

ETSI TS 137 571-4 V10.1.0 (2012-10)



**Universal Mobile Telecommunications System (UMTS);
LTE;
Universal Terrestrial Radio Access (UTRA)
and Evolved UTRA (E-UTRA)
and Evolved Packet Core (EPC);
User Equipment (UE) conformance specification
for UE positioning;
Part 4: Test suites
(3GPP TS 37.571-4 version 10.1.0 Release 10)**



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Foreword

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Introduction

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

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

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

- 3GPP TS 37.571-1: Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 1: Terminal conformance.
- 3GPP TS 37.571-2: Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 2: Protocol conformance.
- 3GPP TS 37.571-3: Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 3: Implementation Conformance Statement (ICS).
- **3GPP TS 37.571-4: Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 4: Test suites.**
- 3GPP TS 37.571-5: Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 5: Test scenarios and assistance data.

1 Scope

The present document specifies the protocol and signalling conformance testing in TTCN for the UE:

- A-GPS at the UTRA Uu interface;
- LTE positioning at the LTE-Uu interface;
- A-GNSS at the UTRA Uu interface.

The following TTCN test specification and design considerations can be found in the present document:

- Test system architecture;
- Test models and ASP definitions;
- Test methods and usage of communication ports definitions;
- Test configurations;
- Design principles and assumptions;
- TTCN styles and conventions;
- Partial PIXIT proforma;
- Test suites in TTCN-2 and TTCN-3;
- The Test Suites designed and implemented in the present document are based on the test specifications in prose in 3GPP TS 37.571-2 [3];
- The applicability of the individual test cases is specified in the test ICS proforma specification in 3GPP TS 37.571-3 [4].

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] 3GPP TS 37.571-1: "Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 1: Conformance test specification".
- [3] 3GPP TS 37.571-2: "Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 2: Protocol conformance".
- [4] 3GPP TS 37.571-3: "Universal Terrestrial Radio Access (UTRA) and Evolved UTRA (E-UTRA) and Evolved Packet Core (EPC); User Equipment (UE) conformance specification for UE positioning; Part 3: Implementation Conformance Statement (ICS)".

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

3 Definitions, symbols and abbreviations

3.1 Definitions

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

3.2 Symbols

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

3.3 Abbreviations

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

ASP Abstract Service Primitive

4 A-GPS system architecture and test model

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

4.1 ATS and module structure

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

4.2 Upper tester

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

4.3 SV PCO

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

4.4 A-GPS Primitives

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

4.5 Specific test suite operation for A-GPS testing

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

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

5.1 Test system architecture

5.1.1 General system architecture

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

5.1.2 Component architecture

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

- E-UTRA PTC;

- UTRA PTC.

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

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

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

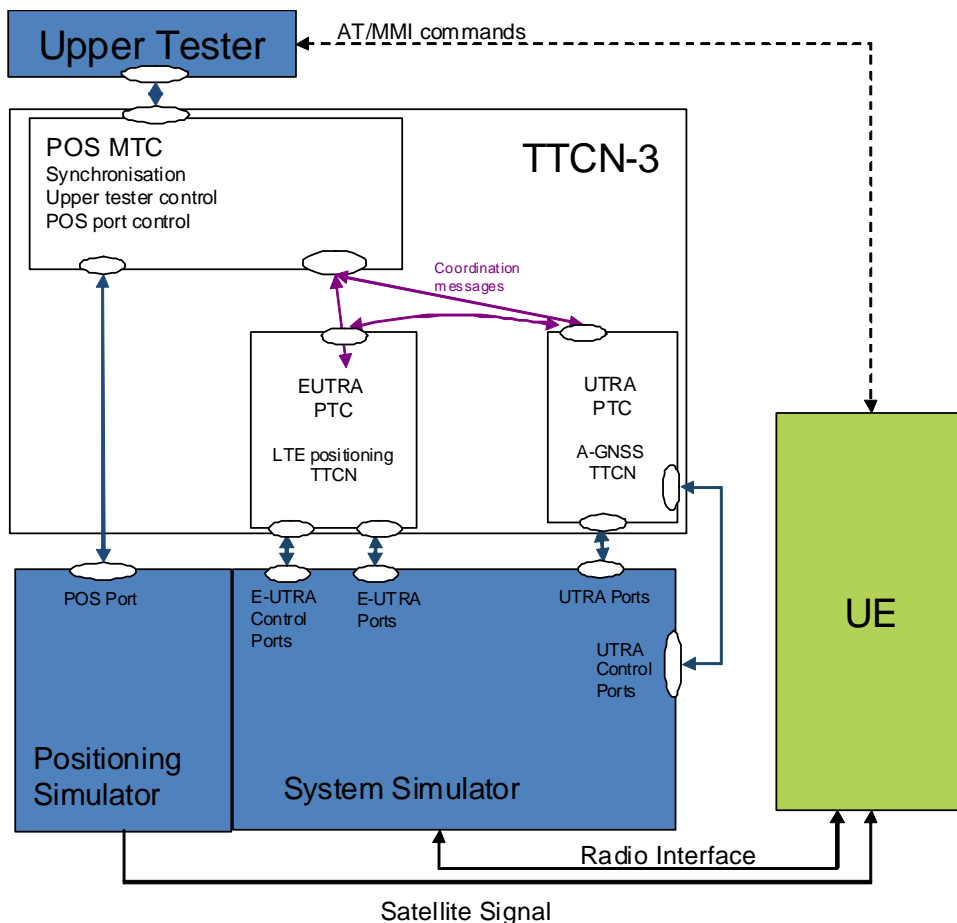


Figure 5.1.2-1: Component architecture for an E-UTRA and UTRA scenario

The PTCs are allocated according to the following principles:

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

5.1.2.1 Interfaces

A number of interfaces are taken into consideration.

POS MTC - PTC:

Common synchronisation of PTCs.

Positioning simulator command/data coordination messages.

Upper tester primitives.

POS MTC - System Interface:

Upper tester primitives.

POS MTC- Positioning Simulator:

Positioning simulator command and data primitives.

PTC - PTC:

Primitives containing information for IRAT handover.

PTC - System Interface:

Primitives containing peer-to-peer message.

Configuration primitives.

5.2 Test model

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

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

5.2.1 LTE GNSS test model

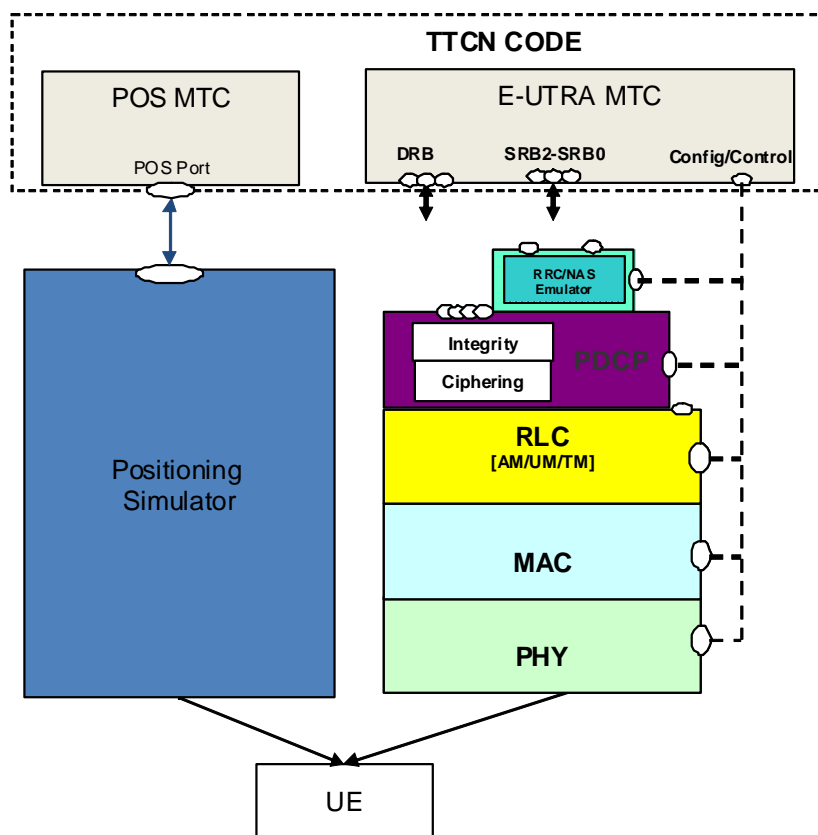


Figure 5.2.1-1: E-UTRA Test model for LTE positioning GNSS testing

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

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

The ASPs at POS Port are used to:

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

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

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

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

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

5.2.2 UTRA A-GNSS test model

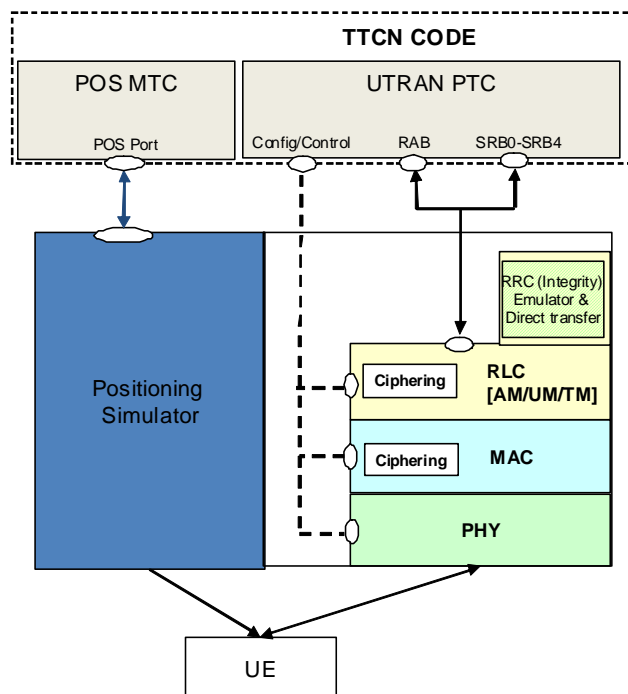


Figure 5.2.2-1: UTRA Test model for A-GNSS testing

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

The UE is configured in normal mode. Ciphering and Integrity (RRC) are enabled. The tests are performed on C-Plane.

