COSPAS-SARSAT MEOLUT COMMISSIONING STANDARD

C/S T.020
Issue 2 – Revision 4
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This document is provided as a complement to the final clean version of the document. In case of discrepancy between this marked-up version and the clean final version, the information in the clean final version shall prevail.

NOTE

This document includes requirements ***yet to be determined or to be confirmed*** **for** ~~**non-static (moving)**~~ **beacons** ~~**with values that are to be determined**~~ ***moving at velocities between 5 and 10 m/s (i.e., "slow-moving medium speed") and above 10 m/s ("fast-moving" beacon)*****. The values of these requirements are labelled as to be confirmed (TBC) or appear in square brackets [ ] and their determination is ongoing.*** ~~**It has been recognized that the beacon motion (even small, e.g., caused by bobbing of an EPIRB in sea waves) degrades MEOSAR location performance for C/S T.001-compliant beacons and needs to be addressed. The effort to obtain satisfying results for SAR operations are ongoing as the Programme works towards meeting the expected performance requirements for MEOSAR.**~~

COSPAS-SARSAT MEOLUT COMMISSIONING STANDARD

HISTORY

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1. INTRODUCTION

1.1 Purpose

The Cospas-Sarsat MEOLUT Commissioning Standard shall be used to verify that a MEOSAR Local User Terminal (MEOLUT) complies with document C/S T.019, "Cospas-Sarsat MEOLUT Performance Specification and Design Guidelines". The national Administrations that wish to connect a new MEOLUT to the Cospas-Sarsat network shall conduct the tests and provide the data, which is specified in this document, to the Cospas-Sarsat Secretariat. The MEOLUT to be commissioned shall be fully described according to the technical file located in Annex A, Appendix 1.

1.2 Scope

This standard specifies MEOLUT commissioning for the 406 MHz data channels that are relayed through the MEOSAR satellites and received and processed by the MEOLUT. Section 2 defines the general commissioning process, section 3 describes the evaluation of the operational requirements, section 4 specifies the commissioning of functional and processing requirements, and section 5 specifies the commissioning of performance requirements. The annexes define the test requirements, signal characteristics, test beacon messages, the format of the test data which is to be collected, and the format of the commissioning report which is to be submitted to the Cospas-Sarsat Secretariat.

1.3 Reference Documents

The following documents contain useful information applicable to MEOLUT commissioning:

Reference	Title
C/S A.001	Cospas-Sarsat Data Distribution Plan (DDP)
C/S A.002	Cospas-Sarsat Mission Control Centres Standard Interface Description (SID)
C/S A.003	Cospas-Sarsat System Monitoring and Reporting
C/S A.005	Cospas-Sarsat MCC Performance Specification and Design Guidelines
C/S A.006	Cospas-Sarsat MCC Commissioning Standard
C/S T.001	Specification for Cospas-Sarsat 406 MHz Distress Beacons
C/S T.006	Cospas-Sarsat Orbitography Network Specification
C/S T.011	Description of the 406 MHz Payloads Used in the Cospas-Sarsat GEOSAR System
C/S T.016	Description of the 406 MHz Payload Used in the Cospas-Sarsat MEOSAR System
C/S T.015	Cospas-Sarsat Specification and Type Approval Standard for 406 MHz Ship Security Alert (SSAS) Beacons
C/S T.017	Cospas-Sarsat MEOSAR Space Segment Commissioning Standard
C/S T.018	Specification for Second Generation Cospas-Sarsat 406 MHz Distress Beacons
C/S T.019	Cospas-Sarsat MEOLUT Performance Specification and Design Guidelines

- END OF SECTION 1 -

2. MEOLUT COMMISSIONING

2.1 General

The Cospas-Sarsat MEOLUT commissioning tests defined in this document are intended to be performed in addition to national acceptance tests, and are required prior to fully integrating a MEOLUT into the Cospas-Sarsat Ground Segment. Conducting these tests and assessing the results is the responsibility of the national Administration that desires to commission a MEOLUT.

The tests verify the MEOLUT's ability to receive and process signals transmitted from a distress beacon that is compliant with document C/S T.001, "Specification for Cospas-Sarsat 406 MHz Distress Beacons" or document C/S T.018, "Specification for Second Generation Cospas-Sarsat 406 MHz Distress Beacons", relayed by the MEOSAR satellites described in document C/S T.016, "Description of the 406 MHz Payload Used in the Cospas-Sarsat MEOSAR System", and received and processed in accordance with document C/S T.019. A cross reference of the requirements in document C/S T.019 and the corresponding commissioning requirements specified in this document is provided in the "Summary Table" of the commissioning report (Annex A). The tests shall be conducted with the MEOLUT in its operational configuration and location, and connected to the associated MCC. However, the data should not be distributed to other Cospas-Sarsat Ground Segment Operators.

The MEOLUT may provide optional capabilities as described in document C/S T.019, such as:

1. the MEOLUT may provide 406 MHz beacon data to other MEOLUTs according to the specifications contained in document C/S T.019,
2. the MEOLUT may process 406 MHz beacon data retrieved from other commissioned MEOLUTs according to the MEOLUT data exchange specifications contained in C/S T.019 to enhance system performance and support redundancy of the Cospas-Sarsat Ground Segment,
3. the ability to receive and process beacon signals received through downlinks from non-MEOSAR, Cospas-Sarsat commissioned satellites to obtain beacon data.

The MEOLUT must initially be commissioned with all optional capabilities disabled according to the non-optional tests described in Annex A. The optional capabilities, if to be used, must then be commissioned to verify that the MEOLUT meets all requirements as described by the optional tests contained in Annex A.

2.2 Pre-Test Requirements

Prior to commencing the test, the national Administration conducting the test shall coordinate with appropriate authorities in its SAR region, as well as notifying all affected Cospas-Sarsat MCCs, of the periods of operation and the location(s) of each of the test beacon(s). It is also invited to provide this information to the Cospas-Sarsat Secretariat.
Before the commissioning begins, the national Administration shall identify the Declared Coverage Area (DCA) of the MEOLUT, as described in document C/S T.019. The processing of a beacon located

within the DCA shall meet the requirements in document C/S T.019. The DCA shall be verified using performance analysis, simulation, or both, and shall be equal to or greater than the Minimum Performance Area defined in document C/S T.019. The DCA shall indicate the declared coverage for each beacon identified in document C/S T.019; that is:

- the declared coverage for non-ELT(DT) C/S T.001 beacons, where relevant performance specifications are met,
- the declared coverage for ELT(DT) C/S T.001 beacons, where relevant performance specifications are met,
- the declared coverage for non-ELT(DT) C/S T.018 beacons, where relevant performance specifications are met,
- the declared coverage for ELT(DT) C/S T.018 beacons, where relevant performance specifications are met.

Assumptions with respect to visibility as per Annex D of document C/S T.019 and TOA/FOA data quality and single-channel throughput used in the analysis or simulation should be validated with data from Annex E.

The MEOLUT shall be commissioned with all assets that comprise the MEOLUT. However, if the DCA assumes fewer assets, for example, fewer antenna beams, then commissioning results shall also be reported for a MEOLUT in that configuration. In particular, if fewer antenna beams are used for the DCA, only data that results from an antenna tracking schedule generated using the fewer number of antenna beams shall be used in generating the results. This may result in the need for two sets of results, one for the MEOLUT with all available assets, and one for the MEOLUT with the configuration needed for the DCA.

2.3 Test Data Collection

The commissioning process for the MEOLUT comprises the collection of specific beacon messages and the specified numbers of solutions. The MEOLUT shall utilize beacon data received directly from downlinks from MEOSAR satellites for the data acquisition and statistical data analysis for the commissioning tests.

Data collection requirements for commissioning a MEOLUT's optional capabilities are as follows:

1. The MEOLUT, once commissioned, may provide 406 MHz beacon data to other MEOLUTs according to the specifications contained in document C/S T.019. Data collected directly from downlinks from commissioned MEOSAR satellites that comply with document C/S T.016, "Description of the 406 MHz Payload Used in the Cospas-Sarsat MEOSAR System" and document C/S T.017 "Cospas-Sarsat MEOSAR Space Segment Commissioning Standard" shall be used for the data acquisition and statistical data analysis for the commissioning tests.
2. The MEOLUT may process 406 MHz beacon data retrieved from other commissioned MEOLUTs according to the MEOLUT data exchange specifications contained in document C/S T.019. Data from every commissioned MEOLUT that will provide data to the MEOLUT

being commissioned shall be used for the data acquisition and statistical data analysis for the commissioning tests.

