



TECHNICAL SPECIFICATION

**Digital cellular telecommunications system (Phase 2+);
Mobile Station (MS) conformance specification;
Part 7: Location Services (LCS)
test scenarios and assistance data
(3GPP TS 51.010-7 version 12.4.0 Release 12)**

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Foreword

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- Part 1: Conformance specification
Reference: 3GPP TS 51.010-1.
- Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification.
Reference: 3GPP TS 51.010-2.
- Part 3: Layer 3 (L3) Abstract Test Suite (ATS).
Reference: 3GPP TS 51.010-3 v6.3.0 (Note 1).
- Part 4: SIM Application Toolkit conformance specification.
Reference: 3GPP TS 51.010-4.
- Part 5: Inter-RAT (GERAN to UTRAN) Abstract Test Suite (ATS)
Reference: 3GPP TS 51.010-5.
- Part 7: Location Services (LCS) test scenarios and assistance data.**
Reference: 3GPP TS 51.010-7.

NOTE 1: GP-25: TTCN is not maintained after v6.3.0, and is henceforward to be considered an example test suite rather than the conformance tests

1 Scope

The present document contains the orbital model information, the assistance data and the assistance data files that shall be used for all LCS Assisted GPS and Assisted GNSS test cases defined in subclause 70 of TS 51.010-1 [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 TR 41.001: "GSM Release specifications".
- [3] 3GPP TR 21 912 (V3.1.0): "Example 2, using fixed text".
- [4] 3GPP TS 51.010-1: "Mobile Station (MS) conformance specification; Part 1: Conformance specification".
- [5] 3GPP TS 44.031: "Location Services (LCS); Mobile Station (MS) - Serving Mobile Location Centre (SMLC); Radio Resource LCS Protocol (RRLP)".
- [6] STANAG 4294: NATO STANAG 4294. Navstar Global Positioning System (GPS) System Characteristics.
- [7] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".
- [8] 3GPP TS 45.005: "Reference needed".
- [9] BDS-SIS-ICD-B1I-2.0: "BeiDou Navigation Satellite System Signal In Space Interface Control Document Open Service Signal (Version 2.0)", December 2013.

3 Abbreviations

3.1 Abbreviations

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

A-BDS	Assisted - BeiDou Navigation Satellite System
A-GNSS	Assisted - Global Navigation Satellite System
A-GPS	Assisted - Global Positioning System
BDS	BeiDou Navigation Satellite System
FFS	For Further Study
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
LCS	Location Services
SS	Satellite Simulator

SV	Space Vehicle
SV ID	Space Vehicle Identification

4 Orbital model information, assistance data and assistance data files

4.1 General

The following subclauses define the GPS and GNSS orbital model information, the assistance data and the assistance data files for the test cases defined in TS 51.010-1 [4] subclauses 70.7 to 70.9 for A-GPS Signalling test cases, subclauses 70.13 to 70.15 for A-GNSS Signalling test cases, subclause 70.11 for A-GPS Minimum Performance test cases and subclause 70.16 for A-GNSS Minimum Performance test cases.

The orbital model information is defined and where appropriate is given in Yuma format in .txt files for each scenario in the appropriate data file defined in Annex A or Annex B.

Where the assistance data is fixed or is not required on a per-satellite basis, then it is defined in the following subclauses. Where assistance data is required on a per-satellite basis, or where the values of the data also vary with time then it is specified in comma-separated-variable files in the appropriate data file defined in Annex A or Annex B. These files specify the values to be used for each satellite, indexed by satellite PRN or SV ID, and, where applicable, the values to be used indexed by both time and satellite PRN or SV ID.

All the Assistance Data information elements are given with reference to TS 44.031 [5], where the details are defined.

5 GPS information

5.1 GPS Scenario and Assistance data for Assisted GPS signalling tests

5.1.1 General

This subclause defines the GPS scenario and the associated assistance data that shall be used for all Assisted GPS signalling tests defined in TS 51.010-1 [4] subclauses 70.7 to 70.9.

The satellite simulator (SS) shall generate the six satellite signals defined in subclause 5.1.2 and shall provide assistance data as defined in subclauses 5.1.3 to 5.1.8.

Where assistance data is required on a per-satellite basis, or where the values of the data also varies with time it is specified in comma-separated-variable files in the GPS_data.zip file defined in Annex A. These files specify the values to be used for each satellite, indexed by satellite PRN, and, where applicable, the values to be used indexed by both time and satellite PRN.

Assistance data that is marked as "time varying" and the GPS TOW field are only specified and used in 0.96 second increments. Interpolation between these values shall not be used.

The accuracy of the GPS TOW and assistance data that is marked as "time varying" in the provided assistance data shall be within +/- 2 s relative to the GPS time in the system simulator.

Assistance data Information Elements and fields that are not specified shall not be used.

