for WLAN AP Identification and reporting delay under nominal conditions test

Parameter	Unit	Cell 1		AP 1, 4		AP 2, 5		AP 3, 6	
		T1	T2	T1	T2	T1	T2	T1	T2
E-UTRA RF Channel Number		1		N/A		N/A		N/A	
WLAN Channel Number		N/A		1		2		3	
$BW_{channel}$		10MHz		N/A		N/A		N/A	
WLAN Channel spacing		N/A		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz	
PDSCH parameters: DL Reference Measurement Channel		R.0 FDD		N/A		N/A		N/A	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel		R.6 FDD		N/A		N/A		N/A	
OCNG Patterns		OP.1 FDD		N/A		N/A		N/A	
PBCH_RA	dB	0		N/A		N/A		N/A	
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_{oc1}[Note 2]	dBm/15 KHz	-98		N/A		N/A		N/A	
N_{oc2}[Note 3]	dBm/20 MHz	N/A		-75		-75		-75	
$\hat{E}_s/N_{oc1}$	dB	3	3	N/A		N/A		N/A	
$\hat{E}_s/I_{ot}$ [Note 4]	dB	3	3						
RSRP [Note 4]	dBm/15 kHz	-95	-95						
SCH_RP [Note 4]	dBm/15 kHz	-95	-95						
Io [Note 3]	dBm/Ch BW	-65.5	-65.5						
WLAN Received Power Level	dBm	N/A	N/A	- inf	-60	- inf	-60	- inf	-60
WLAN SNR[Note 4]	dB	N/A		15		15		15	
Propagation Condition		AWGN							
Antenna Configuration		1x2		-		-		-	

Note 1: OCNG shall be used such that all cells 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_{oc1} to be fulfilled.
Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over the bandwidth and time and shall be modelled as AWGN of appropriate power for N_{oc2} to be fulfilled.
Note 4: Es/Iot, RSRP, SCH_RP, Io and WLAN SNR have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 5: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

A.3.2.2.2 Test Requirements

The WLAN Response Time shall fulfil the requirements in section 4.3 and the WLAN AP report shall fulfil the requirements in section 7.3. This test is, as stated in Clause 7, statistical in nature and the UE shall meet the corresponding requirement for at least 90% of the reported cases.

A.3.2.3 LTE-TDD: WLAN AP Identification and reporting delay under nominal conditions test

A.3.2.3.1 Test purpose and Environment

The purpose of this test is to verify the requirements in Clause 7.3 for WLAN AP measurements. The UE shall send wlan-MeasurementInformation IE including WLAN measurements for each AP indicating at least wlan-AP-Identifier (BSSID) and RSSI (if reporting of RSSI is supported by the UE as indicated by the UE in the LPP PROVIDE CAPABILITIES message).

In this test, there are cell1 (E-UTRAN TDD) and 6 WLAN APs transmitting beacon signals at least every 102.4 ms. There is an active LTE connection between the SS and the UE and the measurements are performed in RRC_CONNECTED state. The beacon signals from different APs shall be received at different time slots or in non-overlapping frequency channels. Non-overlapping frequency channels shall be at least 25 MHz apart in the WLAN 2.4 GHz band and at least 20 MHz apart in the WLAN 5 GHz band. The APs are transmitting in 3 non-overlapping frequency channels in the same WLAN Frequency Band. There are 2 APs in every channel. The test consists of two successive time periods, with duration of T1 and T2, respectively. WLAN-RequestLocationInformation message shall be provided to the UE during T1. WLAN Access Points only transmit signal during T2.

Table A.3.2.3.1-1: General WLAN AP test parameters for WLAN AP Identification and reporting delay under nominal conditions test

Parameter	Unit	Value	Comment
Number of Access Points	N/A	6	AP1-AP6
Time Slot 1	ms	1	AP1, AP2
Time Slot 2	ms	1	AP3, AP4
Time Slot 3	ms	1	AP5
Time Slot 4	ms	1	AP6
T1	s	5	During this time the WLAN signal is not transmitted
T2	s	25	UE shall report WLAN measurement information within 20s

Table A.3.2.3.1-2: E-UTRAN TDD Cell specific and WLAN AP specific test parameters for WLAN AP Identification and reporting delay under nominal conditions test