3. The MEOLUT has the ability to receive and process beacon signals received through downlinks from non-MEOSAR, Cospas-Sarsat commissioned satellites to obtain beacon data. Data collected from every non-MEOSAR, Cospas-Sarsat commissioned satellite that will be used shall be included in the data acquisition and statistical data analysis for the commissioning tests.

2.4 Frequency Registration

Administrations should register their MEOLUT's use of the 1544 to 1545 MHz frequency band by "notifying" their MEOLUTs with the International Telecommunication Union (ITU) in accordance with article 11 of the radio regulations. The information required to notify MEOLUTs is identified at Annex H. The ITU only accepts notification requests submitted in electronic format and has developed a software application, available free of charge from their web site, which captures the required information and produces the necessary electronic file.

2.5 Data Collection Limitation

Only the data collected from those satellite channels that comply with documents C/S T.016 and C/S T.017 shall be used for the statistical data analysis. Data from satellites in an Initial Operational Capability (IOC) status should not be used for test data collection.

The data collection limitations for commissioning a MEOLUT's optional capabilities are as follows:

1. The MEOLUT once commissioned may provide 406 MHz beacon data to other MEOLUTs according to the specifications contained in document C/S T.019. Only the data collected from those satellite channels that comply with documents C/S T.016 and C/S T.017 shall be used for the statistical data analysis. Data from satellites in an Initial Operational Capability (IOC) status should not be used for test data collection.
2. The MEOLUT may process 406 MHz beacon data retrieved from other commissioned MEOLUTs according to the MEOLUT data exchange specifications contained in C/S T.019 to enhance system performance and support redundancy of the Cospas-Sarsat Ground System. Only data that has been retrieved from another MEOLUT that has also been commissioned to provide 406 MHz beacon data to other MEOLUTs may be used.
3. The MEOLUT may have the ability to receive and process beacon signals received through downlinks from non-MEOSAR, Cospas-Sarsat commissioned satellites to obtain beacon data. Only the data collected from commissioned satellites shall be used. Data from satellites in an Initial Operational Capability (IOC) status should not be used for test data collection.

2.6 Reference System

All location data for the MEOLUT commissioning shall be given with respect to the Bureau International de l'Heure (BIH) geodetic reference system.

2.7 Submission of Results

The results of the MEOLUT commissioning process shall be documented in the commissioning report, in accordance with the format detailed at Annex A.

The complete commissioning report and the data files detailed at Annex E are to be submitted to the Cospas-Sarsat Secretariat for further evaluation, and distribution to Participants for subsequent review at the Joint Committee. Revisions or updates to commissioning reports should be provided to the Secretariat with a clear indication given on the cover page of the sections that have been revised and a short description of the nature of the revisions.

In order to provide Participants with sufficient time to adequately review the commissioning report, all reports (or updates) must be submitted to the Secretariat a minimum of six weeks prior to the start of the Joint Committee meeting. Submissions received after this date will be considered for review at the following Joint Committee meeting.

2.8 MEOLUT Commissioning and Integration

The test results, as defined in the annexes, shall be submitted to the Cospas-Sarsat Secretariat. The results will be reviewed by the Cospas-Sarsat Secretariat and submitted to the Joint Committee. The MEOLUT will be integrated into the Cospas-Sarsat Ground Segment as described in Annex F and Annex G.

2.9 MEOLUT/MCC Interface

Validation that the MEOLUT/MCC interface satisfies the minimum requirements of document C/S T.019 shall be completed by the national Administration as part of the MEOLUT commissioning.

2.10 Confirmation of Requirements

The national Administration shall confirm compliance to all requirements detailed in this document with either a measurement, a verification, a declaration, analysis or a combination of these methods:

a) A measurement requires the national Administration to conduct a test and include the supporting data as part of the commissioning report.

b) A verification requires a national Administration to test a requirement; however, supporting data does not need to be provided as part of the commissioning report.

c) A declaration of compliance confirms that specific requirements are met although not necessarily tested as part of the commissioning process.

d) Analysis requires the national Administration to provide analysis as part of the commissioning report that confirms that specific requirements are met.

Conformance to all requirements shall be documented in the commissioning report.

The exact method of confirming compliance for each respective requirement is identified in the summary table of the commissioning report (Annex A).

2.11 Change of Configuration

2.11.1 Location of MEOLUT

If the location of a commissioned MEOLUT has been changed, the responsible national Administration shall ensure that the MEOLUT continues to satisfy C/S T.019 requirements prior to resuming operations. Additionally, the national Administration shall:

a) confirm that the level of local interference does not adversely affect the MEOLUT performance;

b) verify the performance of the communication links;

c) verify the performance of the antenna and RF subsystems; and

d) update the technical file of the MEOLUT commissioning report (Appendix 1 to Annex A refers) by providing a declaration that the MEOLUT satisfies C/S T.019 requirements and the following information, to the Cospas-Sarsat Secretariat:

- Antenna Characteristics (Annex A, Appendix 1, section A.2.1),
- General LUT Indoor Equipment Description (Annex A, Appendix 1, section A.2.2) - identify any changes to the equipment configuration, or indicate “no change” if the configuration has not been changed,
- General Capabilities (Annex A, Appendix 1, section A.2.3), - identify any changes to the general capabilities of the MEOLUT, or indicate “no change” if appropriate,
- Communications Capability (Annex A, Appendix 1, section A.4),
- Declared Coverage Area (Annex A, Appendix 1, section A.5),
- Location (Annex A, Appendix 1, section A.6).

2.11.2 Modification to MEOLUT Configuration (eg, Addition of Satellite Channels, Addition of Data Sources or Significant Change in the Processing)

If the configuration of a commissioned MEOLUTs has been changed, the responsible national Administration shall ensure that the MEOLUT continues to satisfy C/S T.019 requirements prior to resuming operations. After the configuration change, Administrations shall confirm the MEOLUT

satisfies C/S T.019 before distributing data from the MEOLUT operationally. Additionally, the national Administration shall:

a. verify the performance of the antenna and RF subsystems if adding a new antenna or a new channel;
b. provide updated Tables A.1, A.2 and A.3, and conduct tests defined in Annex A, at least for performance testing related to section 5 of document C/S T.019;
c. update the technical file of the MEOLUT commissioning report (Appendix 1 to Annex A refers) by providing a declaration that the MEOLUT satisfies C/S T.019 requirements and the following information, to the Cospas-Sarsat Secretariat:
    i. Antenna Characteristics (Annex A, Appendix 1, section A.2.1) if adding a new antenna, or indicate "no change" if the configuration has not been changed,
    ii. General LUT Indoor Equipment Description (Annex A, Appendix 1, section A.2.2) - identify any changes to the equipment configuration, or indicate "no change" if the configuration has not been changed,
    iii. General Capabilities (Annex A, Appendix 1, section A.2.3), - identify any changes to the general capabilities of the MEOLUT, or indicate "no change" if appropriate,
    iv. Communications Capability (Annex A, Appendix 1, section A.4),
    v. Declared Coverage Area (Annex A, Appendix 1, section A.5).

Some conditions that may be considered a change in configuration that would warrant conducting these tests might include:

a. adding a new antenna or channel to a commissioned MEOLUT;
b. removing an antenna or channel from a commissioned MEOLUT;
c. adding data collection from other commissioned MEOLUTs that exchange data according to the MEOLUT data exchange specifications contained in document C/S T.019;
d. significant modifications to the MEOLUT processing algorithm(s), other software, or hardware; and
e. implementing major new functionality (e.g., processing of a new beacon standard).

The responsible administration shall submit results of its verification of MEOLUT performance in a supplementary commissioning report to the Joint Committee meetting for subsequent review.