The ASPs at POS Port are used to:

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

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

The SS also sends the GPS or GNSS assistance data to the UE through RRC signalling to facilitate the UE acquiring and tracking satellites. Such assistance data shall be consistent to within ± 2 seconds with the satellite signals generated (see 3GPP TS 37.571-2 [3], clause 4.2).

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

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

5.3 ASP specifications

The E-UTRAN and UTRAN ASP definitions are specified according to 3GPP TS 36.523-3 [6], clause 6.

The positioning simulator ASP definitions are documented in annex C.

5.4 OTDOA test model

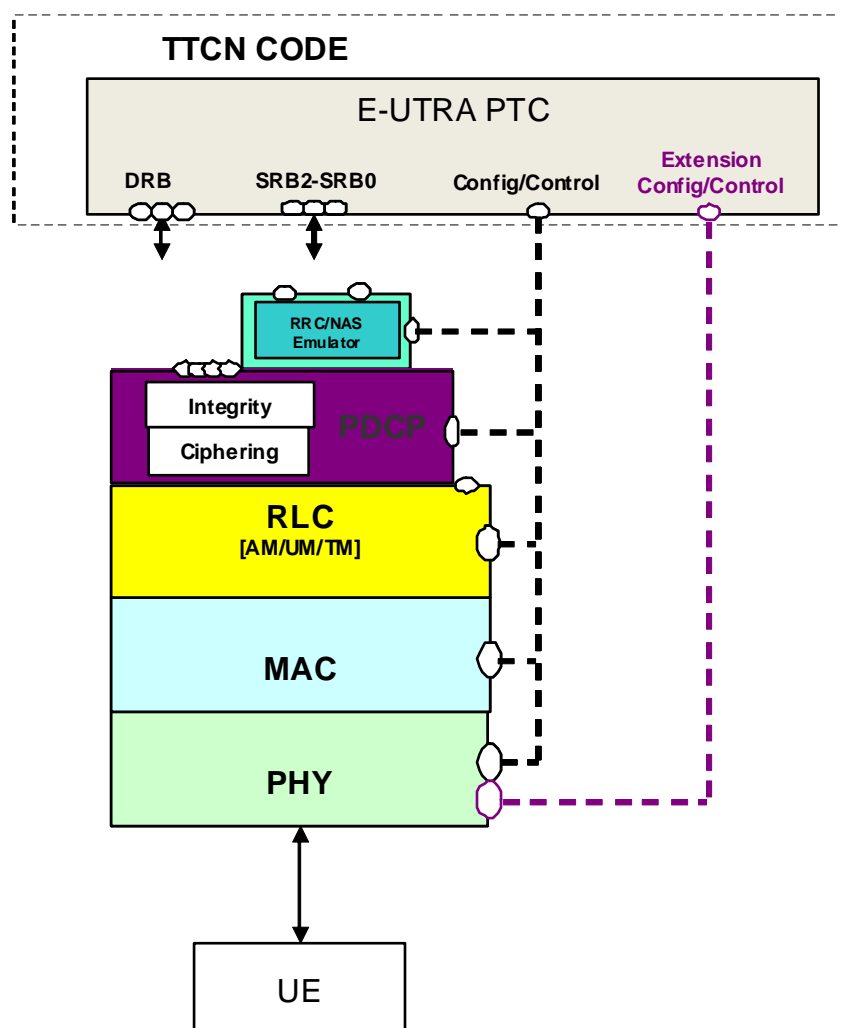


Figure 5.4-1: E-UTRA OTDOA test model

The LTE OTDOA test model consists of an SS E-UTRAN protocol stack. The SS E-UTRA emulation part is the same as the model defined in 3GPP TS 36.523-3 [6] with an additional port to configure the antenna port 6 and the Positioning Reference Signal (PRS) in the LTE cells. The extension of LTE ASPs is defined in annex C.

The simulated OTDOA environment is specified in 3GPP TS 37.571-2 [3], clause 5.2.2), cells are synchronous and configured with the timing offset set to 0. The PRS is transmitted according to 3GPP TS 36.211 [23], clause 6.10.4.

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

The PRS signals are transmitted by the SS E-UTRAN, the assistance data are written in TTCN.

5.5 ECID test model

The test model is referred to the LTE positioning test model defined in clause 5.2.1; except that no satellite signals are required.

6 Reserved for LTE-A positioning

7 Upper Tester Interface

7.1 MMI for A-GPS

Refer to 3GPP TS 34.123-3 [8], clause B.1.12.

7.2 MMI for A-GNSS and LTE positioning

Refer to 3GPP TS 36.523-3 [6], clause 5.

The following MMI commands are defined for A-GNSS and LTE positioning.

Table 7.2-1: MMI commands

Command	Parameters	
	Name	Value
CHECK_DTCH_THROUGHCONNECTED		none
TRIGGER_MOLR	"TypeMolr"	< TypeMolr>
CHECK_LCS_CLIENT		none
LOCATION_ACCEPT	"LocationOnTime"	< LocationOnTime>
LOCATION_DENY	"LocationOnTime"	< LocationOnTime>
LOCATION_IGNORE		none
CLEAR_STORED_ASSISTANCE_DATA		none
LOCATION_NOTIFY	LocationNotify	"location allowed if no response" or "location not allowed if no response"

Table 7.2-2: MMI commands imported from 3GPP TS 36.523-3 [6], clause 5

Command
"SWITCH_ON"
"SWITCH_OFF"
"POWER_ON"
"POWER_OFF"

8 IXIT Proforma

8.1 A-GPS test suite parameters declarations

Refer to 3GPP TS 34.123-3 [8], clause B.1.13.

8.2 A-GNSS and LTE positioning test suite parameters declarations

Same PIXIT parameters are referred to clause 8.1.

Annex A (normative): Test Suites

This annex contains the approved TTCN Test Suites.

A.1 A-GPS test suite

This annex includes the reference to those approved A-GPS ATS which are contained in 3GPP TS 34.123-3 [8], clause A.11.

The ATSs have been produced using the Tree and Tabular Combined Notation (TTCN2) according to TR 101 666 [20].

A.1.1 Version of specifications

Table A.1.1-1 shows the version of the test specifications which the delivered ATSs are referred to.

Table A.1.1-1: Versions of the test and Core specifications

Core specifications	3GPP TS 25.331 [12]
Test specifications	3GPP TS 37.571-2 [3]
	3GPP TS 37.571-3 [4]
	3GPP TS 37.571-5 [6]
	3GPP TS 34.123-3 [8]
	3GPP TS 34.108 [9]
	3GPP TS 34.109 [18]

A.1.2 AGPS ATS

The approved AGPS test cases are listed. An "X" in columns FDD or LCR TDD indicates the test case approved for the relevant ATS.

Table A.1.2-1: AGPS TTCN test cases

Test case reference		Description	FDD	LCR_TDD
TS 37.571-2 [3]	TS 34.123-3 [8]			
6.1.1.1	17.2.2.1	LCS Network Induced location request/UE-Based GPS/Emergency Call/with USIM	X	
6.1.1.2	17.2.2.2	LCS Network Induced location request/UE-Based GPS/Emergency Call/without USIM	X	
6.1.1.3	17.2.2.3	LCS Network induced location request/UE-Assisted GPS/Emergency call/With USIM	X	
6.1.1.4	17.2.2.4	LCS Network induced location request/UE-Assisted GPS/Emergency call/Without USIM	X	
6.1.2.1	17.2.3.2	LCS Mobile originated location request/UE-Based GPS/Position estimate request/Success	X	
6.1.2.7	17.2.3.9	LCS Mobile originated location request/UE-Assisted GPS/Position Estimate/Success	X	
6.1.3.1	17.2.4.1	LCS Mobile terminated location request/UE-Based GPS	X	
6.1.3.2	17.2.4.2	LCS Mobile-terminated location request/UE-Based GPS/Request for additional assistance data/Success	X	
6.1.3.3	17.2.4.3	LCS Mobile-terminated location request/UE-Based GPS/Failure - Not Enough Satellites	X	
6.1.3.4	17.2.4.4	LCS Mobile terminated location request/UE-Assisted GPS/Success	X	
6.1.3.5	17.2.4.5	LCS Mobile terminated location request/UE-Assisted GPS/Request for additional assistance data/Success	X	
6.1.3.7	17.2.4.7	LCS Mobile terminated location request/UE-Based GPS/Privacy Verification/Location Not Allowed if No Response	X	

A.1.3 The TTCN Machine Processable form (TTCN.MP)

The TTCN.MP representation corresponding to the corresponding FDD ATS is referred to 3GPP TS 34.123-3 [8], clause A.11.