Parameter	Unit	Cell 1		AP 1, 4		AP 2, 5		AP 3, 6	
		T1	T2	T1	T2	T1	T2	T1	T2
E-UTRA RF Channel Number		1		N/A		N/A		N/A	
WLAN Channel Number		N/A		1		2		3	
$BW_{channel}$		10MHz		N/A		N/A		N/A	
WLAN Channel spacing		N/A		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz	
PDSCH parameters: DL Reference Measurement Channel		R.0 TDD		N/A		N/A		N/A	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel		R.6 TDD		N/A		N/A		N/A	
OCNG Patterns		OP.1 TDD		N/A		N/A		N/A	
PBCH_RA	dB	0		N/A		N/A		N/A	
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_{oc1} Note 2	dBm/15 KHz	-98		N/A		N/A		N/A	
N_{oc2} Note 3	dBm/20 MHz	N/A		-75		-75		-75	
$\hat{E}_s/N_{oc1}$	dB	3	3	N/A		N/A		N/A	
$\hat{E}_s/I_{ot}$ Note 4	dB	3	3						
RSRP Note 4	dBm/15 kHz	-95	-95						
SCH_RP Note 4	dBm/15 kHz	-95	-95						
Io Note 3	dBm/Ch BW	-65.5	-65.5						
WLAN Received Power Level	dBm	N/A	N/A	- inf	-60	- inf	-60	- inf	-60
WLAN SNR Note 4	dB	N/A		15		15		15	
Propagation Condition		AWGN							
Antenna Configuration		1x2		-		-		-	

Note 1: OCNG shall be used such that all cells 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_{oc1} to be fulfilled.
Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over the bandwidth and time and shall be modelled as AWGN of appropriate power for N_{oc2} to be fulfilled.
Note 4: Es/Iot, RSRP, SCH_RP, Io and WLAN SNR have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 5: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

A.3.2.3.2 Test Requirements

The WLAN Response Time shall fulfil the requirements in section 4.3 and the WLAN AP report shall fulfil the requirements in section 7.3. This test is, as stated in Clause 7, statistical in nature and the UE shall meet the corresponding requirement for at least 90% of the reported cases.

A.3.2.4 LTE-FDD: WLAN AP Identification and reporting delay under dynamic range conditions test

A.3.2.4.1 Test purpose and Environment

The purpose of this test is to verify the requirements in Clause 7.4 for WLAN AP measurements. The UE shall send wlan-MeasurementInformation IE including WLAN measurements for each AP indicating at least wlan-AP-Identifier (BSSID) and RSSI (if reporting of RSSI is supported by the UE as indicated by the UE in the LPP PROVIDE CAPABILITIES message).

In this test, there are cell1 (E-UTRAN FDD) and 3 WLAN APs transmitting beacon signals at least every 102.4 ms. There is an active LTE connection between the SS and the UE and the measurements are performed in RRC_CONNECTED state. The beacon signals from different APs shall be received at different time slots or in non-overlapping frequency channels. Non-overlapping frequency channels shall be at least 25 MHz apart in the WLAN 2.4 GHz band and at least 20 MHz apart in the WLAN 5 GHz band. The APs are transmitting in 3 non-overlapping frequency channels in the same WLAN Frequency Band. There is 1 AP in every channel. The test consists of two successive time periods, with duration of T1 and T2, respectively. WLAN-RequestLocationInformation message shall be provided to the UE during T1. WLAN Access Points only transmit signal during T2.

Table A.3.2.4.1-1: General test parameters for WLAN AP Identification and reporting delay under dynamic range conditions test

Parameter	Unit	Value	Comment
Number of Access Points	N/A	3	AP1-AP3
Time Slot 1	ms	1	AP1, AP2, AP3
T1	s	5	During this time the WLAN signal is not transmitted
T2	s	25	UE shall report WLAN measurement information within 20s

Table A.3.2.4.1-2: E-UTRAN FDD Cell specific test parameters for WLAN AP Identification and reporting delay under dynamic range conditions test