- END OF SECTION 2 -

3. EVALUATION OF OPERATIONAL REQUIREMENTS

3.1 MEOLUT Data Availability

The MEOLUT data availability shall be measured during the commissioning period in accordance with guidance provided at Annex B. If any basic function or requirement is not performed by the MEOLUT, the MEOLUT data shall be considered unavailable.

A reliability assessment is performed by measurement during the commissioning period and by an analysis that predicts the availability for a one-year period to verify that the MEOLUT will meet the availability requirement in accordance with guidance provided at Annex B.

3.2 Data Requirements

The national Administration shall ensure that the MEOLUT provides the data necessary for the associated MCC to distribute alert data according to document C/S A.002 (SID). This shall be verified and noted in the appropriate section of the MEOLUT commissioning report.

3.3 Satellite Tracking and Visibility Capability

The national Administration shall ensure that the MEOLUT shall be capable of meeting the requirements of section 3.4 in document C/S T.019. This shall be declared in the appropriate section of the MEOLUT commissioning report.

3.4 Status and Alarm

The national Administration shall describe the status and alarm functions of the MEOLUT and declare compliance in the appropriate section of the MEOLUT commissioning report.

3.5 RF Radiation and Emissions

The national Administration shall ensure that the MEOLUT does not radiate or emit any radio frequency signals that will interfere with the functioning of the Cospas-Sarsat System. This shall be declared in the appropriate section of the MEOLUT commissioning report.

3.6 Data Archiving

The national Administration shall describe the data archiving capability of the MEOLUT and declare compliance to the relevant section of document C/S T.019 in the appropriate section of the MEOLUT commissioning report.

- END OF SECTION 3 -

4. EVALUATION OF FUNCTIONAL AND PROCESSING REQUIREMENTS

4.1 Functional Requirements

4.1.1 Antenna and RF Subsystems

The national Administration shall verify that the antenna and RF subsystems of the MEOLUT can acquire, track and receive the downlink signals from any Cospas-Sarsat MEOSAR satellites as described in document C/S T.016. This verification shall be documented in the MEOLUT commissioning report.

4.1.2 Time and Frequency Reference Subsystem

The national Administration shall declare in the MEOLUT commissioning report, the MEOLUT's capability to maintain time and frequency subsystems according to document C/S T.019.

4.1.3 Satellite Tracking Subsystem

The national Administration shall declare, in the MEOLUT commissioning report, the MEOLUT's capability to maintain accurate satellite orbital elements and tracking schedules as described in document C/S T.019.

4.1.4 MCC Interface

The national Administration shall verify that the MEOLUT provides timely alert data of the level of quality and detail specified in documents C/S T.019, C/S A.002 and C/S A.005, "Cospas-Sarsat Mission Control Centre Performance Specification and Design Guidelines". This verification shall be documented in the MEOLUT commissioning report.

The national Administration shall declare in the MEOLUT commissioning report the methodology used by the MEOLUT to determine when an independent-location solution has a better location quality than solutions previously sent to the MCC, so that the better-quality solution would then be sent to the associated MCC.

4.2 Beacon Message Processing

The national Administration shall conduct tests, and record the results in the appropriate section of the commissioning report, which confirm the MEOLUTs compliance to the "channels processing specifications" detailed in document C/S T.019.

These tests require the MEOLUT to process the data described at Annex D.1 in the manner prescribed. The processing consists of bit verification, message validation, message processing and transmission. The specific beacon test messages contained at Annex D.1 can be transmitted by a test beacon or a beacon simulator.

National Administrations should ensure that test beacons or simulators are capable of transmitting the beacon messages at the frequencies described at Annex D.1. Alternatively, national Administrations may arrange for the simulators in the United States or France to uplink the messages contained at Annex D.1. If the test messages cannot be transmitted during the commissioning period, the national Administration may develop alternative methods of confirming compliance with the beacon message processing requirements and proceed with the commissioning test, and preparation and submission of the commissioning report. For beacon message processing, the unavailability of the test beacon or simulators to uplink the test messages contained at Annex D.1 shall not prevent the MEOLUT from being commissioned, if other adequate methods are used. If alternative methods are used, these methods shall be completely documented in the commissioning report.

- END OF SECTION 4 -

5. EVALUATION OF PERFORMANCE REQUIREMENTS

The national Administration shall conduct the tests defined at Annex C to confirm conformance with the MEOLUT performance requirements detailed at document C/S T.019. The results of these tests shall be included in the MEOLUT commissioning report. Additional guidance pertaining to the tests detailed at Annex C is provided in the remainder of this section.

5.1 Data Collection Test

Tests shall be conducted to confirm that the MEOLUT processing satisfies the performance requirements detailed in document C/S T.019.

All data collected from test beacons during the entire time period of the commissioning test shall be used to generate statistics that validate the performance requirements are met.

All data and results shall be provided electronically to the Secretariat as part of the commissioning report. The required data elements and the format of the files to be included in the commissioning report are detailed in Annex E.

5.1.1 Test Beacons

Beacon tests shall be conducted with type-approved Cospas-Sarsat 406 MHz beacons coded with the test protocol and/or beacon simulators (i.e., not an orbitography beacon), as described in document C/S T.022. The beacons that are used for these tests shall not be used for updating the satellite orbital elements. However, any reference beacon that is not used by the MEOLUT for the determination of satellite orbits may be used as a test beacon during the commissioning of the MEOLUT. The characteristics of all beacons used during commissioning shall be described in the commissioning report.

Each test beacon must be placed as described below at a 3D position that is known to within 5 metres, and shall remain fixed at this position throughout the test (except for tests involving moving beacons). For tests involving moving beacons, a reference trajectory (set of time/latitude/longitude/altitude points) shall be provided with an accuracy of 100 metres. The test beacon locations shall be given with respect to the reference system given in section 2.6.

1) Use test beacon(s) located at the MEOLUT to perform all commissioning tests to verify the MEOLUT meets all performance requirements.
2) Use 1 or more test beacon(s) located as near the edge of the Declared Coverage Area as practical or at least 1,000 km from the MEOLUT, to demonstrate the MEOLUT Declared Coverage Area.

These tests require the MEOLUT to process the data described at Annex D.~~2~~ *3* in the manner prescribed. The processing consists of beacon detection probability, probability of DOA location, DOA location accuracy, TOA/FOA measurement accuracy (if applicable), and expected horizontal error /

quality factor. The specific beacon test messages contained at Annex D.~~2~~ 3 can be transmitted by a test beacon or a beacon simulator.

Beacons, and their set-up, used for the moving test configurations shall be documented in the commissioning report. Their location and velocity as a function of time shall be reported in the commissioning report. The beacon velocity profile should include velocities in a nearly static configuration and in a slow-moving configuration, as well as the transition between these regimes.

National Administrations should ensure that test beacons or simulators are capable of transmitting the beacon messages at the frequencies described at Annex D.~~2~~3. Alternatively, national Administrations may arrange for the simulators in the USA or France to uplink the messages contained at Annex D.~~2~~3. If the test messages cannot be transmitted during the commissioning period, the national Administration may develop alternative methods of confirming compliance with the beacon message processing requirements and proceed with the commissioning test, and preparation and submission of the commissioning report. The unavailability of the test beacon or simulators to uplink the test messages contained at Annex D.~~2~~ 3 shall not prevent the MEOLUT from being commissioned, if other adequate methods are used. If alternative methods are used, these methods shall be completely documented in the commissioning report.

If test beacons transmit in the operational 406 MHz frequency band or if beacon bursts are transmitted using the normal frame synchronization pattern, the total number of beacons simutaneously active shall not exceed 5.

5.1.2 Satellite Tracking Schedule

Beacon tests shall consist of receiving and processing data on all scheduled passes from the commissioned satellites that are visible during the test period. All available data channels shall be used for the collection of data from available satellites during this data collection test.

5.2 Detection and Location Statistics

Statistics will be reported for beacons identified in section 5.1.1, item 1, and separately for those identified in item 3.

Statistics will be also reported for all orbitography/reference beacons defined in document C/S A.001.

The statistics are defined in Annex A and shall be derived as listed in Annex C.

5.3 Detection and Location Data

The detection and location data from all tracked satellite passes shall be provided for each test beacon used during the test period.