A.2 A-GNSS and LTE positioning test suite

The test suites have been produced using the Testing and Test Control Notation version 3 (TTCN3) according to ES 201 873-1 [17].

A.2.1 Baseline of specifications

Table A.2.1-1 shows the baseline of the relevant cores specifications and the test specifications which the delivered TTCN test suites are referred to.

Table A.2.1-1: References of the test and Core specifications

Core specifications baseline	3GPP TS 36.355 [10]
	3GPP TS 24.301 [11]
	3GPP TS 25.331 [12]
Test specifications	3GPP TS 37.571-2 [3]
	3GPP TS 37.571-3 [4]
	3GPP TS 37.571-5 [5]
	3GPP TS 36.508 [7]

The Test Suite in TTCN3 is contained in multiple ASCII files which accompany the present document.

A.2.2 E-UTRA LTE positioning Test Cases

Table A.2.2-1 lists all approved test cases. An "X" in columns FDD or TDD indicates the test case approved for the respective variant.

Table A.2.2-1: E-UTRA LTE positioning TTCN test cases

Test case	Description	FDD	TDD

A.2.3 UTRA A-GNSS Test Cases

Table A.2.3-1 lists all approved test cases. An "X" in columns FDD or TDD indicates the test case approved for the respective variant.

Table A.2.3-1: UTRA A-GNSS TTCN test cases

Test case	Description	FDD	TDD

Annex B (informative): ASN.1 modules

B.1 A-GPS ASN.1 module

Refer to 3GPP TS 34.123-3 [8], annex H.

B.2 A-GNSS ASN.1 modules

B.2.1 Encoding information

Even though the codec is out of scope of the present document there are aspects with impact on TTCN-3 implementation. A-GNSS ASN.1 types are grouped by applicable encoding rules in three different modules to avoid circular references. Encoding rules are applied per module when the A-GNSS ASN.1 is imported by other modules.

Table B.2.1-1: Encoding rules applied to the A-GNSS ASN.1 modules

ASN.1 modules	Encoding Rule
LCS-DefinitionsTCAP-Para	DIRECT: no additional encoding rules required
LCS-DefinitionsTCAP, LCS-Definitions-Arguments	BER_Definite: Basic Encoding Rule referred to 3GPP TS 24.080 [13], clause 3.6.1 and 3GPP TS 29.002 [14], clause 17.1.1: - The definite short form is used for length encoding, if data length is less than 128 octets. - The definite long form is used for length encoding, if data length is greater than 127 octets, the minimum number of octets shall be used to code the length field.

B.2.2 LCS-DefinitionsTCAP-Para ASN.1 module

```
LCS-DefinitionsTCAP-Para DEFINITIONS ::=
BEGIN

IMPORTS
  LocationNotificationArg,
  LCS-MOLRArg,
  LocationNotificationRes,
  LCS-MOLRRes,
  SystemFailureParam,
  UnexpectedDataParam,
  DataMissingParam,
  FacilityNotSupParam,
  SS-SubscriptionViolationParam,
  PositionMethodFailure-Param

FROM LCS-Definitions-Arguments;

--*****
--Derived from SS-DataTypes in 3GPP TS 24.080 ver.800
--*****

InvokeArgument ::= CHOICE {
    lcsNotification [0] EXPLICIT LocationNotificationArg,
    lcs-MOLR        [1] EXPLICIT LCS-MOLRArg
}
```

```

ReturnRes ::= CHOICE {
    lcsNotificationRes [0] EXPLICIT LocationNotificationRes,
    lcsMOLRRes         [1] EXPLICIT LCS-MOLRRes
}

ReturnErrPara ::= CHOICE {
    lcsNotificationErrPara [0] EXPLICIT LcsNotificationErrPara,
    lcs-MOLR-ResErrPara   [1] EXPLICIT Lcs-MOLR-ErrPara
}

LcsNotificationErrPara ::= CHOICE {
    systemFailure [0] EXPLICIT SystemFailureParam,
    unexpectedDataValue [1] EXPLICIT UnexpectedDataParam
}
-- This is derived from information object "lcs-LocationNotification"

Lcs-MOLR-ErrPara ::= CHOICE {
    systemFailure [0] EXPLICIT SystemFailureParam,
    unexpectedDataValue [1] EXPLICIT UnexpectedDataParam,
    dataMissing [2] EXPLICIT DataMissingParam,
    facilityNotSupported [3] EXPLICIT FacilityNotSupParam,
    ss-SubscriptionViolation [4] EXPLICIT SS-SubscriptionViolationParam,
    positionMethodFailure [5] EXPLICIT PositionMethodFailure-Param,
    ...
}
-- This is derived from information object "lcs-MOLR"

END

```

B.2.3 LCS-DefinitionsTCAP ASN.1 module

```
LCS-DefinitionsTCAP DEFINITIONS ::=
```

```
BEGIN
```

```
IMPORTS
```

```

    InvokeArgument,
    ReturnRes,
    ReturnErrPara,
    LcsNotificationErrPara,
    Lcs-MOLR-ErrPara

```

```
FROM LCS-DefinitionsTCAP-Para;
```

```

-----
-- From ITU-T Rec. X.880 (July/1994)
-----

```

```

Code ::= CHOICE {
    local INTEGER,
    global OBJECT IDENTIFIER
}

```

```

-----
-- Derived from ITU-T Rec. Q.773 (June/1997)
-----

```

```

Component ::= CHOICE {
    invoke [1] IMPLICIT Invoke,
    returnResultLast [2] IMPLICIT ReturnResult,
    returnError [3] IMPLICIT ReturnError,
    reject [4] IMPLICIT Reject
}

```

```

-- The used part of Q.773 is almost the same as the component portion of TC messages. The only
-- difference is that returnResultNotLast is not used. (see 24.080, clause 3.6.1)

```

```

Invoke ::= SEQUENCE {
    invokeID InvokeIdType,
    linkedID [0] IMPLICIT InvokeIdType OPTIONAL,
    operationCode Code,
    -- local:116 for lcsNotification
    -- local:115 for lcs-MOLR
}

```

```

parameter          InvokeArgument OPTIONAL
}

ReturnResult ::= SEQUENCE {
  invokeID          InvokeIdType,
  result            SEQUENCE {
    operationCode   Code,
    -- local:116 for lcsNotification
    -- local:115 for lcs-MOLR

    parameter      ReturnRes
                  } OPTIONAL
}

ReturnError ::= SEQUENCE {
  invokeID          InvokeIdType,
  errorCode         Code,
  -- local:34 for SystemFailure
  -- local:36 for UnexpectedDataValue
  -- local:35 for DataMissing
  -- local:21 for FacilityNotSupported
  -- local:19 for SS-SubscriptionViolation
  -- local:54 for PositionMethodFailure

  parameter        ReturnErrPara OPTIONAL
}

Reject ::= SEQUENCE {
  invokeID CHOICE {
    derivable          InvokeIdType,
    not-derivable     NULL },
  problem CHOICE {
    generalProblem     [0] IMPLICIT GeneralProblem,
    invokeProblem      [1] IMPLICIT InvokeProblem,
    returnResultProblem [2] IMPLICIT ReturnResultProblem,
    returnErrorProblem [3] IMPLICIT ReturnErrorProblem }
}

InvokeIdType ::= INTEGER (-128..127)

GeneralProblem ::= INTEGER {
  unrecognizedComponent (0),
  mistypedComponent (1),
  badlyStructuredComponent (2) }

InvokeProblem ::= INTEGER {duplicateInvokeID (0),
  unrecognizedOperation (1),
  mistypedParameter (2),
  resourceLimitation (3),
  initiatingRelease (4),
  unrecognizedLinkedID (5),
  linkedResponseUnexpected (6),
  unexpectedLinkedOperation (7) }

ReturnResultProblem ::= INTEGER {unrecognizedInvokeID (0),
  returnResultUnexpected (1),
  mistypedParameter (2) }

ReturnErrorProblem ::= INTEGER {unrecognizedInvokeID (0),
  returnErrorUnexpected (1),
  unrecognizedError (2),
  unexpectedError (3),
  mistypedParameter (4) }

END