5.1.2 GPS Scenario

The following GPS scenario shall be used. The assistance data specified in the following subclauses is consistent with this GPS scenario:

- Yuma Almanac data: see file Sig Tokyo_Yuma.txt in the GPS_data.zip file defined in Annex A

- MS location and Reference location: static at latitude: 35 degrees 40 minutes north, longitude: 139 degrees 45 minutes east, (Tokyo) height: = 50m
 - Start time: 12th September 2003 21:30:00
 - Visible satellites simulated: PRNs: 4, 6, 9, 10, 13, 22.
- Ionospheric model: see values in subclause 5.1.6
- The levels of the simulated satellites shall all be at -125dBm +/- 6dB

5.1.3 Assistance Data Reference Time

Table 5.1.3.1: Reference Time (Fields occurring once per message)

Parameter	Units	Value/remark
GPS Week	weeks	211
GPS TOW	Sec	509400 Start time. Add integer number of 0.96 seconds as required. (Note)
Note: GPS TOW This is the value of GPS TOW in seconds when the GPS scenario is started in the GPS simulator. The value of GPS TOW to be used in the Reference Time IE shall be calculated at the time the IE is required by adding the elapsed time since the time the scenario was started in the GPS simulator to this value, rounded up to the next 0.96 second interval. This "current GPS TOW" is then also used to determine the value of any other parameters marked as "Time varying" in subclause 5.1		

5.1.3a Assistance Data GPS Reference Time Extension

Table 5.1.3a.1: GPS Reference Time Extension (Fields occurring once per message)

Parameter	Units	Value/remark	Release
GPS Week Cycle Number	1024 weeks	1	Rel-10 onwards

5.1.4 Assistance Data Reference Location

Table 5.1.4.1: Reference Location

Parameter	Units	Value/remark
Type of Shape	Bit field	Ellipsoid point with altitude and uncertainty Ellipsoid
Degrees of latitude	degrees	+3.56666666666667 10E1
Degrees of longitude	degrees	+1.39750000000000 10E2
Altitude	m	+50
Uncertainty semi-major	m	3000
Uncertainty semi-minor	m	3000
Orientation of major axis	degrees	0
Uncertainty altitude	m	500
Confidence	%	68

5.1.5 Assistance Data Navigation Model

Table 5.1.5.1: Navigation Model (Fields occurring once per message)

Parameter	Units	Value/remark
Num_Sats_Total		6

Table 5.1.5.2: Navigation Model (Fields occurring once per satellite)

Parameter	Units	Value/remark
SatID		PRNs: 4, 6, 9, 10, 13, 22.
Satellite Status		See file: Sig Navigation_model.csv
C/A or P on L2		See file: Sig Navigation_model.csv
URA Index		See file: Sig Navigation_model.csv
SV Health		See file: Sig Navigation_model.csv
IODC		See file: Sig Navigation_model.csv
L2 P Data Flag		See file: Sig Navigation_model.csv
SF 1 Reserved		See file: Sig Navigation_model.csv
T_{GD}	sec	See file: Sig Navigation_model.csv
t_{oc}	sec	See file: Sig Navigation_model.csv
af_2	sec/sec ²	See file: Sig Navigation_model.csv
af_1	sec/sec	See file: Sig Navigation_model.csv
af_0	sec	See file: Sig Navigation_model.csv
C_{rs}	meters	See file: Sig Navigation_model.csv
Δn	semi-circles/sec	See file: Sig Navigation_model.csv
M_0	semi-circles	See file: Sig Navigation_model.csv
C_{uc}	radians	See file: Sig Navigation_model.csv
e		See file: Sig Navigation_model.csv
C_{us}	radians	See file: Sig Navigation_model.csv
$(A)^{1/2}$	meters ^{1/2}	See file: Sig Navigation_model.csv
t_{oe}	sec	See file: Sig Navigation_model.csv
Fit Interval Flag		See file: Sig Navigation_model.csv
AODO	sec	See file: Sig Navigation_model.csv
C_{ic}	radians	See file: Sig Navigation_model.csv
OMEGA_0	semi-circles	See file: Sig Navigation_model.csv
C_{is}	radians	See file: Sig Navigation_model.csv
i_0	semi-circles	See file: Sig Navigation_model.csv
C_{rc}	meters	See file: Sig Navigation_model.csv
ω	semi-circles	See file: Sig Navigation_model.csv
OMEGA_{dot}	semi-circles/sec	See file: Sig Navigation_model.csv
Idot	semi-circles/sec	See file: Sig Navigation_model.csv