A minimum of 1,000 for C/S T.001- and 10,000 for C/S T.018-beacon burst transmissions shall be used to establish the detection data statistics. A minimum of 1,000 location data solutions shall be used to establish the location data statistics for both C/S T.001 and C/S T.018 beacons.

A minimum of 100,000 detections shall be used to establish the processing anomaly statistics.

- END OF SECTION 5 –

ANNEX A

MEOLUT COMMISSIONING REPORT

Country or national Administration: _____

Cospas-Sarsat Identifier: _____

Location of MEOLUT: _____

Start of Commissioning Period: _____

End of Commissioning Period: _____

Section A.1 contains a summary of the commissioning results as well as the analysis (A), declarations (D) and verifications (V), by the national Administration, for requirements not specifically measured (M). The organization of the summary table follows the requirements contained in document C/S T.019.

Section A.2. contains the measurements (M) to support the results presented in section A.1, a copy of the associated data is provided in electronic format as required by this document. A technical description of the MEOLUT is presented in Appendix 1.

Section A.3 contains a summary table providing the implementation status of the MEOLUT critical changes decided by the Council.

A.1 Summary Table

Tables A.1, A.2 and A.3 shall be provided in full in the commissioning report (for initial or subsequent commissioning), with rows not applicable showing as greyed out.

Table A.1: MEOLUT Commissioning Summary Data Table (General Part)

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
3.1	MEOLUT Data Availability	A≥95	2.1.1		M, A	
3.2	Data Requirements	n/a	n/a		D, V	Verify capability to use standard formats in Table 3.1 of C/S T.019. If non-standard formats will be used, declare and verify this capability.
3.3.1	Satellite Data Channels	Minimum MEOSAR	n/a		V	
3.3.2	MEOLUT Data Exchange	n/a	n/a		D	Only applicable to MEOLUTs which exchange data with other MEOLUTs
3.4	Satellite Tracking and Visibility	n/a	n/a		V	
3.5	Status and Alarm	n/a	n/a		D	Include description in technical file
3.6	RF Radiation and Emissions	n/a	n/a		D	
3.7	Data Archiving	n/a	n/a		D	
3.8	QMS	n/a			D	
4.1.1	Antenna and RF Subsystem	n/a	n/a		V	
4.1.2	Time and Frequency Reference Subsystem	n/a	n/a		V	
4.1.3	Satellite Tracking Subsystem	All MEOSAR satellites	n/a		D	
4.1.4	MCC Interface	n/a	n/a		V	
4.2.8	MEOLUT Data Exchange	See C/S T.019 Annex C	n/a		D	Only applicable to MEOLUTs which exchange data with other MEOLUTs
4.2.9	Time and Frequency Requirements	n/a	n/a		D	
4.2.10	Independent Location Processing	n/a	n/a		V	Check generation of location and validity
4.2.11	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E. See additional tests for-ELT(DT) beacons in Tables A.2 and A.3
5	Declared Coverage Area (for each beacon identified in document C/S T.019)	n/a	Appendix 1, A.5		A and/or V	See section Appendix 1, section A.5

Table A.2: MEOLUT Commissioning Summary Data Table (C/S T.001 Beacon Part)

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
4.2.2	Beacon Message Recovery	Exact match on 9 Bit Frame Synch	n/a		D	Achieve identical match on 9 bit frame synchronization
See para 2.2.4.B to C/S T.001	Bit Rate Tolerance Check Test - BR1	M/N>0.75	2.2.1		M	
4.2.3.1	Bit Verification Test - BV1	See Annex D.1	2.2.2		M	
	Bit Verification Test - BV2	See Annex D.1	2.2.2		M	
	Bit Verification Test – BV3	See Annex D.1	2.2.2		M	
4.2.4.1	Beacon Message Validation Test - MV1	See Annex D.1	2.2.3		M	
	Beacon Message Validation Test - MV2	See Annex D.1	2.2.3		M	
	Beacon Message Validation Test – MV5	See Annex D.1	2.2.3		M	
	Beacon Message Validation Test – MV6	See Annex D.1	2.2.3		M	
4.2.5.1	Invalid Message Processing Test – IMP1	See Annex D.1	2.2.4		M	
4.2.6.1	Beacon Message Processing Test - LP1	See Annex D.1	2.2.5		M	
	Beacon Message Processing Test - LP2	See Annex D.1	2.2.5		M	
	Beacon Message Processing Test - LP3	See Annex D.1	2.2.5		M	
	Beacon Message Processing Test - LP4	See Annex D.1	2.2.5		M	
4.2.6.1 and 4.2.11	Return Link Test – RL1	See Annex D.1	2.2.6		M	
4.2.7	Multiple valid message processing	n/a	2.2.7		D	
4.2.11	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E
			2.2.8		M	For C/S T.001 ELT(DT) beacons using script in section D.3.2.2
5.1	RF Signal Margin	n/a	n/a		D	
5.2.1	Signal Sensitivity	Signal sensitivity better than 34.8 dB-Hz			D	
5.3.1	Beacon Message Detection Probability *(nearly-static beacon)*	T≥0.99	2.3.1.1		M	After 10 minutes - *Configuration 1*
					M	*After 10 minutes - Configuration 2*
	Beacon Message Detection Probability ((low speed) slow-moving beacon)	*T≥0.99*	*2.3.1.1*		*M*	*After 10 minutes - Configuration 3.1*
			2.3.1.1		*M*	*After 10 minutes - Configuration 3.2*
	Beacon Message Detection Probability(#) ((medium speed) slow-moving beacon)	*T≥0.99*	*2.3.1.1*		*M*	*After 10 minutes - Configuration 4*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Beacon Message Detection Probability(*) (fast-moving beacon)	*T≥0.99*	*2.3.1.1*		*M*	*After 10 minutes - Configuration 5*
	Beacon Message Detection Probability (ELT(DT))	T>0.99	2.3.1.2		M	Within any 1 minute period
	Probability of FDOA/TDOA Location *(nearly-static beacon)*	PDL≥0.90	2.3.1.3		M	Single burst – *Configuration 1*
					M	*Single burst – Configuration 2*
		PDL≥0.98	2.3.1.3		M	After 10 minutes - *Configuration 1*
					M	*After 10 minutes - Configuration 2*
	Probability of FDOA/TDOA Location EOC	PDL≥0.75	2.3.1.3		M	Single burst
		PDL≥0.98	2.3.1.3		M	After 20 minutes
5.4.1.1, 5.4.2.1	*Probability of FDOA/TDOA Location ((low speed) slow-moving beacon)*	*PDL≥0.90*	*2.3.1.3*		*M*	*Single burst – Configuration 3.1*
			2.3.1.3		*M*	*Single burst – Configuration 3.2*
		PDL≥0.98	*2.3.1.3*		*M*	*After 10 minutes - Configuration 3.1*
			2.3.1.3		*M*	*After 10 minutes - Configuration 3.2*
	Probability of FDOA/TDOA Location(#) ((medium speed) slow-moving beacon)	*PDL≥0.90*	*2.3.1.3*		*M*	*After 10 minutes - Configuration 4*
		PDL≥0.98	*2.3.1.3*		*M*	*After 10 minutes - Configuration 4*
	Probability of FDOA/TDOA Location(*) (fast-moving beacon)	*PDL≥0.90*	*2.3.1.3*		*M*	*Single burst – Configuration 5*
		PDL≥0.98	*2.3.1.3*		*M*	*After 10 minutes - Configuration 5*
5.5.1	Capacity	100 beacons	n/a		D	
5.6.1	Location Accuracy (nearly-static beacon)	M/N≥0.90 (5 km)	2.3.1.4		M	Single burst – Configuration 1
					M	Single burst – Configuration 2
	Location Accuracy EOC	M/N≥0.70 (5 km)	2.3.1.4		M	Single burst – Configuration 1
		M/N≥0.90 (10 km)	2.3.1.4		M	Single burst– Configuration 1
	Location Accuracy (nearly-static beacon)	M/N≥0.95 (5 km)	2.3.1.4		M	Within 10 minutes – Configuration 1
					M	Within 10 minutes – Configuration 2
		M/N≥0.98 (10 km)	2.3.1.4		M	Within 10 minutes – Configuration 1
					M	Within 10 minutes – Configuration 2
	Location Accuracy EOC	M/N≥0.95 (5 km)	2.3.1.4		M	Within 20 minutes – Configuration 1
		M/N≥0.98 (10 km)	2.3.1.4		M	Within 20 minutes – Configuration 1
5.6.3	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.70 (10 km)	2.3.1.4		M	Single burst – Configuration 3.*1*
			2.3.1.4		*M*	*Single burst – Configuration 3.2*
		M/N≥0.95 (20 km)	2.3.1.4		M	Single burst– Configuration 3.*1*
			2.3.1.4		*M*	*Single burst– Configuration 3.2*
	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.75 (5 km)	2.3.1.4		M	Within 10 minutes – Configuration 3.*1*
			2.3.1.4		*M*	*Within 10 minutes – Configuration 3.2*
		M/N≥0.95 (7 km)	2.3.1.4		M	Within 10 minutes – Configuration 3.*1*
			2.3.1.4		*M*	*Within 10 minutes – Configuration 3.2*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.70 (10 km)*	*2.3.1.4*		*M*	*Single burst – Configuration 4*
		M/N≥0.95 (20 km)	*2.3.1.4*		*M*	*Single burst – Configuration 4*
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.75 (5 km)*	*2.3.1.4*		*M*	*Within 10 minutes – Configuration 4*
		M/N≥0.95 (7 km)	*2.3.1.4*		*M*	*Within 10 minutes – Configuration 4*
5.6.5[1]	Location Accuracy(*) (fast-moving beacon)	M/N>0.90 (TBD km)	2.3.1.4		M	Single burst – Configuration ~~4~~*5*
		M/N≥0.95 (TBD km)	2.3.1.4		M	Within 10 minutes– Configuration ~~4~~*5*
		M/N≥0.98 (TBD km)	2.3.1.4		M	Within 10 minutes – Configuration ~~4~~*5*
5.7.1	Processing Bandwidth	406.006 to 406.094 MHz	n/a		D	
5.7.2	Acquisition Frequency Range	Beacon with a deviation from the center frequency of ± 5.45 kHz	n/a		D	
5.8.1.1	TOA/FOA Measurement Accuracy	TOA_{σ}<25 µsec TOA_{bias} < 2.5 µsec FOA_{σ}< 0.2 Hz FOA_{bias} < 0.02 Hz	2.3.2.6		M	Only applicable to MEOLUTs which will provide data to other MEOLUTs 34.8 dBHz < C/N_0 < 37.8 dBHz
5.8.2	External Data Processing	C/S T.019 sections 4.2.10 and 5			D	Only applicable to MEOLUTs which process data from other MEOLUTs
	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E.
			2.2.8		M	For C/S T.001 ELT(DT) beacons using script in section D.3.2.2
	RF Signal Margin	n/a	n/a		D	
	Signal Sensitivity	Signal sensitivity better than 34.8 dB-Hz			D	
	Beacon Message Detection Probability *(nearly-static beacon)*	T≥0.99	2.3.2.1		M	After 10 minutes - *Configuration 1*
			2.3.2.1		*M*	*After 10 minutes - Configuration 2*
	Beacon Message Detection Probability ((low speed) slow-moving beacon)	*T≥0.99*	*2.3.2.1*		*M*	*After 10 minutes- Configuration 3.1*
			2.3.2.1		*M*	*After 10 minutes- Configuration 3.2*
	Beacon Message Detection Probability(#) ((medium speed)slow-moving beacon)	*T≥0.99*	*2.3.2.1*		*M*	*After 10 minutes- Configuration 4*