```

B.2.4 LCS-Definitions-Arguments ASN.1 module

LCS-Definitions-Arguments DEFINITIONS ::=

BEGIN

```

--*****
--Derived from SS-DataTypes in 3GPP TS 24.080 ver.800
--*****

LocationNotificationArg ::= SEQUENCE {
    notificationType          [0] IMPLICIT NotificationToMSUser,
    locationType              [1] IMPLICIT LocationType,
    lcsClientExternalID      [2] IMPLICIT LCSClientExternalID    OPTIONAL,
    lcsClientName            [3] IMPLICIT LCSClientName          OPTIONAL,
    ...,
    lcsRequestorID           [4] IMPLICIT LCSRequestorID        OPTIONAL,
    lcsCodeword              [5] IMPLICIT LCSCodeword            OPTIONAL,
    lcsServiceTypeID         [6] IMPLICIT LCSServiceTypeID      OPTIONAL
}
-- The notificationType may only be set to notifyLocationAllowed,
-- notifyAndVerify-LocationAllowedIfNoResponse,
-- or notifyAndVerify-LocationNotAllowedIfNoResponse.
-- The locationEstimateType field of the locationType may only be set to
-- currentLocation, currentOrLastKnownLocation,
-- notificationVerificationOnly, or activateDeferredLocation.
-- The deferredLocationEventType field of the locationType may only be set to
-- enteringIntoArea, and/or leavingFromArea, and/or beingInsideArea,
-- and/or periodicLDR.
-- For LCS location notification of MT-LR for current location, the
-- locationEstimateType field of the locationType shall be set to currentLocation.
-- For LCS location notification of MT-LR for current or last known location, the
-- locationEstimateType field of the locationType shall be set to currentOrLastKnownLocation.
-- For the LCS location notification for the LDR of MS available event,
-- the locationEstimateType field of the locationType shall be set to currentLocation.
-- For LCS location notification for the LDR of change of area event,
-- the locationEstimateType field of the locationType shall be set to
-- activateDeferredLocation, and the deferredLocationEventType shall be
-- set to enteringIntoArea, and/or leavingFromArea, and/or beingInsideArea.
-- For the post positioning LCS location notification, the locationEstimateType
-- field of the locationType shall be set to notificationVerificationOnly.
-- For LCS location notification for the LDR of periodic location event,
-- the locationEstimateType field of the locationType shall be set to
-- activateDeferredLocation, and the
-- deferredLocationEventType shall be set to periodicLDR.

-- exception handling:
-- At reception of an unrecognised notificationType value the receiver shall reject the
-- operation with a return error cause of unexpected data value.
-- At reception of an unrecognised locationType value the receiver shall reject the
-- operation with a return error cause of unexpected data value.
-- At reception of an unallowed notificationType value the receiver shall either ignore the
-- received operation or reject the operation with a return error cause of unexpected
-- data value.
-- At reception of an unallowed locationType value the receiver shall either ignore the
-- received operation or reject the operation with a return error cause of unexpected
-- data value.

LocationNotificationRes ::= SEQUENCE {
    verificationResponse      [0] IMPLICIT VerificationResponse OPTIONAL,
    ...
}

VerificationResponse ::= ENUMERATED {
    permissionDenied (0),
    permissionGranted (1),
    ...
}
-- exception handling:
-- an unrecognized value shall be treated the same as value 0 (permissionDenied)

LCS-MOLRArg ::= SEQUENCE {
    molr-Type                 [0] IMPLICIT MOLR-Type,
    locationMethod            [1] IMPLICIT LocationMethod        OPTIONAL,
    lcs-QoS                   [2] IMPLICIT LCS-QoS                OPTIONAL,
}

```

```

lcsClientExternalID [3] IMPLICIT LCSCClientExternalID OPTIONAL,
mlc-Number [4] IMPLICIT ISDN-AddressString OPTIONAL,
gpsAssistanceData [5] IMPLICIT GPSAssistanceData OPTIONAL,
...
supportedGADShapes [6] IMPLICIT SupportedGADShapes OPTIONAL,
lcsServiceTypeID [7] IMPLICIT LCSServiceTypeID OPTIONAL,
ageOfLocationInfo [8] IMPLICIT AgeOfLocationInformation OPTIONAL,
locationType [9] IMPLICIT LocationType OPTIONAL,
pseudonymIndicator [10] IMPLICIT NULL OPTIONAL,
h-gmlc-address [11] IMPLICIT GSN-Address OPTIONAL,
locationEstimate [12] IMPLICIT Ext-GeographicalInformation OPTIONAL,
velocityEstimate [13] IMPLICIT VelocityEstimate-AGPS OPTIONAL,
referenceNumber [14] IMPLICIT LCS-ReferenceNumber OPTIONAL,
periodicLDRInfo [15] IMPLICIT PeriodicLDRInfo OPTIONAL,
locationUpdateRequest [16] IMPLICIT NULL OPTIONAL,
sequenceNumber [17] IMPLICIT SequenceNumber OPTIONAL,
terminationCause [18] IMPLICIT TerminationCause OPTIONAL,
mo-lrShortCircuit [19] IMPLICIT NULL OPTIONAL,
ganssAssistanceData [20] IMPLICIT GANSSAssistanceData OPTIONAL,
multiplePositioningProtocolPDUs [21] MultiplePositioningProtocolPDUs OPTIONAL
}
-- The parameter locationMethod shall be included if and only if the
-- molr-Type is set to value deCipherringKeys or assistanceData.
-- The parameter gpsAssistanceData shall be included if and only if the
-- molr-Type is set to value assistanceData and
-- locationMethod is set to value assistedGPS or assistedGPSandGANSS.
-- The parameter ganssAssistanceData shall be included if and only if the molr-Type is set to
value
-- assistanceData and locationMethod is set to value assistedGANSS or assistedGPSandGANSS.
-- supportedGADShapes shall not be included for deferred MO-LR initiation or deferred MO-LR or
MT-LR
-- responses.
-- multiplePositioningProtocolPDUs may only be included for E-UTRAN access.
-- locationMethod shall not be included for E-UTRAN access.
-- gpsAssistanceData shall not be included for E-UTRAN access.
-- h-gmlc-address shall not be included for E-UTRAN access.
-- locationEstimate shall not be included for E-UTRAN access.
-- velocityEstimate shall not be included for E-UTRAN access.
-- referenceNumber shall not be included for E-UTRAN access.
-- periodicLDRInfo shall not be included for E-UTRAN access.
-- locationUpdateRequest shall not be included for E-UTRAN access.
-- sequenceNumber shall not be included for E-UTRAN access.
-- terminationCause shall not be included for E-UTRAN access.
-- mo-lrShortCircuit shall not be included for E-UTRAN access.
-- ganssAssistanceData shall not be included for E-UTRAN access.

MOLR-Type ::= ENUMERATED {
locationEstimate (0),
assistanceData (1),
deCipherringKeys (2),
...
deferredMo-lrTTTTInitiation (3),
deferredMo-lrSelfLocationInitiation (4),
deferredMt-lrOrmo-lrTTTTLocationEstimate (5),
deferredMt-lrOrmo-lrCancellation (6)
}
-- exception handling:
-- an unrecognized value shall be rejected by the receiver with a return error cause of
-- unexpected data value.

LocationMethod ::= ENUMERATED {
msBasedEOTD (0),
msAssistedEOTD (1),
assistedGPS (2),
...
msBasedOTDOA (3),
assistedGANSS (4),
assistedGPSandGANSS (5)
}
-- exception handling:
-- When this parameter is received with value msBasedEOTD or msAssistedEOTD and the MS
-- is camped on an UMTS Service Area then the receiver shall reject it
-- with a return error cause of unexpected data value.
-- When this parameter is received with value msBasedOTDOA and the MS
-- is camped on a GSM Cell then the receiver shall reject it with
-- a return error cause of unexpected data value.
-- an unrecognized value shall be rejected by the receiver with
-- a return error cause of unexpected data value.