Parameter	Unit	Cell 1		AP 1		AP 2		AP 3	
		T1	T2	T1	T2	T1	T2	T1	T2
E-UTRA RF Channel Number		1		N/A		N/A		N/A	
WLAN Channel Number		N/A		1		2		3	
$BW_{channel}$		10MHz		N/A		N/A		N/A	
WLAN Channel spacing		N/A		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz	
PDSCH parameters: DL Reference Measurement Channel		R.0 FDD		N/A		N/A		N/A	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel		R.6 FDD		N/A		N/A		N/A	
OCNG Patterns		OP.1 FDD		N/A		N/A		N/A	
PBCH_RA	dB	0		N/A		N/A		N/A	
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_{oc1}[Note 2]	dBm/15 KHz	-98		N/A		N/A		N/A	
N_{oc2}[Note 3]	dBm/20 MHz	N/A		-85		-85		-85	
$\hat{E}_s/N_{oc1}$	dB	3	3	N/A		N/A		N/A	
$\hat{E}_s/I_{ot}$ [Note 4]	dB	3	3						
RSRP [Note 4]	dBm/15 kHz	-95	-95						
SCH_RP [Note 4]	dBm/15 kHz	-95	-95						
Io [Note 3]	dBm/Ch BW	-65.5	-65.5						
WLAN Received Power Level	dBm	N/A	N/A	-inf	WLAN 2.4 GHz band: -74 WLAN 5 GHz band: -79	-inf	WLAN 2.4 GHz band: -39 WLAN 5 GHz band: -63	-inf	WLAN 2.4 GHz band: -74 WLAN 5 GHz band: -79
WLAN SNR[Note 4]	dB	N/A		WLAN 2.4 GHz band: 11 WLAN 5 GHz band: 6		WLAN 2.4 GHz band: 46 WLAN 5 GHz band: 22		WLAN 2.4 GHz band: 11 WLAN 5 GHz band: 6	
Propagation Condition		AWGN							
Antenna Configuration		1x2		-		-		-	

Note 1: OCNG shall be used such that all cells 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_{oc1} to be fulfilled.

Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over the bandwidth and time and shall be modelled as AWGN of appropriate power for N_{oc2} to be fulfilled.

Note 4: Es/Iot, RSRP, SCH_RP, Io and WLAN SNR have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 5: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

A.3.2.4.2 Test Requirements

The WLAN Response Time shall fulfil the requirements in section 4.3 and the WLAN AP report shall fulfil the requirements in section 7.4. This test is, as stated in Clause 7, statistical in nature and the UE shall meet the corresponding requirement for at least 90% of the reported cases.

A.3.2.5 LTE-TDD: WLAN AP Identification and reporting delay under dynamic range conditions test

A.3.2.5.1 Test purpose and Environment

The purpose of this test is to verify the requirements in Clause 7.4 for WLAN AP measurements. The UE shall send wlan-MeasurementInformation IE including WLAN measurements for each AP indicating at least wlan-AP-Identifier (BSSID) and RSSI (if reporting of RSSI is supported by the UE as indicated by the UE in the LPP PROVIDE CAPABILITIES message).

In this test, there are cell1 (E-UTRAN TDD) and 3 WLAN APs transmitting beacon signals at least every 102.4 ms. There is an active LTE connection between the SS and the UE and the measurements are performed in RRC_CONNECTED state. The beacon signals from different APs shall be received at different time slots or in non-overlapping frequency channels. Non-overlapping frequency channels shall be at least 25 MHz apart in the WLAN 2.4 GHz band and at least 20 MHz apart in the WLAN 5 GHz band. The APs are transmitting in 3 non-overlapping frequency channels in the same WLAN Frequency Band. There is 1 AP in every channel. The test consists of two successive time periods, with duration of T1 and T2, respectively. WLAN-RequestLocationInformation message shall be provided to the UE during T1. WLAN Access Points only transmit signal during T2.

Table A.3.2.5.1-1: General test parameters for WLAN AP Identification and reporting delay under dynamic range conditions test

Parameter	Unit	Value	Comment
Number of Access Points	N/A	3	AP1-AP3
Time Slot 1	ms	1	AP1, AP2, AP3
T1	s	5	During this time the WLAN signal is not transmitted
T2	s	25	UE shall report WLAN measurement information within 20s

Table A.3.2.5.1-2: E-UTRAN TDD Cell specific test parameters for WLAN AP Identification and reporting delay under dynamic range conditions test