[1] A MEOLUT is not required to provide an independent location for ELT(DT)s unless the MEOLUT is commissioned to provide independant location for fast-moving beacons.

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Beacon Message Detection Probability(*) (fast-moving beacon)	*T≥0.99*	*2.3.2.1*		*M*	*After 10 minutes- Configuration 5*
	Beacon Message Detection Probability (ELT(DT))	T>0.99	2.3.2.2		M	Within any 1 minute period
	Probability of FDOA/TDOA Location *(nearly-static beacon)*	PDL≥0.90	2.3.2.3		M	Single burst – *Configuration 1*
					M	*Single burst – Configuration 2*
		PDL≥0.98	2.3.2.3		M	After 10 minutes - *Configuration 1*
					M	*After 10 minutes - Configuration 2*
	Probability of FDOA/TDOA Location EOC	PDL≥0.75	2.3.2.3		M	Single burst
		PDL≥0.98	2.3.2.3		M	After 20 minutes
	Probability of FDOA/TDOA Location ((low speed) slow-moving beacon)	*PDL≥0.90*	*2.3.2.3*		*M*	*Single burst – Configuration 3.1*
			2.3.2.3		*M*	*Single burst – Configuration 3.2*
		PDL≥0.98	*2.3.2.3*		*M*	*After 10 minutes - Configuration 3.1*
			2.3.2.3		*M*	*After 10 minutes - Configuration 3.2*
	Probability of FDOA/TDOA Location(#) ((medium speed) slow-moving beacon)	*PDL≥0.90*	*2.3.2.3*		*M*	*Single burst – Configuration 4*
		PDL≥0.98	*2.3.2.3*		*M*	*After 10 minutes - Configuration 4*
	Probability of FDOA/TDOA Location(*) (fast-moving beacon)	*PDL≥0.90*	*2.3.2.3*		*M*	*Single burst – Configuration 5*
		PDL≥0.98	*2.3.2.3*		*M*	*After 10 minutes - Configuration 5*
	Capacity	100 beacons	n/a		D	
	Location Accuracy (nearly-static beacon)	M/N≥0.90 (5 km)	2.3.2.4		M	Single Burst – Configuration 1
					M	Single burst – Configuration 2
	Location Accuracy EOC	M/N≥0.70 (5 km)	2.3.2.4		M	Single Burst – Configuration 1
		M/N≥0.90 (10 km)	2.3.2.4		M	Single Burst – Configuration 1
	Location Accuracy (nearly-static beacon)	M/N≥0.95 (5 km)	2.3.2.4		M	Within 10 minutes – Configuration 1
						Within 10 minutes – Configuration 2
		M/N≥0.98 (10 km)	2.3.2.4		M	Within 10 minutes – Configuration 1
						Within 10 minutes – Configuration 2
	Location Accuracy EOC	M/N≥0.95 (5 km)	2.3.2.4		M	Within 20 minutes – Configuration 1
		M/N≥0.98 (10 km)	2.3.2.4		M	Within 20 minute – Configuration 1s
	Location Accuracy ((*low speed)* slow-moving beacon)	M/N≥0.70 (10 km)	2.3.2.4		M	Single burst – Configuration 3.*1*
			2.3.2.4		*M*	*Single burst – Configuration 3.2*
		M/N≥0.95 (20 km)	2.3.2.4		M	Single burst – Configuration 3.*1*
			2.3.2.4		*M*	*Single burst – Configuration 3.2*
	Location Accuracy ((*low speed)* slow-moving beacon)	M/N≥0.75 (5 km)	2.3.2.4		M	Within 10 minutes – Configuration 3.*1*
			2.3.2.4		*M*	*Within 10 minutes – Configuration 3.2*
		M/N≥0.95 (7 km)	2.3.2.4		M	Within 10 minutes – Configuration 3.*1*
			2.3.2.4		*M*	*Within 10 minutes – Configuration 3.2*
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.70 (10 km)*	*2.3.2.4*		*M*	*Single burst – Configuration 4*
		M/N≥0.95 (20 km)	*2.3.2.4*		*M*	*Single burst – Configuration 4*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.75 (5 km)*	*2.3.2.4*		*M*	*Within 10 minutes – Configuration 4*
		M/N≥0.95 (7 km)	*2.3.2.4*		*M*	*Within 10 minutes – Configuration 4*
	Location Accuracy(*) (fast-moving beacon)	M/N>0.90 (TBD km)	2.3.2.4		M	Single burst – Configuration 5~~4~~
	Location Accuracy(*) (fast-moving beacon)	M/N≥0.95 (TBD km)	2.3.2.4		M	Within 10 minutes – Configuration 5~~4~~
		M/N≥0.98 (TBD km)	2.3.2.4		M	Within 10 minutes – Configuration 5~~4~~
	Processing Bandwidth	406.006 to 406.094 MHz	n/a		D	
	Acquisition Frequency Range	Beacon with a deviation from the center frequency of ± 5.45 kHz	n/a		D	
	Expected Horizontal Error / Quality Factor	~~Prediction accurate 95 ± 2 %~~*Prediction Accuracy* $NC_{1/10}/NL < 0.15$ $0.93 \leq NC_1/NL \leq 0.97$ $NC_2/NL < 0.01$	2.3.2.5		M	Results reported but will not be judged as pass or fail criteria during EOC.
	Processing Anomalies	$< 1x10^{-4}$	2.3.2.7		M	Results reported but will not be judged as pass or fail criteria during EOC. Processing anomalies that consist of a single burst from a single satellite shall be identified separately
5.9	Combined Processing	C/S T.019 sections 4.2.10 and 5			D	Only applicable to MEOLUTs which use non-MEOSAR C/S satellites
	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E
			2.2.8		M	For C/S T.001 ELT(DT) beacons using script in section D.3.2.2
	RF Signal Margin	n/a	n/a		D	
	Signal Sensitivity	Signal sensitivity better than 34.8 dB-Hz			D	
	Beacon Message Detection Probability *(nearly-static beacon)*	T≥0.99	2.3.3.1		M	After 10 minutes - *Configuration 1*
					M	*After 10 minutes - Configuration 2*
	Beacon Message Detection Probability ((low speed) slow-moving beacon)	*T≥0.99*	*2.3.1.1*		*M*	*After 10 minutes- Configuration 3.1*
			2.3.1.1		*M*	*After 10 minutes - Configuration 3.2*
	Beacon Message Detection Probability(#) ((medium speed) slow-moving beacon)	*T≥0.99*	*2.3.1.1*		*M*	*After 10 minutes - Configuration 4*
	Beacon Message Detection Probability(*) (fast-moving beacon)	*T≥0.99*	*2.3.1.1*		*M*	*After 10 minute - Configuration 5*
	Beacon Message Detection Probability (ELT(DT))	T>0.99	2.3.3.2		M	Within any 1 minute period