5.1.6 Assistance Data Ionospheric Model

Table 5.1.6.1: Assistance Data Ionospheric Model

Parameter	Units	Value/remark
α_0	seconds	4.6566129 10E-9
α_1	sec/semi-circle	1.4901161 10E-8
α_2	sec/(semi-circle) ²	-5.96046 10E-8
α_3	sec/(semi-circle) ³	-5.96046 10E-8
β_0	seconds	79872
β_1	sec/semi-circle	65536
β_2	sec/(semi-circle) ²	-65536
β_3	sec/(semi-circle) ³	-393216

5.1.7 Assistance Data Almanac

Table 5.1.7.1: Almanac (Fields occurring once per message)

Parameter	Units	Value/remark
Num_Sats_Total		24
WN _a	weeks	212

Table 5.1.7.2: Almanac (Fields occurring once per satellite)

Parameter	Units	Value/remark
SatID		PRNs: 1 to 24
E	dimensionless	See file: Sig Almanac.csv
t _{oa}	sec	See file: Sig Almanac.csv
δi	semi-circles	See file: Sig Almanac.csv
OMEGADOT	semi-circles/sec	See file: Sig Almanac.csv
SV Health		See file: Sig Almanac.csv
A ^{1/2}	meters ^{1/2}	See file: Sig Almanac.csv
OMEGA ₀	semi-circles	See file: Sig Almanac.csv
ω	semi-circles	See file: Sig Almanac.csv
M ₀	semi-circles	See file: Sig Almanac.csv
af ₀	seconds	See file: Sig Almanac.csv
af ₁	sec/sec	See file: Sig Almanac.csv

5.1.7a Assistance Data GPS Almanac Extension

Table 5.1.7a.1: GPS Almanac Extension (Fields occurring once per message)

Parameter	Units	Value/remark	Release
Complete Almanac Provided		1 (TRUE)	Rel-10 onwards

5.1.8 Assistance Data Acquisition Assistance

Table 5.1.8.1: GPS Acquisition Assistance - Parameters appearing once per message

Parameter	Units	Value/remark
Number of Satellites		6
GPS TOW	sec	509400 Start time. Add integer number of 0.96 seconds as required. (Note)
Note: GPS TOW This is the value of GPS TOW in seconds when the GPS scenario is started in the GPS simulator. The value of GPS TOW to be used in the Acquisition Assistance IE shall be calculated at the time the IE is required by adding the elapsed time since the time the scenario was started in the GPS simulator to this value, rounded up to the next 0.96 second interval.		

Table 5.1.8.2: GPS Acquisition Assistance - Parameters appearing [number of satellites] times per message

Parameter	Units	Value/remark
SVID/PRNID		PRNs: 4, 6, 9, 10, 13, 22.
Doppler (0 th order term)	Hz	Time varying. See file: Sig Acquisition_assist.csv (Note)
Doppler (1 st order term)	Hz/sec	Time varying. See file: Sig Acquisition_assist.csv (Note)
Doppler Uncertainty	Hz	Time varying. See file: Sig Acquisition_assist.csv (Note)
Code Phase	chips	Time varying. See file: Sig Acquisition_assist.csv (Note)
Integer Code Phase		Time varying. See file: Sig Acquisition_assist.csv (Note)
GPS Bit number		Time varying. See file: Sig Acquisition_assist.csv (Note)
Code Phase Search Window	chips	Time varying. See file: Sig Acquisition_assist.csv (Note)
Azimuth	deg	Time varying. See file: Sig Acquisition_assist.csv (Note)
Elevation	deg	Time varying. See file: Sig Acquisition_assist.csv (Note)
Note: Acquisition_assistparameters This field is "Time varying" and its value depends on the "current GPS TOW" as described in subclause 5.1.3. The value of this field to be used shall be determined by taking the "current GPS TOW" value and selecting the field value in the Sig Acquisition_assist.csv file corresponding to the value of "current GPS TOW".		

5.1.8a Assistance Data GPS Acquisition Assistance Extension

Table 5.1.8a.1: GPS Acquisition Assistance Extension - Parameters appearing once per message

Parameter	Units	Value/remark	Release
N_SAT		6	Rel-10 onwards

Table 5.1.8a.2: GPS Acquisition Assistance Extension - Parameters appearing [number of satellites] times per message

Parameter	Units	Value/remark	Release
SatID		PRNs: 4, 6, 9, 10, 13, 22.	Rel-10 onwards
Azimuth LSB	degrees	Time varying. Calculated from Azimuth, see file: Sig Acquisition_assist.csv (Note)	Rel-10 onwards
Elevation LSB	degrees	Time varying. Calculated from Elevation, see file: Sig Acquisition_assist.csv (Note)	Rel-10 onwards
Note: This field is "Time varying" and its value depends on the "current GPS TOW" as described in subclause 5.1.3. The value of this field to be used shall be determined by taking the "current GPS TOW" value and selecting the field value in the Sig Acquisition_assist.csv file corresponding to the value of "current GPS TOW".			