Parameter	Unit	Cell 1		AP 1		AP 2		AP 3	
		T1	T2	T1	T2	T1	T2	T1	T2
E-UTRA RF Channel Number		1		N/A		N/A		N/A	
WLAN Channel Number		N/A		1		2		3	
$BW_{channel}$		10MHz		N/A		N/A		N/A	
WLAN Channel spacing		N/A		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz		WLAN 2.4 GHz band: 25 MHz WLAN 5 GHz band: 20 MHz	
PDSCH parameters: DL Reference Measurement Channel		R.0 TDD		N/A		N/A		N/A	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel		R.6 TDD		N/A		N/A		N/A	
OCNG Patterns		OP.1 TDD		N/A		N/A		N/A	
PBCH_RA	dB	0		N/A		N/A		N/A	
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_{oc1}[Note 2]	dBm/15 KHz	-98		N/A		N/A		N/A	
N_{oc2}[Note 3]	dBm/20 MHz	N/A		-85		-85		-85	
$\hat{E}_s/N_{oc1}$	dB	3	3	N/A		N/A		N/A	
$\hat{E}_s/I_{ot}$ [Note 4]	dB	3	3						
RSRP [Note 4]	dBm/15 kHz	-95	-95						
SCH_RP [Note 4]	dBm/15 kHz	-95	-95						
Io [Note 3]	dBm/Ch BW	-65.5	-65.5						
WLAN Received Power Level	dBm	N/A	N/A	-inf	WLAN 2.4 GHz band: -74 WLAN 5 GHz band: -79	-inf	WLAN 2.4 GHz band: -39 WLAN 5 GHz band: -63	-inf	WLAN 2.4 GHz band: -74 WLAN 5 GHz band: -79
WLAN SNR[Note 4]	dB	N/A		WLAN 2.4 GHz band: 11 WLAN 5 GHz band: 6		WLAN 2.4 GHz band: 46 WLAN 5 GHz band: 22		WLAN 2.4 GHz band: 11 WLAN 5 GHz band: 6	
Propagation Condition		AWGN							
Antenna Configuration		1x2		-		-		-	

Note 1: OCNG shall be used such that all cells 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_{oc1} to be fulfilled.

Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over the bandwidth and time and shall be modelled as AWGN of appropriate power for N_{oc2} to be fulfilled.

Note 4: Es/Iot, RSRP, SCH_RP, Io and WLAN SNR have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 5: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

A.3.2.5.2 Test Requirements

The WLAN Response Time shall fulfil the requirements in section 4.3 and the WLAN AP report shall fulfil the requirements in section 7.4. This test is, as stated in Clause 7, statistical in nature and the UE shall meet the corresponding requirement for at least 90% of the reported cases.

A.3.3 Bluetooth Measurement Requirements

A.3.3.1 E-UTRAN FDD Bluetooth identification

A.3.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE correctly identify and report Bluetooth Low Energy devices within the requirements stated in clause 4.4.

The test parameters are given in Tables A.3.3.1.1-1 and A.3.3.1.1-2 below. In the tests there are cell1 (E-UTRAN FDD) and 6 Bluetooth low energy (BLE) devices. The test consists of two successive time periods, with duration of T1 and T2, respectively. BT-RequestLocationInformation message shall be provided to the UE during T1. BLE devices only transmit signal during T2.

Table A.3.3.1.1-1: General test parameters for E-UTRAN FDD Bluetooth measurement under AWGN in non-DRX

Parameter	Unit	Value	Comment
Active cell		Cell 1	Cell 1 is on E-UTRA RF channel number 1.
Bluetooth Low Energy (BLE) Devices		BLE 1, BLE 2, BLE3, BLE4, BLE5 and BLE6	BLE 1 and BLE2 are on Bluetooth Advertising Channel 1 (2402 MHz). BLE 3 and BLE4 are on Bluetooth Advertising Channel 2 (2426 MHz). BLE 5 and BLE6 are on Bluetooth Advertising Channel 3 (2480 MHz).
CP length		Normal	Applicable to cell 1
E-UTRA RF Channel Number		1	One E-UTRA FDD carrier frequency is used.
Bluetooth Advertising Channel Number		Channel 1:2402 MHz, Channel 2:2426 MHz, Channel 3:2480 MHz	Bluetooth advertising channels (2402, 2426, 2480 MHz)
Bluetooth beacon signal broadcast interval	ms	100 ms	
DRX		OFF	
T1	s	5	During this time the cell1 shall be known to the UE; but cell2 shall be unknown to the UE.
T2	s	15	UE should report Bluetooth measurement information within 10.24s.