```

```

GPSAssistanceData ::= OCTET STRING (SIZE (1..38))
  -- Octets 1 to 38 are coded in the same way as the octets 3 to 7+2n
  -- of Requested GPS Data IE in 3GPP TS 49.031.

GANSSAssistanceData ::= OCTET STRING (SIZE (1..40))
  -- Octets 1 to 40 are coded in the same way as the octets 3 to 9+2n of Requested GANSS Data IE
  -- in 3GPP TS 49.031 [14] .

TerminationCause ::= ENUMERATED {
  subscriberTermination (0),
  uETermination (1),
  ... }

MultiplePositioningProtocolPDUs ::= SEQUENCE (SIZE (1..maxNumLPPMsg)) OF PositioningProtocolPDU

PositioningProtocolPDU ::= OCTET STRING
  -- PositioningProtocolPDU contains a LPP message defined in 3GPP TS 36.355 [10].

maxNumLPPMsg INTEGER ::= 3

LCS-MOLRRes ::= SEQUENCE {
  locationEstimate          [0] IMPLICIT Ext-GeographicalInformation OPTIONAL,
  decipheringKeys          [1] IMPLICIT DecipheringKeys           OPTIONAL,
  ...,
  add-LocationEstimate     [2] IMPLICIT Add-GeographicalInformation OPTIONAL,
  velocityEstimate         [3] IMPLICIT VelocityEstimate-AGPS     OPTIONAL,
  referenceNumber          [4] IMPLICIT LCS-ReferenceNumber       OPTIONAL,
  h-gmlc-address           [5] IMPLICIT GSN-Address              OPTIONAL,
  mo-lrShortCircuit        [6] IMPLICIT NULL                     OPTIONAL,
  reportingPLMNList        [7] IMPLICIT ReportingPLMNList        OPTIONAL
}

  -- Parameters locationEstimate or add-LocationEstimate (one but not both)
  -- shall be included if and only if the
  -- molr-Type in LocationRequestArg was set to value locationEstimate.
  -- Parameter add-LocationEstimate shall not be included
  -- if the supportedGADShapes parameter was not received in the LCS-MOLRArg.
  -- The locationEstimate and the add-locationEstimate parameters shall not be
  -- sent if the supportedGADShapes parameter has been received in LCS-MOLRArg
  -- and the shape encoded in locationEstimate or add-LocationEstimate
  -- is not marked as supported in supportedGADShapes.
  -- In such a case LCS-MOLRArg shall be rejected with error
  -- FacilityNotSupported with additional indication
  -- shapeOfLocationEstimateNotSupported.
  -- Parameter decipheringKeys shall be included if and only if the molr-Type
  -- in LocationRequestArg was set to value deCIPHERingKeys.
  -- Parameter velocityEstimate may only be included if the lcs-QoS in LCS-MOLRArg includes
  -- velocityRequest

DecipheringKeys ::= OCTET STRING (SIZE (15))
  -- Octets in DecipheringKeys are coded in the same way as the octets 3 to 17
  -- of Deciphering Key IE in 3GPP TS 49.031. I.e. these octets contain
  -- Current Deciphering Key, Next Deciphering Key and Ciphering Key Flag.

-----
-- Derived from MAP-Errors 3GPP 29.002
-----

SystemFailureParam ::= CHOICE {
  networkResource          NetworkResource,
  -- networkResource must not be used in version 3
  extensibleSystemFailureParam ExtensibleSystemFailureParam
  -- extensibleSystemFailureParam must not be used in version <3
}

NetworkResource ::= ENUMERATED {
  plmn (0),
  hlr (1),
  vlr (2),
  pvlr (3),
  controllingMSC (4),
  vmsc (5),
  eir (6),
  rss (7)
}

```



```

    }

ExtensibleSystemFailureParam ::= SEQUENCE {
    networkResource          NetworkResource          OPTIONAL,
    extensionContainer       ExtensionContainer       OPTIONAL,
    additionalNetworkResource [0] AdditionalNetworkResource OPTIONAL,
    failureCauseParam       [1] FailureCauseParam    OPTIONAL
}

AdditionalNetworkResource ::= ENUMERATED {
    sgsn (0),
    ggsn (1),
    gmlc (2),
    gsmSCF (3),
    nplr (4),
    auc (5),
    ...,
    ue (6),
    mme (7)
}
-- if unknown value is received in AdditionalNetworkResource
-- it shall be ignored.

FailureCauseParam ::= ENUMERATED {
    limitReachedOnNumberOfConcurrentLocationRequests (0),
    ...
}
-- if unknown value is received in FailureCauseParam it shall be ignored

UnexpectedDataParam ::= SEQUENCE {
    extensionContainer       ExtensionContainer       OPTIONAL,
    ...
}

DataMissingParam ::= SEQUENCE {
    extensionContainer       ExtensionContainer       OPTIONAL,
    ...
}

FacilityNotSupParam ::= SEQUENCE {
    extensionContainer       ExtensionContainer       OPTIONAL,
    ...,
    shapeOfLocationEstimateNotSupported [0] IMPLICIT NULL    OPTIONAL,
    neededLcsCapabilityNotSupportedInServingNode [1] IMPLICIT NULL    OPTIONAL
}

SS-SubscriptionViolationParam ::= SEQUENCE {
    extensionContainer       ExtensionContainer       OPTIONAL,
    ...
}

PositionMethodFailure-Param ::= SEQUENCE {
    positionMethodFailure-Diagnostic [0] IMPLICIT PositionMethodFailure-Diagnostic OPTIONAL,
    extensionContainer [1] IMPLICIT ExtensionContainer OPTIONAL,
    ...
}

PositionMethodFailure-Diagnostic ::= ENUMERATED {
    congestion (0),
    insufficientResources (1),
    insufficientMeasurementData (2),
    inconsistentMeasurementData (3),
    locationProcedureNotCompleted (4),
    locationProcedureNotSupportedByTargetMS (5),
    qosNotAttainable (6),
    positionMethodNotAvailableInNetwork (7),
    positionMethodNotAvailableInLocationArea (8),
    ...
}
-- exception handling:
-- any unrecognized value shall be ignored

ExtensionContainer ::= SEQUENCE {
    privateExtensionList [0] IMPLICIT PrivateExtensionList OPTIONAL,
    pcs-Extensions [1] IMPLICIT PCS-Extensions OPTIONAL,
    ...
}

```

```

    }

PrivateExtensionList ::= SEQUENCE SIZE (1..maxNumOfPrivateExtensions) OF
    PrivateExtension

PrivateExtension ::= SEQUENCE {
    extId      OBJECT IDENTIFIER,
    extType    OCTET STRING    OPTIONAL}

maxNumOfPrivateExtensions    INTEGER ::= 10

PCS-Extensions ::= SEQUENCE {...}

--*****
-- From 3GPP TS 29.002
--*****

NotificationToMSUser ::= ENUMERATED {
    notifyLocationAllowed (0),
    notifyAndVerify-LocationAllowedIfNoResponse (1),
    notifyAndVerify-LocationNotAllowedIfNoResponse (2),
    ...,
    locationNotAllowed (3) }
    -- exception handling:
    -- At reception of any other value than the ones listed the receiver shall ignore
    -- NotificationToMSUser.

LocationType ::= SEQUENCE {
    locationEstimateType      [0] IMPLICIT LocationEstimateType,
    ...,
    deferredLocationEventType [1] IMPLICIT DeferredLocationEventType OPTIONAL }

LocationEstimateType ::= ENUMERATED {
    currentLocation (0),
    currentOrLastKnownLocation (1),
    initialLocation (2),
    ...,
    activateDeferredLocation (3),
    cancelDeferredLocation (4),
    notificationVerificationOnly (5)
}
    -- exception handling:
    -- a ProvideSubscriberLocation-Arg containing an unrecognized LocationEstimateType
    -- shall be rejected by the receiver with a return error cause of unexpected data value

DeferredLocationEventType ::= BIT STRING {
    msAvailable (0),
    enteringIntoArea (1),
    leavingFromArea (2),
    beingInsideArea (3) ,
    periodicLDR (4)
} (SIZE (1..16))
    -- beingInsideArea is always treated as oneTimeEvent regardless of the possible value
    -- of occurrenceInfo inside areaEventInfo.
    -- exception handling:
    -- a ProvideSubscriberLocation-Arg containing other values than listed above in
    -- DeferredLocationEventType shall be rejected by the receiver with a return error cause of
    -- unexpected data value.

LCSCClientExternalID ::= SEQUENCE {
    externalAddress [0] IMPLICIT ISDN-AddressString OPTIONAL,
    extensionContainer [1] IMPLICIT ExtensionContainer OPTIONAL,
    ...
}

LCSCClientName ::= SEQUENCE {
    dataCodingScheme [0] IMPLICIT USSD-DataCodingScheme,
    nameString [2] IMPLICIT NameString,
    ...,
    lcs-FormatIndicator [3] IMPLICIT LCS-FormatIndicator OPTIONAL
}

    -- The USSD-DataCodingScheme shall indicate use of the default alphabet through the following
encoding
    -- bit 7 6 5 4 3 2 1 0
    --      0 0 0 0 1 1 1 1

```

```

NameString ::= USSD-String (SIZE (1..maxNameStringLength))

maxNameStringLength  INTEGER ::= 63

USSD-DataCodingScheme ::= OCTET STRING (SIZE (1))
  -- The structure of the USSD-DataCodingScheme is defined by the Cell
  -- Broadcast Data Coding Scheme as described in 3GPP TS 23.038 [19]

LCSRequestorID ::= SEQUENCE {
  dataCodingScheme      [0] IMPLICIT USSD-DataCodingScheme,
  requestorIDString     [1] IMPLICIT RequestorIDString,
  ...,
  lcs-FormatIndicator   [2] IMPLICIT LCS-FormatIndicator  OPTIONAL
}

LCS-FormatIndicator ::= ENUMERATED {
  logicalName      (0),
  e-mailAddress   (1),
  msisdn          (2),
  url             (3),
  sipUrl         (4),
  ... }

RequestorIDString ::= USSD-String (SIZE (1..maxRequestorIDStringLength))

maxRequestorIDStringLength  INTEGER ::= 63

LCSCodeword ::= SEQUENCE {
  dataCodingScheme      [0] IMPLICIT USSD-DataCodingScheme,
  lcsCodewordString     [1] IMPLICIT LCSCodewordString,
  ...
}

LCSCodewordString ::= USSD-String (SIZE (1..maxLCSCodewordStringLength))

maxLCSCodewordStringLength  INTEGER ::= 20

LCSServiceTypeID ::= INTEGER (0..127)
  -- the integer values 0-63 are reserved for Standard LCS service types
  -- the integer values 64-127 are reserved for Non Standard LCS service types

USSD-String ::= OCTET STRING (SIZE (1..maxUSSD-StringLength))
  -- The structure of the contents of the USSD-String is dependent
  -- on the USSD-DataCodingScheme as described in 3GPP TS 23.038 [19].

maxUSSD-StringLength  INTEGER ::= 160

ISDN-AddressString ::= AddressString (SIZE (1..maxISDN-AddressLength))
  -- This type is used to represent ISDN numbers.

maxISDN-AddressLength  INTEGER ::= 9

AddressString ::= OCTET STRING (SIZE (1..maxAddressLength))
  -- This type is used to represent a number for addressing purposes. It is
  -- composed of
  -- a) one octet for nature of address, and numbering plan indicator.
  -- b) digits of an address encoded as TBCD-String.

  -- a) The first octet includes a one bit extension indicator, a
  -- 3 bits nature of address indicator and a 4 bits numbering
  -- plan indicator, encoded as follows:

  -- bit 8: 1 (no extension)

  -- bits      765: nature of address indicator
  --           000 unknown
  --           001 international number
  --           010 national significant number
  --           011 network specific number
  --           100 subscriber number
  --           101 reserved
  --           110 abbreviated number
  --           111 reserved for extension

  -- bits      4321: numbering plan indicator
  --           0000 unknown
  --           0001 ISDN/Telephony Numbering Plan (Rec ITU-T E.164)
  --           0010 spare