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Probability of FDOA/TDOA Location	PDL≥0.90	2.3.3.3		M	Single burst – *Configuration 1*
					M	*Single burst – Configuration 2*
		PDL≥0.98	2.3.3.3		M	After 10 minutes – *Configuration 1*
					M	*After 10 minutes - Configuration 2*
	Probability of FDOA/TDOA Location EOC	PDL≥0.75	2.3.3.3		M	Single burst
		PDL≥0.98	2.3.3.3		M	After 20 minutes
	Probability of FDOA/TDOA Location ((low speed) slow-moving beacon)	*PDL≥0.90*	*2.3.1.3*		*M*	*Single burst – Configuration 3.1*
			2.3.1.3		*M*	*Single burst – Configuration 3.2*
		PDL≥0.98	*2.3.1.3*		*M*	*After 10 minutes - Configuration 3.1*
			2.3.1.3		*M*	*After 10 minutes - Configuration 3.2*
	Probability of FDOA/TDOA Location(#) ((medium speed) slow-moving beacon)	*PDL≥0.90*	*2.3.1.3*		*M*	*Single burst – Configuration 4*
		PDL≥0.98	*2.3.1.3*		*M*	*After 10 minutes - Configuration 4*
	Probability of FDOA/TDOA Location(*) (fast-moving beacon)	*PDL≥0.90*	*2.3.1.3*		*M*	*Single burst – Configuration 5*
		PDL≥0.98	*2.3.1.3*		*M*	*After 10 minutes -Configuration 5*
	Capacity	100 beacons	n/a		D	
	Location Accuracy (nearly-static beacon)	M/N≥0.90 (5 km)	2.3.3.4		M	Single burst – Configuration 1
					M	Single burst – Configuration 2
	Location Accuracy EOC	M/N≥0.70 (5 km)	2.3.3.4		M	Single burst – Configuration 1
		M/N≥0.90 (10 km)	2.3.3.4		M	Single burst – Configuration 1
	Location Accuracy (nearly-static beacon)	M/N≥0.95 (5 km)	2.3.3.4		M	Within 10 minutes – Configuration 1
					M	Within 10 minutes – Configuration 2
		M/N≥0.98 (10 km)	2.3.3.4		M	Within 10 minutes – Configuration 1
					M	Within 10 minutes – Configuration 2
	Location Accuracy EOC	M/N≥0.95 (5 km)	2.3.3.4		M	Within 20 minutes – Configuration 1
		M/N≥0.98 (10 km)	2.3.3.4		M	Within 20 minutes – Configuration 1
	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.70 (10 km)	2.3.3.4		M	Single burst – Configuration 3*.1*
			2.3.3.4		*M*	*Single burst – Configuration 3.2*
		M/N≥0.95 (20 km)	2.3.3.4		M	Single burst – Configuration 3*.1*
			2.3.3.4		*M*	*Single burst – Configuration 3.2*
	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.75 (5 km)	2.3.3.4		M	Within 10 minutes – Configuration 3*.1*
			2.3.3.4		*M*	*Within 10 minutes – Configuration 3.2*
		M/N≥0.95 (7 km)	2.3.3.4		M	Within 10 minutes – Configuration 3*.1*
			2.3.3.4		*M*	*Within 10 minutes – Configuration 3.2*
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.70 (10 km)*	*2.3.1.4*		*M*	*Single burst – Configuration 4*
		M/N≥0.95 (20 km)	*2.3.1.4*		*M*	*Single burst – Configuration 4*
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.75 (5 km)*	*2.3.3.4*		*M*	*Within 10 minutes – Configuration 4*
		M/N≥0.95 (7 km)	*2.3.3.4*		*M*	*Within 10 minutes – Configuration 4*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Location Accuracy(*) (fast-moving beacon)	M/N>0.90 (TBD km)	2.3.3.4		M	Single burst – Configuration 54
	Location Accuracy(*) (fast-moving beacon)	M/N≥0.95 (TBD km)	2.3.3.4		M	Within 10 minutes – Configuration 54
		M/N≥0.98 (TBD km)	2.3.3.4		M	Within 10 minutes – Configuration 54
	Processing Bandwidth	406.006 to 406.094 MHz	n/a		D	
	Acquisition Frequency Range	Beacon with a deviation from the center frequency of ± 5.45 kHz	n/a		D	
	Expected Horizontal Error / Quality Factor	~~Prediction accurate 95%~~*Prediction Accuracy* $NC_{1/10}/NL < 0.15$ $0.93 \leq NC_1/NL \leq 0.97$ $NC_2/NL < 0.01$	2.3.3.5		M	Results reported but will not be judged as pass or fail criteria during EOC
	Processing Anomalies	$< 1x10^{-4}$	2.3.3.6		M	Results reported but will not be judged as pass or fail criteria during EOC. Processing anomalies that consist of a single burst from a single satellite shall be identified separately.
5.10	Expected Horizontal Error / Quality Factor	~~Prediction accurate 95 ± 2 %~~*Prediction Accuracy* $NC_{1/10}/NL < 0.15$ $0.93 \leq NC_1/NL \leq 0.97$ $NC_2/NL < 0.01$	2.3.1.5		M	Results reported but will not be judged as pass or fail criteria during EOC.
5.11	Processing Anomalies	$< 1x10^{-4}$	2.3.1.6		M	Results reported but will not be judged as pass or fail criteria during EOC. Processing anomalies that consist of a single burst from a single satellite shall be identified separately.