Table A.3.3.1.1-2: Cell specific test parameters for E-UTRAN FDD-WLAN event triggered reporting under AWGN in non-DRX

Parameter	Unit	Cell 1		BLE1, BLE2		BLE3, BLE4		BLE5, BLE6	
		T1	T2	T1	T2	T1	T2	T1	T2

E-UTRA RF Channel Number		1		N/A		N/A		N/A	
Bluetooth Advertising Channel Number		N/A		1		2		3	
$BW_{channel}$		10MHz		2 MHz		2 MHz		2 MHz	
PDSCH parameters: DL Reference Measurement Channel		R.0 FDD		N/A		N/A		N/A	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel		R.6 FDD		N/A		N/A		N/A	
OCNG Patterns		OP.1 FDD		N/A		N/A		N/A	
PBCH_RA	dB	0		N/A		N/A		N/A	
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_{oc1} Note 2	dBm/15 KHz	-98		N/A		N/A		N/A	
N_{oc2} Note 3	dBm/2MHz	N/A		-84		-84		-84	
$\hat{E}_s/N_{oc1}$	dB	3	3	N/A		N/A		N/A	
$\hat{E}_s/I_{ot}$ Note 4	dB	3	3						
RSRP Note 4	dBm/15 kHz	-95	-95						
SCH_RP Note 4	dBm/15 kHz	-95	-95						
Io Note 3	dBm/Ch BW	-65.5	-65.5						
Bluetooth RSSI Note 4	dBm/2 MHz	N/A	N/A	-infinity	-60	-infinity	-60	-infinity	-60
SINR Note 4	dB	N/A	N/A	-infinity	-63.2	-infinity	-63.2	-infinity	-63.2
Propagation Condition		AWGN							
Antenna Configuration		1x2		-		-		-	

Note 1: OCNG shall be used such that all cells 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_{oc1} to be fulfilled.

Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over the bandwidth and time and shall be modelled as AWGN of appropriate power for N_{oc2} to be fulfilled.

Note 4: Es/Iot, RSRP, SCH_RP, Io and Bluetooth RSSI have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 5: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

A.3.3.1.2 Test Requirements

The UE shall send *BT-ProvideLocationInformation*, with a measurement reporting delay less than 10.24s from the beginning of time period T2.

The rate of correct events observed during repeated tests shall be at least 90% for each of the events.

NOTE: The actual overall delays measured in the tests may be up to $2\times TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.3.3.2 E-UTRAN TDD Bluetooth identification

A.3.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE correctly identify and report Bluetooth Low Energy devices within the requirements stated in clause 4.4.

The test parameters are given in Tables A.3.3.2.1-1 and A.3.3.2.1-2 below. In the tests there are cell1 (E-UTRAN FDD) and 6 Bluetooth low energy (BLE) devices. The test consists of two successive time periods, with duration of T1 and T2, respectively. BT-RequestLocationInformation message shall be provided to the UE during T1. BLE devices only transmit signal during T2.

Table A.3.3.2.1-1: General test parameters for E-UTRAN TDD Bluetooth measurement under AWGN in non-DRX

Parameter	Unit	Value	Comment
Active cell		Cell 1	Cell 1 is on E-UTRA RF channel number 1.
Bluetooth Low Energy (BLE) Devices		BLE 1, BLE 2, BLE3, BLE4, BLE5 and BLE6	BLE 1 and BLE2 are on Bluetooth Advertising Channel 1 (2402 MHz). BLE 3 and BLE4 are on Bluetooth Advertising Channel 2 (2426 MHz). BLE 5 and BLE6 are on Bluetooth Advertising Channel 3 (2480 MHz).
CP length		Normal	Applicable to cell 1
E-UTRA RF Channel Number		1	One E-UTRA FDD carrier frequency is used.
Bluetooth Advertising Channel Number		Channel 1:2402 MHz, Channel 2:2426 MHz, Channel 3:2480 MHz	Bluetooth advertising channels (2402, 2426, 2480 MHz)
Bluetooth beacon signal broadcast interval	ms	100 ms	
DRX		OFF	
Special subframe configuration		6	As specified in table 4.2-1 in TS 36.211 [16]. The same configuration applies to all cells.
Uplink-downlink configuration		1	As specified in table 4.2-2 in TS 36.211 [16]. The same configuration applies to all cells
T1	s	5	During this time the cell1 shall be known to the UE; but cell2 shall be unknown to the UE.
T2	s	15	UE should report Bluetooth measurement information within 10.24s.