```

```

--          0011      data numbering plan (ITU-T Rec X.121)
--          0100      telex numbering plan (ITU-T Rec F.69)
--          0101      spare
--          0110      land mobile numbering plan (ITU-T Rec E.212)
--          0111      spare
--          1000      national numbering plan
--          1001      private numbering plan
--          1111      reserved for extension

```

-- all other values are reserved.

-- b) The following octets representing digits of an address
 -- encoded as a TBCD-STRING.

maxAddressLength INTEGER ::= 20

```

LCS-QoS ::= SEQUENCE {
  horizontal-accuracy      [0] IMPLICIT Horizontal-Accuracy      OPTIONAL,
  verticalCoordinateRequest [1] IMPLICIT NULL                    OPTIONAL,
  vertical-accuracy        [2] IMPLICIT Vertical-Accuracy        OPTIONAL,
  responseTime             [3] IMPLICIT ResponseTime             OPTIONAL,
  extensionContainer       [4] IMPLICIT ExtensionContainer        OPTIONAL,
  ...,
  velocityRequest          [5] IMPLICIT NULL                    OPTIONAL
}

```

Horizontal-Accuracy ::= OCTET STRING (SIZE (1))

-- bit 8 = 0
 -- bits 7-1 = 7 bit Uncertainty Code defined in 3GPP TS 23.032. The horizontal location
 -- error should be less than the error indicated by the uncertainty code with 67%
 -- confidence.

Vertical-Accuracy ::= OCTET STRING (SIZE (1))

-- bit 8 = 0
 -- bits 7-1 = 7 bit Vertical Uncertainty Code defined in 3GPP TS 23.032.
 -- The vertical location error should be less than the error indicated
 -- by the uncertainty code with 67% confidence.

ResponseTime ::= SEQUENCE {

```

  responseTimeCategory      ResponseTimeCategory,
  ...
}

```

-- note: an expandable SEQUENCE simplifies later addition of a numeric response time.

ResponseTimeCategory ::= ENUMERATED {

```

  lowdelay (0),
  delaytolerant (1),
  ...
}
-- exception handling:
-- an unrecognized value shall be treated the same as value 1 (delaytolerant)

```

SupportedGADShapes ::= BIT STRING {

```

  ellipsoidPoint (0),
  ellipsoidPointWithUncertaintyCircle (1),
  ellipsoidPointWithUncertaintyEllipse (2),
  polygon (3),
  ellipsoidPointWithAltitude (4),
  ellipsoidPointWithAltitudeAndUncertaintyEllipsoid (5),
  ellipsoidArc (6) } (SIZE (7..16))
-- A node shall mark in the BIT STRING all Shapes defined in 3GPP TS 23.032 it supports.
-- exception handling: bits 7 to 15 shall be ignored if received.

```

Ext-GeographicalInformation ::= OCTET STRING (SIZE (1..maxExt-GeographicalInformation))

-- Refers to geographical Information defined in 3GPP TS 23.032.
 -- This is composed of 1 or more octets with an internal structure according to
 -- 3GPP TS 23.032
 -- Octet 1: Type of shape, only the following shapes in 3GPP TS 23.032 are allowed:
 -- (a) Ellipsoid point with uncertainty circle
 -- (b) Ellipsoid point with uncertainty ellipse
 -- (c) Ellipsoid point with altitude and uncertainty ellipsoid
 -- (d) Ellipsoid Arc
 -- (e) Ellipsoid Point
 -- Any other value in octet 1 shall be treated as invalid
 -- Octets 2 to 8 for case (a) Ellipsoid point with uncertainty circle
 -- Degrees of Latitude 3 octets
 -- Degrees of Longitude 3 octets
 -- Uncertainty code 1 octet
 -- Octets 2 to 11 for case (b) Ellipsoid point with uncertainty ellipse:

```

-- Degrees of Latitude          3 octets
-- Degrees of Longitude        3 octets
-- Uncertainty semi-major axis  1 octet
-- Uncertainty semi-minor axis  1 octet
-- Angle of major axis         1 octet
-- Confidence                   1 octet
-- Octets 2 to 14 for case (c) Ellipsoid point with altitude and uncertainty ellipsoid
-- Degrees of Latitude          3 octets
-- Degrees of Longitude        3 octets
-- Altitude                     2 octets
-- Uncertainty semi-major axis  1 octet
-- Uncertainty semi-minor axis  1 octet
-- Angle of major axis         1 octet
-- Uncertainty altitude        1 octet
-- Confidence                   1 octet
-- Octets 2 to 13 for case (d) Ellipsoid Arc
-- Degrees of Latitude          3 octets
-- Degrees of Longitude        3 octets
-- Inner radius                 2 octets
-- Uncertainty radius          1 octet
-- Offset angle                 1 octet
-- Included angle              1 octet
-- Confidence                   1 octet
-- Octets 2 to 7 for case (e) Ellipsoid Point
-- Degrees of Latitude          3 octets
-- Degrees of Longitude        3 octets

--
-- An Ext-GeographicalInformation parameter comprising more than one octet and
-- containing any other shape or an incorrect number of octets or coding according
-- to 3GPP TS 23.032 shall be treated as invalid data by a receiver.
--
-- An Ext-GeographicalInformation parameter comprising one octet shall be discarded
-- by the receiver if an Add-GeographicalInformation parameter is received
-- in the same message.
--
-- An Ext-GeographicalInformation parameter comprising one octet shall be treated as
-- invalid data by the receiver if an Add-GeographicalInformation parameter is not
-- received in the same message.

maxExt-GeographicalInformation  INTEGER ::= 20
-- the maximum length allows for further shapes in 3GPP TS 23.032 to be included in later
-- versions of 3GPP TS 29.002

Add-GeographicalInformation ::= OCTET STRING (SIZE (1..maxAdd-GeographicalInformation))
-- Refers to geographical information defined in 3GPP TS 23.032.
-- This is composed of 1 or more octets with an internal structure according to
-- 3GPP TS 23.032
-- Octet 1: Type of shape, all the shapes defined in 3GPP TS 23.032 are allowed:
-- Octets 2 to n (where n is the total number of octets necessary to encode the shape
-- according to 3GPP TS 23.032) are used to encode the shape itself in accordance with the
-- encoding defined in 3GPP TS 23.032
--
-- An Add-GeographicalInformation parameter, whether valid or invalid, received
-- together with a valid Ext-GeographicalInformation parameter in the same message
-- shall be discarded.
--
-- An Add-GeographicalInformation parameter containing any shape not defined in
-- 3GPP TS 23.032 or an incorrect number of octets or coding according to
-- 3GPP TS 23.032 shall be treated as invalid data by a receiver if not received
-- together with a valid Ext-GeographicalInformation parameter in the same message.

maxAdd-GeographicalInformation  INTEGER ::= 91
-- the maximum length allows support for all the shapes currently defined in 3GPP TS 23.032

AgeOfLocationInformation ::= INTEGER (0..32767)
-- the value represents the elapsed time in minutes since the last
-- network contact of the mobile station (i.e. the actuality of the
-- location information).
-- value "0" indicates that the MS is currently in contact with the network
-- "32767" indicates that the location information is at least 32767 minutes old

GSN-Address ::= OCTET STRING (SIZE (5..17))
-- Octets are coded according to TS 3GPP TS 23.003

LCS-ReferenceNumber ::= OCTET STRING (SIZE(1))

PeriodicLDRInfo ::= SEQUENCE {