Notes:
(#) Testing of Configuration 4 is not required for MEOLUT commissioning until the location accuracy performance and the test velocity (in brackets in Annex C) is ~~finalized~~ confirmed for Configuration 4, but could be provided if available.
(*) Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

Table A.3: MEOLUT Commissioning Summary Data Table (C/S T.018 Beacon Part)

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
4.2.2	Beacon Message Recovery - MR1	See Annex D.1	3.2.1		M	
	Beacon Message Recovery - MR2	See Annex D.1	3.2.1		M	
4.2.3.2	Bit Verification - BV1	See Annex D.1	3.2.2		M	
4.2.5.2	Invalid Message Processing – IMP1	See Annex D.1	3.2.3		M	

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
4.2.6.2	Message Association - MA1	See Annex D.1	3.2.4		M	
4.2.6.1 and 4.2.11	Return Link Test – RL1	See Annex D.1	3.2.5		M	
4.2.11	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E.
			3.2.6		M	For C/S T.018 ELT(DT) beacons using script in section D.3.4.2.
5.1	RF Signal Margin	n/a	n/a		D	
5.2.2	Signal Sensitivity	Signal sensitivity better than 30.55 dB-Hz			D	
5.3.2	Beacon Message Detection Probability *(nearly-static beacon)*	T≥0.999	3.3.1.1		M	After 30 seconds - *Configuration 1*
					M	*After 30 seconds - Configuration 2*
	Beacon Message Detection Probability ((low speed) slow-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 3.1*
					M	*After 30 seconds - Configuration 3.2*
	Beacon Message Detection Probability(#) ((medium speed) slow-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 4*
	Beacon Message Detection Probability(*) (fast-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 5*
	Beacon Message Detection Probability (ELT(DT))	T>0.99	3.3.1.2			Within any 1 minute period
5.4.1.2, 5.4.2.2	Probability of FDOA/TDOA Location *(nearly-static beacon)*	PDL≥0.95	3.3.1.3		M	Single burst - *Configuration 1*
					M	*Single burst - Configuration 2*
		PDL≥0.98	3.3.1.3		M	Within 30 seconds - *Configuration 1*
					M	*Within 30 seconds - Configuration 2*
		PDL≥0.98	3.3.1.3		M	Within 5 minutes - *Configuration 1*
					M	*Within 5 minutes - - Configuration 2*
		PDL≥0.98	3.3.1.3		M	Within 30 minutes - *Configuration 1*
					M	*Within 30 minutes - Configuration 2*
5.4.1.2, 5.4.2.2	*Probability of FDOA/TDOA Location ((low speed) slow-moving beacon)*	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 3.1*
					M	*Single burst- Configuration 3.2*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds- Configuration 3.1*
					M	*Within 30 seconds- Configuration 3.2*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes- Configuration 3.1*
					M	*Within 5 minutes- Configuration 3.2*
5.4.1.2, 5.4.2.2	*Probability of FDOA/TDOA Location(#) ((medium speed) slow-moving beacon)*	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 4*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds- Configuration 4*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes- Configuration 4*
5.4.1.2, 5.4.2.2	*Probability of FDOA/TDOA Location(*) (fast-moving beacon)*	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 5*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds- Configuration 5*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes- Configuration 5*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
5.5.2	Capacity	100 beacons	n/a		D	
5.6.2	Location Accuracy (nearly-static beacon)	M/N≥0.95 (5 km)	3.3.1.4		M	Single Burst - Configuration 1
					M	Single Burst - Configuration 2
		M/N≥0.97 (5 km)	3.3.1.4		M	Within 30 seconds - Configuration 1
					M	Within 30 seconds - Configuration 2
		M/N≥0.97 (1 km)	3.3.1.4		M	Within 5 minutes - Configuration 1
					M	Within 5 minutes - Configuration 2
		M/N≥0.97 (0.1 km)	3.3.1.4		M	After 30 minutes - Configuration 1
					M	After 30 minutes - Configuration 2
5.6.4	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.95 (5 km)	3.3.1.4		M	Single Burst - Configuration 3*.1*
			3.3.1.4		*M*	*Single Burst - Configuration 3.2*
		M/N≥0.97 (5 km)	3.3.1.4		M	Within 30 seconds - Configuration 3*.1*
			3.3.1.4		*M*	*Within 30 seconds - Configuration 3.2*
		M/N≥0.97 (1 km)	3.3.1.4		M	Within 5 minutes - Configuration 3*.1*
			3.3.1.4		*M*	*Within 5 minutes - Configuration 3.2*
5.6.5	*Location Accuracy(#) ((medium speed) slow-moving beacon)*	*M/N≥0.95 (5 km)*	*3.3.1.4*		*M*	*Single Burst - Configuration 4*
		M/N≥0.97 (5 km)	*3.3.1.4*		*M*	*Within 30 seconds - Configuration 4*
		M/N≥0.97 (1 km)	*3.3.1.4*		*M*	*Within 5 minutes - Configuration 4*
5.6.6	Location Accuracy(*) (fast-moving beacon)	M/N≥0.95 (TBD km)	3.3.1.4		M	Single Burst - Configuration *5*~~4~~
		M/N≥0.97 (TBD km)	3.3.1.4		M	Within 30 seconds - Configuration ~~4~~*5*
		M/N≥0.97 (TBD km)	3.3.1.4		M	Within 5 minutes - Configuration *5*~~4~~
5.7.1	Processing Bandwidth	406.006 to 406.094 MHz	n/a		D	
5.7.2	Acquisition Frequency Range	Beacon center frequency in the range 406.05 MHz ± 1.65 kHz	n/a		D	
5.8.1.2	TOA/FOA Measurement Accuracy	TOA_{σ} < [1] µsec TOA_{bias} < [0.2] µsec FOA_{σ} < [0.2] Hz FOA_{bias} < [0.02] Hz	3.3.2.6		M	Only applicable to MEOLUTs which will provide data to other MEOLUTs [30.55] dBHz < C/N_0 < [33.55] dBHz
5.8.2	External Data Processing	C/S T.019 sections 4.2.10 and 5			D	Only applicable to MEOLUTs which process data from other MEOLUTs
	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E
			3.2.6		M	For C/S T.018 ELT(DT) beacons using script in section D.3.4.2.
	RF Signal Margin	n/a	n/a		D	
	Signal Sensitivity	Signal sensitivity better than 30.55 dB-Hz			D	
	Beacon Message Detection Probability	T≥0.999	3.3.2.1		M	After 30 seconds - *Configuration 1*
					M	*After 30 seconds - Configuration 2*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Beacon Message Detection Probability ((low speed) slow-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 3.1*
					M	*After 30 seconds - Configuration 3.2*
	Beacon Message Detection Probability(#) ((medium speed) slow-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 4*
	Beacon Message Detection Probability(*) (fast-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 5*
	Beacon Message Detection Probability (ELT(DT))	T>0.99	3.3.2.2			Within any 1 minute period
	Probability of FDOA/TDOA Location *(nearly-static beacon)*	PDL≥0.95	3.3.2.3		M	Single burst - *Configuration 1*
					M	*Single burst - Configuration 2*
		PDL≥0.98	3.3.2.3		M	Within 30 seconds - *Configuration 1*
					M	*Within 30 seconds - Configuration 2*
		PDL≥0.98	3.3.2.3		M	Within 5 minutes - *Configuration 1*
					M	*Within 5 minutes - Configuration 2*
		PDL≥0.98	3.3.2.3		M	Within 30 minutes - *Configuration 1*
					M	*Within 30 minutes - Configuration 2*
	Probability of FDOA/TDOA Location ((low speed) slow-moving beacon)	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 3.1*
					M	*Single burst- Configuration 3.2*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds- Configuration 3.1*
					M	*Within 30 seconds- Configuration 3.2*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes- Configuration 3.1*
					M	*Within 5 minutes- Configuration 3.2*
	Probability of FDOA/TDOA Location(#) ((medium speed) slow-moving beacon)	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 4*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds- Configuration 4*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes- Configuration 4*
	Probability of FDOA/TDOA Location(*) (fast-moving beacon)	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 5*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds- Configuration 5*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes- Configuration 5*
	Capacity	100 beacons	n/a		D	
	Location Accuracy (nearly-static beacon)	M/N≥0.95 (5 km)	3.3.2.4		M	Single Burst - Configuration 1
					M	Single Burst - Configuration 2
		M/N≥0.97 (5 km)	3.3.2.4		M	Within 30 seconds - Configuration 1
					M	Within 30 seconds - Configuration 2
		M/N≥0.97 (1 km)	3.3.2.4		M	Within 5 minutes - Configuration 1
					M	Within 5 minutes - Configuration 2
		M/N≥0.97 (0.1 km)	3.3.2.4		M	After 30 minutes - Configuration 1
					M	After 30 minutes - Configuration 2
	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.95 (5 km)	3.3.2.4		M	Single Burst - Configuration 3.*1*
			3.3.2.4		*M*	*Single Burst - Configuration 3.2*
			3.3.2.4		M	Within 30 seconds - Configuration 3.*1*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
		M/N≥0.97 (5 km)	*3.3.2.4*		*M*	*Within 30 seconds - Configuration 3.2*
		M/N≥0.97 (1 km)	3.3.2.4		M	Within 5 minutes - Configuration 3.*1*
			3.3.2.4		*M*	*Within 5 minutes - Configuration 3.2*
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.95 (5 km)*	*3.3.2.4*		*M*	*Single Burst - Configuration 4*
		M/N≥0.97 (5 km)	*3.3.2.4*		*M*	*Within 30 seconds - Configuration 4*
		M/N≥0.97 (1 km)	*3.3.2.4*		*M*	*Within 5 minutes - Configuration 4*
	Location Accuracy(*) (fast-moving beacon)	M/N≥0.95 (TBD km)	3.3.2.4		M	Single Burst - Configuration ~~4~~*5*
		M/N≥0.97 (TBD km)	3.3.2.4		M	Within 30 seconds - Configuration ~~4~~*5*
		M/N≥0.97 (TBD km)	3.3.2.4		M	Within 5 minutes - Configuration ~~4~~*5*
	Processing Bandwidth	406.006 to 406.094 MHz	n/a		D	
	Acquisition Frequency Range	Beacon center frequency in the range 406.05 MHz ± 1.65 kHz	n/a		D	
	Expected Horizontal Error / Quality Factor	~~Prediction accurate 95 ±2 %~~*Prediction Accuracy* $NC_{1/10}/NL < 0.15$ $0.93 \leq NC_1/NL \leq 0.97$ $NC_2/NL < 0.01$	3.3.2.5		M	Results reported but will not be judged as pass or fail criteria during EOC.
	Processing Anomalies	$< 1x10^{-4}$	3.3.2.7		M	Results reported but will not be judged as pass or fail criteria during EOC. Processing anomalies that consist of a single burst from a single satellite shall be identified separately.
5.9	Combined Processing	C/S T.019 sections 4.2.10 and 5			D	Only applicable to MEOLUTs which use non-MEOSAR C/S satellites.
	Transmitting Data to the MCC	n/a	n/a		V	Using MCC message log table as defined in Annex E
			3.2.6		M	For C/S T.018 ELT(DT) beacons using script in section D.3.4.2.
	RF Signal Margin	n/a	n/a		D	
	Signal Sensitivity	Signal sensitivity better than 30.55 dB-Hz			D	
	Beacon Message Detection Probability *(nearly-static beacon)*	T≥0.999	3.3.3.1		M	After 30 seconds - *Configuration 1*
					M	*After 30 seconds - Configuration 2*
	Beacon Message Detection Probability ((low speed) slow-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 3.1*
					M	*After 30 seconds - Configuration 3.2*
	Beacon Message Detection Probability(#) ((medium speed) slow-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 4*