Table A.3.3.2.1-2: Cell specific test parameters for E-UTRAN TDD-WLAN event triggered reporting under AWGN in non-DRX

Parameter	Unit	Cell 1		BLE1, BLE2		BLE3, BLE4		BLE5, BLE6	
		T1	T2	T1	T1	T1	T2	T1	T2

E-UTRA RF Channel Number		1		N/A		N/A		N/A	
Bluetooth Advertising Channel Number		N/A		1		2		3	
$BW_{channel}$		10MHz		2 MHz		2 MHz		2 MHz	
PDSCH parameters: DL Reference Measurement Channel		R.0 TDD		N/A		N/A		N/A	
PCFICH/PDCCH/PHICH parameters: DL Reference Measurement Channel		R.6 TDD		N/A		N/A		N/A	
OCNG Patterns		OP.1 TDD		N/A		N/A		N/A	
PBCH_RA	dB	0		N/A		N/A		N/A	
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_{oc1} Note 2	dBm/15 KHz	-98		N/A		N/A		N/A	
N_{oc2} Note 3	dBm/2 MHz	N/A		-84		-84		-84	
$\hat{E}_s/N_{oc1}$	dB	3	3	N/A		N/A		N/A	
$\hat{E}_s/I_{ot}$ Note 4	dB	3	3						
RSRP Note 4	dBm/15 kHz	-95	-95						
SCH_RP Note 4	dBm/15 kHz	-95	-95						
Io Note 3	dBm/Ch BW	-65.5	-65.5						
Bluetooth RSSI Note 4	dBm/2 MHz	N/A	N/A	-infinity	-60	-infinity	-60	-infinity	-60
SINR Note 4	dB	N/A	N/A	-infinity	-63.2	-infinity	-63.2	-infinity	-63.2
Propagation Condition		AWGN							
Antenna Configuration		1x2		-		-		-	

Note 1: OCNG shall be used such that all cells 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_{oc1} to be fulfilled.

Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over the bandwidth and time and shall be modelled as AWGN of appropriate power for N_{oc2} to be fulfilled.

Note 4: Es/Iot, RSRP, SCH_RP, Io and WLAN RSSI have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 5: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.

A.3.3.2.2 Test Requirements

The UE shall send *BT-ProvideLocationInformation*, with a measurement reporting delay less than 10.24s from the beginning of time period T2.

The rate of correct events observed during repeated tests shall be at least 90% for each of the events.

NOTE: The actual overall delays measured in the tests may be up to $2\times TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

A.4 Measurement Performance Requirements

A.4.1 General

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in clause 5 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in clause 5 for at least 90% of the reported cases.

- Measurements are performed in RRC_CONNECTED state.

A.4.2 MBS Code Phase Measurement Accuracy Requirements in AWGN

A.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the MBS Code Phase measurement accuracy is within the specified limits. This single test will verify the requirements in clauses 5.2, 5.3 and 5.4 for MBS measurements. The channel type for this test is AWGN, as specified in the appropriate sub-clause of clause 5. This test can be used for both UTRA and E-UTRA testing.

In each test, there is one beacon transmitted in each of four consecutive beacon slots. The position of first of the four consecutive beacons in the beacon transmission period can be any slot, but it is static for the duration of the test. In other slots there are no simulated beacons. All beacons are in the same time slotted RF channel, with centre frequency of 925.977 MHz or set using the network assistance data. All beacons are of type TB1 (2 MHz) [7], or set using the network assistance data in Release 14, and the data transmitted is in Type 2 packets with the following data fields: The MBS Transmitter ID and the Slot Index shall be set to the MBS slot number; All other beacon payload data shall be populated with zeros.

In the four slots containing beacon transmissions, every other slot shall contain a beacon with the higher signal strength beacon, and the other slots shall contain a beacon with the lower signal strength.