```

```

reportingAmount      ReportingAmount-AGPS,
reportingInterval    ReportingInterval-AGPS,
...
}
-- reportingInterval x reportingAmount shall not exceed 8639999 (99 days, 23 hours,
-- 59 minutes and 59 seconds) for compatibility with OMA MLP and RLP

ReportingAmount-AGPS ::= INTEGER (1..maxReportingAmount)

maxReportingAmount INTEGER ::= 8639999

ReportingInterval-AGPS ::= INTEGER (1..maxReportingInterval)
-- ReportingInterval is in seconds

maxReportingInterval INTEGER ::= 8639999

VelocityEstimate-AGPS ::= OCTET STRING (SIZE (4..7))
-- Refers to Velocity description defined in 3GPP TS 23.032.
-- This is composed of 4 or more octets with an internal structure according to
-- 3GPP TS 23.032
-- Octet 1: Type of velocity, only the following types in 3GPP TS 23.032 are allowed:
-- (a) Horizontal Velocity
-- (b) Horizontal with Vertical Velocity
-- (c) Horizontal Velocity with Uncertainty
-- (d) Horizontal with Vertical Velocity and Uncertainty
-- For types Horizontal with Vertical Velocity and Horizontal with Vertical Velocity
-- and Uncertainty, the direction of the Vertical Speed is also included in Octet 1
-- Any other value in octet 1 shall be treated as invalid
-- Octets 2 to 4 for case (a) Horizontal velocity:
-- Bearing                1 octet
-- Horizontal Speed                2 octets
-- Octets 2 to 5 for case (b) - Horizontal with Vertical Velocity:
-- Bearing                1 octet
-- Horizontal Speed                2 octets
-- Vertical Speed                1 octet
-- Octets 2 to 5 for case (c) - Horizontal velocity with Uncertainty:
-- Bearing                1 octet
-- Horizontal Speed                2 octets
-- Uncertainty Speed                1 octet
-- Octets 2 to 7 for case (d) - Horizontal with Vertical Velocity and Uncertainty:
-- Bearing                1 octet
-- Horizontal Speed                2 octets
-- Vertical Speed                1 octet
-- Horizontal Uncertainty Speed                1 octet
-- Vertical Uncertainty Speed                1 octet

SequenceNumber ::= INTEGER (1..maxReportingAmount)

ReportingPLMNList ::= SEQUENCE {
    plmn-ListPrioritized [0] NULL OPTIONAL,
    plmn-List [1] PLMNList
}

PLMNList ::= SEQUENCE SIZE (1..maxNumOfReportingPLMN) OF
    ReportingPLMN

maxNumOfReportingPLMN INTEGER ::= 20

ReportingPLMN ::= SEQUENCE {
    plmn-Id [0] PLMN-Id,
    ran-Technology [1] RAN-Technology OPTIONAL,
    ran-PeriodicLocationSupport [2] NULL OPTIONAL,
    ...
}

RAN-Technology ::= ENUMERATED {
    gsm (0),
    umts (1),
    ...
}

PLMN-Id ::= OCTET STRING (SIZE (3))
-- The internal structure is defined as follows:
-- octet 1 bits 4321 Mobile Country Code 1st digit
-- bits 8765 Mobile Country Code 2nd digit
-- octet 2 bits 4321 Mobile Country Code 3rd digit
-- bits 8765 Mobile Network Code 3rd digit
-- or filler (1111) for 2 digit MNCs
-- octet 3 bits 4321 Mobile Network Code 1st digit

```

-- bits 8765 Mobile Network Code 2nd digit

END

B.3 LPP ASN.1

The LPP asn.1 modules is extracted from 3GPP TS 36.355 [10] without any change.

Annex C (informative): E-UTRA System Simulator Extension ASP Definitions in TTCN-3

C.1 EUTRA_POS_ASP_TypeDefs

Type definitions for configuration of Positioning Reference Signal in the system simulator; Common design principles: refer to 3GPP TS 36.523-3 [6], annex D.

C.1.1 System_Configuration_PosExt

Formal ASP Definitions for EUTRA PRS system configuration.

SystemRequest_PosExt_Type

TTCN-3 Union Type		
Name	SystemRequest_PosExt_Type	
Comment	NOTE: Same structure as SystemRequest_Type in 3GPP TS 36.523-3 [6], annex D.	
Cell	CellConfigRequest_PosExt_Type	configure PRS in an LTE cell; the cell shall be configured as usual beforehand and SS shall raise an error when the cell does not exist yet; there is no explicit release of the PRS but the whole cell needs to be released

SystemConfirm_PosExt_Type

TTCN-3 Union Type		
Name	SystemConfirm_PosExt_Type	
Comment	confirmations for system configuration; in general to be sent after the configuration has been done	
Cell	Null_Type	(no further parameters from SS)

C.1.2 Cell_Configuration_PosExt

Specific Info for PRS Cell Configuration Primitive.

C.1.2.1 Cell_Configuration_Common_PosExt

CellConfigRequest_PosExt_Type

TTCN-3 Union Type		
Name	CellConfigRequest_PosExt_Type	
Comment	NOTE: Same structure as SystemRequest_Type in 3GPP TS 36.523-3 [6], annex D.	
AddOrReconfigure	CellConfigInfo_PosExt_Type	for PRS configuration of given cell: CellId : identifier of the cell to be configured RoutingInfo : None TimingInfo : Now (for initial configuration and for reconfiguration in general) ControllInfo : CnfFlag:=true; FollowOnFlag:=false (in general)

CellConfigInfo_PosExt_Type

TTCN-3 Record Type			
Name	CellConfigInfo_PosExt_Type		
Comment	NOTE: Same structure as SystemRequest_Type in 3GPP TS 36.523-3 [6], annex D; common information for initial cell configuration or reconfiguration; in case of reconfiguration OMIT means 'keep configuration as it is'.		
Basic	BasicCellConfig_PosExt_Type	opt	Extended PRS information for a cell

BasicCellConfig_PosExt_Type

TTCN-3 Record Type			
Name	BasicCellConfig_PosExt_Type		
Comment	NOTE: Same structure as SystemRequest_Type in 3GPP TS 36.523-3 [6], annex D. Physical layer:		
PhysicalLayerConfigDL	PhysicalLayerConfigDL_PosExt_Type	opt	Default settings regarding physical control PRS signal

C.1.2.2 Downlink_Physical_Layer_Configuration_PosExt

Downlink physical layer configuration:

- DL antenna configuration for port 6.
- PRS configuration.

AntennaPort6_Config_Type

TTCN-3 Record Type			
Name	AntennaPort6_Config_Type		
Comment	to configure antenna port 6 for positioning; all fields are declared as optional to allow single reconfigurations; in this case omit means "keep as it is"		
Port	AntennaPort_Type	opt	
PRS	PRS_Info	opt	

PhysicalLayerConfigDL_PosExt_Type

TTCN-3 Record Type			
Name	PhysicalLayerConfigDL_PosExt_Type		
Comment	all fields are declared as optional to allow single reconfigurations; in this case omit means "keep as it is"		
AntennaPort6	AntennaPort6_Config_Type	opt	

C.1.3 System_Interface_PosExt**SYSTEM_CTRL_POSEXT_REQ**

TTCN-3 Record Type			
Name	SYSTEM_CTRL_POSEXT_REQ		
Comment			
Common	ReqAspCommonPart_Type		For configuration of antenna port 6 TimingInfo is now
Request	SystemRequest_PosExt_Type		configure a PRS in a cell

SYSTEM_CTRL_POSEXT_CNF

TTCN-3 Record Type			
Name	SYSTEM_CTRL_POSEXT_CNF		
Comment			
Common	CnfAspCommonPart_Type		TimingInfo is ignored by TTCN => SS may set TimingInfo to "None"
Confirm	SystemConfirm_PosExt_Type		

EUTRA_SYSTEM_POSEXT_PORT

TTCN-3 Port Type			
Name	EUTRA_SYSTEM_POSEXT_PORT		
Comment	EUTRA PTC: Ext Port for system configuration of antenna port 6		
out	SYSTEM_CTRL_POSEXT_REQ		
in	SYSTEM_CTRL_POSEXT_CNF		

C.2 References to TTCN-3

References to TTCN-3		
EUTRA_POS_ASP_TypeDefs	Positioning/EUTRA_POS_ASP_TypeDefs.ttcn	Rev 6449

Annex D (informative): Positioning System Simulator ASP Definitions in TTCN-3

D.1 PosSystem_ASP_TypeDefs

D.1.1 PosSystem_Load_Scenario

Load scenarios follow 3GPP TS 37.571-5 [5].