The higher power beacons (-30 dBm) shall have code phase delay of 1.6678×10^{-4} ms (corresponding to 50 m) and the lower power beacons (-130 dBm) shall have code phase delay of 5.00346×10^{-3} ms (corresponding to 1500 m).

Each of the beacons shall use a unique PN code chosen from the PN code list for TB1 [7].

If the UE supports MBS assistance data, the UE will receive the MBS assistance data for each beacon via LPP, according to Annex A.

Table A.4.2.1-1: General test parameters for Code Phase measurement Accuracy

Parameter	Unit	Value	Comment
Centre Frequency	MHz	925.977	
RF Channel	N/A	AWGN	
MBS Beacon Configuration	N/A	TB1 (2 MHz)	
MBS Packet Type	N/A	Type 2	
Beacon PN Code	Integer	Chosen from the PN code list for TB1	
-30 dBm beacon transmitted Code Phase (delay)	ms	1.6678×10^{-4}	Corresponds to 50 m. Constant per beacon for the duration of the test.
-130 dBm beacon transmitted Code Phase (delay)	ms	5.00346×10^{-3}	Corresponds to 1500 m. Constant per beacon for the duration of the test.
T_{MBS_meas}	ms	12000	

Table A.4.2.1-2: MBS Beacon Payload fields for Code Phase measurement Accuracy

Parameter	Unit	Value	Comment
TxID	Integer	Equal to Slot number	
Slot Index	Integer	Equal to Slot number	
All other fields	N/A	0	

A.4.2.2 Test Requirements

The MBS Code Phase measurement accuracy shall fulfil the requirements in clauses 5.2, 5.3 and 5.4.

A.4.3 MBS Code Phase Measurement Accuracy Requirements in Multipath

A.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the MBS Code Phase measurement accuracy is within the specified limits. This test will verify the requirements in clause 5.5 for MBS measurements. The channel type for the test is specified in clause 5.5. This test can be used for both UTRA and E-UTRA testing.

In this test, there is one beacon transmitted in each of two chosen slots. The position of the beacons in the beacon transmission period is static for the duration of the test. In other slots there are no simulated beacons. Both beacons are in the same time slotted RF channel, with centre frequency of 925.977 MHz or set using the network assistance data. All beacons are of type TB1 (2 MHz) [7], or set using the network assistance data in Release 14, and the data transmitted is in Type 2 packets with the following data fields: The MBS Transmitter ID and the Slot Index shall be set to the MBS slot number; All other beacon payload data shall be populated with zeros.

Both beacon slots shall contain a beacon with the signal strength listed in clause 5.5.

The beacons shall have code phase delay of 1.6678×10^{-4} ms (corresponding to 50 m).

Each of the beacons shall use a unique PN code chosen from the PN code list for TB1 [7].

If the UE supports MBS assistance data, the UE will receive the MBS assistance data for each beacon via LPP, according to Annex A.

Table A.4.3.1-1: General test parameters for Code Phase measurement Accuracy in Multipath

Parameter	Unit	Value	Comment
Centre Frequency	MHz	925.977	
RF Channel	N/A	EPA 5 Hz	
MBS Beacon Configuration	N/A	TB1 (2 MHz)	
MBS Packet Type	N/A	Type 2	
Beacon PN Code	Integer	Chosen from the PN code list for TB1	
-30 dBm beacon transmitted Code Phase (delay)	ms	1.6678×10^{-4}	Corresponds to 50 m. Constant per beacon for the duration of the test.
T_{MBS_meas}	ms	12000	

Table A.4.3.1-2: MBS Beacon Payload fields for Code Phase measurement Accuracy

Parameter	Unit	Value	Comment
TxID	Integer	Equal to Slot number	
Slot Index	Integer	Equal to Slot number	
All other fields	N/A	0	

A.4.3.2 Test Requirements

The MBS Code Phase measurement accuracy shall fulfil the requirements in clause 5.5.

Annex B (normative): Assistance data required for testing (Release 14 and beyond)

B.1 Introduction

This annex defines the assistance data IEs available at the SS in all test cases where the UE supports MBS acquisition assistance data. Almanac assistance data will not be provided since there are only performance requirements for UE-Assisted mode. The acquisition assistance data shall be provided for all beacons.

The information elements are given with reference to 3GPP TS 36.355 [3], where the details are defined.

B.2 MBS Assistance Data

Table B.2-1 defines the acquisition assistance data elements which shall be provided to the UE. Assistance data IEs supported by the UE but not listed in Table B.2-1 shall not be sent.

Table B.2-1: Assistance Data to be provided to the UE for each beacon

MBS Acquisition Assistance Data IE	Mesurement reporting delay test case	MBS Code Phase Measurement accuracy test cases
transmitterID-r14	Yes	Yes
mbsConfiguration-r14	Yes	Yes
pnCodeIndex-r14	Yes	Yes
freq-r14	Yes	Yes

Annex C (informative): Change history

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2016-04	RAN4#78 bis	R4-162662				TS skeleton created from 3GPP TS template.	0.0.1
2016-05	RAN4#78 bis	R4-164435				The text proposal in R4-162662 agreed at RAN4#78bis is included.	0.1.0
2016-05	RAN4#78 bis	R4-164777				The test proposals in R4-164437, R4-164646 and R4-164647 are included.	0.2.0
2016-06	RAN#72	RP-160891				TS agreed in R4-164777, with the version number incremented to 1.0.0, the date and Table of Contents updated and the change history updated. Editorial changes from MCC were also included.	1.0.0
2016-06	RAN#72					TR approved by RAN plenary	13.0.0
2016-12	RP-74	RP-162396	0001	2	F	Removal of square brackets from MBS measurement accuracy requirements	13.1.0
2016-12	RP-74	RP-162396	0002	-	B	R on Bluetooth Wifi requirement for indoor positioning	14.0.0
2016-12	RP-74	RP-162396	0003	-	B	Requirements for WLAN RSSI Measurement for Positioning	14.0.0
2017-03	RP-75	RP-170564	0006		B	Addtion of MBS Assistance Data related requirements for Further Indoor Positioning Enhancements	14.1.0
2017-06	RP-76	RP-171270	0008		F	InDoPos: WLAN requirements (Rel-14)	14.2.0
2017-06	RP-76	RP-171270	0012		F	InDoPos: Corrections to BT-LE requirements (Rel-14)	14.2.0
2017-06	RP-76	RP-171270	0013	2	F	InDoPos: New WLAN delay test case in nominal conditions with LTE FDD and TDD (Rel-14)	14.2.0
2017-06	RP-76	RP-171270	0014	1	F	InDoPos: New WLAN delay test case in dynamic range conditions with LTE FDD and TDD (Rel-14)	14.2.0
2017-06	RP-76	RP-171270	0016	4	B	CR on test case for Bluetooth identification	14.2.0
2017-09	RP-77	RP-171943	0017	1	F	InDoPos: Correction to WLAN positioning requirements and test (Rel-14)	14.3.0
2017-12	RAN#78	RP-172581	0018		F	LBS InDoPos: Removal of remaining square brackets from BT-LE requirements and test cases (Rel-14)	14.4.0
2018-03	RAN#79	RP-180297	0019	1	F	Change WLAN measurement reporting delay to 20 seconds This CR was partially implemented as it clashed with CR#0024.	14.5.0
2018-03	RAN#79	RP-180297	0020		F	Delete WLAN beacon interval test value	14.5.0
2018-03	RAN#79	RP-180297	0022		F	Clarification concerning assistance data for WLAN requirements	14.5.0
2018-03	RAN#79	RP-180297	0023		F	Deletion of optional IEs from WLAN test cases	14.5.0
2018-03	RAN#79	RP-180297	0024		F	Clarifications to WLAN measurement requirements	14.5.0
2018-06	RAN#80	RP-181116	0025		F	Editorial: corrections to 20 second reporting time in WLAN test cases	14.6.0
2018-06	RAN#80	RP-181116	0026		F	Additions and corrections to WLAN test cases for 2.4GHz and 5GHz WLAN bands	14.6.0
2018-06	RAN#80	RP-181116	0027	1	F	Clarification to RSSI reporting in WLAN test cases	14.6.0

History

Document history		
V14.1.0	April 2017	Publication
V14.2.0	August 2017	Publication
V14.3.0	October 2017	Publication
V14.4.0	January 2018	Publication
V14.5.0	April 2018	Publication
V14.6.0	July 2018	Publication