PosSystem_Load_Scenario: Basic Type Definitions

TTCN-3 Basic Types	
ScenarioNumber_Type	integer

PositioningScenario_Type

TTCN-3 Union Type		
Name	PositioningScenario_Type	
Comment		
LTE_Positioning	ScenarioNumber_Type	Reference to 3GPP TS 37.571-5 [5]
AGNSS	ScenarioNumber_Type	Reference to 3GPP TS 37.571-5 [5]

D.1.2 PosSystem_Retrieve_Data

D.1.2.1 SatSystem_Retrieve_UTRAN_Data

UTRAN_GPS_AssistanceDataRequest_Type

TTCN-3 Record Type		
Name	UTRAN_GPS_AssistanceDataRequest_Type	
Comment		
AssistanceDataReqGPS	bitstring	bitstring containing 3GPP TS 25.331 [12] type UE-Positioning-GPS-AdditionalAssistanceDataRequest

UTRAN_GANSS_AssistanceDataRequest_Type

TTCN-3 Record Type			
Name	UTRAN_GANSS_AssistanceDataRequest_Type		
Comment			
AssistanceDataReqGANSS	bitstring	opt	bitstring containing 3GPP TS 25.331 [12] type UE-Positioning-GANSS-AdditionalAssistanceDataRequest
AssistanceDataReqGANSSv860ext	bitstring	opt	bitstring containing 3GPP TS 25.331 [12] type UE-Positioning-GANSS-AdditionalAssistanceDataRequest-v860ext

UTRAN_AssistanceDataRequest_Type

TTCN-3 Union Type	
Name	UTRAN_AssistanceDataRequest_Type
Comment	
GPS	UTRAN_GPS_AssistanceDataRequest_Type
GANSS	UTRAN_GANSS_AssistanceDataRequest_Type

UTRAN_AssistanceDataRequestList_Type

TTCN-3 Record of Type	
Name	UTRAN_AssistanceDataRequestList_Type
Comment	
record length(1.. tsc_MaxPosSystems) of UTRAN_AssistanceDataRequest_Type	

UTRAN_GPS_AssistanceData_Type

TTCN-3 Record Type		
Name	UTRAN_GPS_AssistanceData_Type	
Comment	The returned Almanac information is split into two fields: Almanac for satellites 1 to 16 in AssistanceDataGPSr7 together with other information; Almanac for satellites 17 to31: in 'almanacSat17To31'	
AssistanceDataGPSr7	bitstring	bitstring containing 3GPP TS 25.331 [12] type UE-Positioning-GPS-AssistanceData-r7
AlmanacSatInfoList17To31	bitstring	opt bitstring containing 3GPP TS 25.331 [12] type AlmanacSatInfoList

UTRAN_GANSS_AssistanceData_Type

TTCN-3 Record Type		
Name	UTRAN_GANSS_AssistanceData_Type	
Comment		
AssistanceDataGANSS_r8	bitstring	bitstring containing 3GPP TS 25.331 [12] type UE-Positioning-GANSS-AssistanceData-r8

UTRAN_AssistanceData_Type

TTCN-3 Union Type	
Name	UTRAN_AssistanceData_Type
Comment	
GPS	UTRAN_GPS_AssistanceData_Type
GANSS	UTRAN_GANSS_AssistanceData_Type

UTRAN_AssistanceDataList_Type

TTCN-3 Record of Type	
Name	UTRAN_AssistanceDataList_Type
Comment	
record length(1.. tsc_MaxPosSystems) of UTRAN_AssistanceData_Type	

D.1.2.2 PosSystem_Retrieve_EUTRA_Data

EUTRA_AssistanceDataRequest_Type

TTCN-3 Union Type		
Name	EUTRA_AssistanceDataRequest_Type	
Comment		
LPP_Assistance Data	Bitstring	bitstring containing 3GPP TS 36.355 [10] type RequestAssistanceData-r9-IEs

EUTRA_AssistanceDataProvide_Type

TTCN-3 Union Type		
Name	EUTRA_AssistanceDataProvide_Type	
Comment		
LPP_Assistance Data	bitstring	bitstring containing 3GPP TS 36.355 [10] type ProvideAssistanceData-r9-IEs

EUTRA_AssistanceDataRequestList_Type

TTCN-3 Record of Type		
Name	EUTRA_AssistanceDataRequestList_Type	
Comment		
	record length(1.. tsc_MaxPosSystems) of EUTRA_AssistanceDataRequest_Type	

EUTRA_AssistanceDataList_Type

TTCN-3 Record of Type		
Name	EUTRA_AssistanceDataList_Type	
Comment		
	record length(1.. tsc_MaxPosSystems) of EUTRA_AssistanceDataProvide_Type	

D.1.2.3 PosSystem_Retrieve_Data_Common

AssistanceDataRetrieveRequest_Type

TTCN-3 Union Type		
Name	AssistanceDataRetrieveRequest_Type	
Comment		
LPP	EUTRA_AssistanceDataRequestList_Type	LTE positioning
UTRA_GNSS	UTRAN_AssistanceDataRequestList_Type	Retrieve A-GNSS data list in the order of positioning system provided in PositioningSystemList

AssistanceDataRetrieveResponse_Type

TTCN-3 Union Type		
Name	AssistanceDataRetrieveResponse_Type	
Comment		
LPP	EUTRA_AssistanceDataList_Type	LTE positioning
UTRA_AGNSS	UTRAN_AssistanceDataList_Type	Retrieve A-GNSS data list in the order of positioning system provided in PositioningSystemList

D.1.3 System_Interface

Common ASP definitions.

PosSystemCtrlRequest_Type

TTCN-3 Union Type	
Name	PosSystemCtrlRequest_Type
Comment	
Start	Null_Type
Stop	Null_Type
LoadScenario	PositioningScenario_Type
RetrieveData	AssistanceDataRetrieveRequest_Type

PosSystemCtrlConfirm_Type

TTCN-3 Union Type	
Name	PosSystemCtrlConfirm_Type
Comment	
Start	Null_Type
Stop	Null_Type
LoadScenario	Null_Type
RetrieveData	AssistanceDataRetrieveResponse_Type

POS_SYSTEM_CTRL_REQ

TTCN-3 Record Type		
Name	POS_SYSTEM_CTRL_REQ	
Comment		
PositioningSystemList	PositioningSystemList_Type	The list of positioning systems to be configured; there is only one system of one type in the list e.g. gps, galileo etc.
CnfFlag	boolean	true => SS shall send CNF
Request	PosSystemCtrlRequest_Type	

POS_SYSTEM_CTRL_CNF

TTCN-3 Record Type		
Name	POS_SYSTEM_CTRL_CNF	
Comment		
PositioningSystemList	PositioningSystemList_Type	
Confirm	PosSystemCtrlConfirm_Type	

POS_MTC_SYSTEM_PORT

TTCN-3 Port Type	
Name	POS_MTC_SYSTEM_PORT
Comment	Positioning: port at the MTC to be mapped to the system
out	POS_SYSTEM_CTRL_REQ
in	POS_SYSTEM_CTRL_CNF

POS_MTC_PTC_PORT

TTCN-3 Port Type	
Name	POS_MTC_PTC_PORT
Comment	Positioning: port at the MTC to hand over information from the positioning system to the PTC(s)
out	POS_SYSTEM_CTRL_CNF
in	POS_SYSTEM_CTRL_REQ

POS_PTC_MTC_PORT

TTCN-3 Port Type	
Name	POS_PTC_MTC_PORT
Comment	Positioning: port at the PTC(s) to send commands to the positioning system via the MTC
out	POS_SYSTEM_CTRL_REQ
in	POS_SYSTEM_CTRL_CNF

PosSystem_ASP_TypeDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_MaxPosSystems	integer	8	

PositioningSystemType

TTCN-3 Enumerated Type	
Name	PositioningSystemType
Comment	
gps	
modernizedGPS	
glonass	
galileo	
qzss	
otdoa	
ecid	

PositioningSystemList_Type

TTCN-3 Record of Type	
Name	PositioningSystemList_Type
Comment	
record length (1.. tsc_MaxPosSystems) of PositioningSystemType	

D.2 CommonDefs

CommonDefs: Constant Definitions

TTCN-3 Basic Types			
tsc_UInt8Max	integer	255	
tsc_UInt16Max	integer	65535	
tsc_UInt20Max	integer	1048575	
tsc_UInt32Max	integer	4294967295	

CommonDefs: Basic Type Definitions

TTCN-3 Basic Types		
B128_Type	bitstring length(128)	
B256_Type	bitstring length(256)	
Null_Type	boolean (true)	dummy type for 'typeless' fields in unions
Char1_Type	charstring length (1)	

D.3 References to TTCN-3

References to TTCN-3		
PosSystem_ASP_TypeDefs	Positioning/PosSystem_ASP_TypeDefs.ttcn	Rev 5563
CommonDefs	Common/CommonDefs.ttcn	Rev 5625

Annex E (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
2011-06	RAN5#51	R5-112203	-	-	Initial proposal for A-GNSS		0.0.1
2011-09	RAN5#52	R5-113037	-	-	Introduced positioning test model	0.0.1	0.1.0
2011-11	RAN5#53	R5-115106	-	-	Imported A-GPS test model from 3GPP TS 34.123-3	0.1.0	1.0.0
2011-12	RAN#54	RP-111627	-	-	Presentation of V1.0.0	0.1.0	1.0.0
2012-05	RAN5#55	R5-121083	-	-	Presentation of V1.1.0	1.0.0	1.1.0
2012-06	RAN#56	RP-120614	-	-	Presentation of V2.0.0	1.0.0	2.0.0
2012-06	RAN#56	-	-	-	Editorial correctins and formattings.	2.0.0	9.0.0
2012-06	RAN#56	-	-	-	Raised to v10.0.0 with no change.	9.0.0	10.0.0
2012-09	RAN#57	R5-123690	0001	-	37571-4: Routine maintenance and updates	10.0.0	10.1.0

History

Document history		
V10.0.0	July 2012	Publication
V10.1.0	October 2012	Publication