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
	Beacon Message Detection Probability(*) (fast-moving beacon)	*T≥0.999*	*3.3.1.1*		*M*	*After 30 seconds - Configuration 5*
	Beacon Message Detection Probability (ELT(DT))	T>0.99	3.3.3.2			Within any 1 minute period
	Probability of FDOA/TDOA Location *(nearly-static beacon)*	PDL≥0.95	3.3.3.3		M	Single burst - *Configuration 1*
						Single burst - Configuration 2
		PDL≥0.98	3.3.3.3		M	Within 30 seconds - *Configuration 1*
						Within 30 seconds - Configuration 2
		PDL≥0.98	3.3.3.3		M	Within 5 minutes - *Configuration 1*
						Within 5 minutes - Configuration 2
		PDL≥0.98	3.3.3.3		M	Within 30 minutes - *Configuration 1*
						Within 30 minutes - Configuration 2
	Probability of FDOA/TDOA Location ((low speed) slow-moving beacon)	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst- Configuration 3.1*
					M	*Single burst- Configuration 3.2*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds - Configuration 3.1*
					M	*Within 30 seconds - Configuration 3.2*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes - Configuration 3.1*
					M	*Within 5 minutes - Configuration 3.2*
	Probability of FDOA/TDOA Location(#) ((medium speed) slow-moving beacon)	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst - Configuration 4*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds - Configuration 4*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes - Configuration 4*
	Probability of FDOA/TDOA Location(*) (fast-moving beacon)	*PDL≥0.95*	*3.3.1.3*		*M*	*Single burst - Configuration 5*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 30 seconds - Configuration 5*
		PDL≥0.98	*3.3.1.3*		*M*	*Within 5 minutes - Configuration 5*
	Capacity	100 beacons	n/a		D	
	Location Accuracy (nearly-static beacon)	M/N≥0.95 (5 km)	3.3.3.4		M	Single Burst - Configuration 1
					M	Single Burst - Configuration 2
		M/N≥0.97 (5 km)	3.3.3.4		M	Within 30 seconds - Configuration 1
					M	Within 30 seconds - Configuration 2
		M/N≥0.97 (1 km)	3.3.3.4		M	Within 5 minutes - Configuration 1
					M	Within 5 minutes - Configuration 2
		M/N≥0.97 (0.1 km)	3.3.3.4		M	After 30 minutes - Configuration 1
					M	After 30 minutes - Configuration 2
	Location Accuracy (*(low speed)* slow-moving beacon)	M/N≥0.95 (5 km)	3.3.3.4		M	Single Burst - Configuration 3*.1*
			3.3.3.4		*M*	*Within 30 seconds - Configuration 3.2*
		M/N≥0.97 (5 km)	3.3.3.4		M	Within 30 seconds - Configuration 3*.1*
			3.3.3.4		*M*	*Within 30 seconds - Configuration 3.2*
		M/N≥0.97 (1 km)	3.3.3.4		M	Within 5 minutes - Configuration 3*.1*
			3.3.3.4		*M*	*Within 5 minutes - Configuration 3.2*
	Location Accuracy(#) ((medium speed) slow-moving beacon)	*M/N≥0.95 (5 km)*	*3.3.3.4*		*M*	*Single Burst - Configuration 4*
		M/N≥0.97 (5 km)	*3.3.3.4*		*M*	*Within 30 seconds - Configuration 4*
		M/N≥0.97 (1 km)	*3.3.3.4*		*M*	*Within 5 minutes - Configuration 4*
	Location Accuracy(*) (fast-moving beacon)	M/N≥0.95 (TBD km)	3.3.3.4		M	Single Burst - Configuration 45

Section in C/S T.019	Requirement or Test	Pass Criteria	Result or Report Ref	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
		M/N≥0.97 (TBD km)	3.3.3.4		M	Within 30 seconds - Configuration ~~4~~5
		M/N≥0.97 (TBD km)	3.3.3.4		M	Within 5 minutes - Configuration ~~4~~5
	Processing Bandwidth	406.006 to 406.094 MHz	n/a		D	
	Acquisition Frequency Range	Center frequency in the range 406.05 MHz ± 1.65 kHz	n/a		D	
	Expected Horizontal Error / Quality Factor	~~Prediction accurate 95 ± 2 %~~*Prediction Accuracy* $NC_{1/10}/NL < 0.15$ $0.93 \leq NC_1/NL \leq 0.97$ $NC_2/NL < 0.01$	3.3.3.5		M	Results reported but will not be judged as pass or fail criteria during EOC.
	Processing Anomalies	$< 1x10^{-4}$	3.3.3.6		M	Results reported but will not be judged as pass or fail criteria during EOC. Processing anomalies that consist of a single burst from a single satellite shall be identified separately.
5.10	Expected Horizontal Error / Quality Factor	~~Prediction accurate 95%~~*Prediction Accuracy* $NC_{1/10}/NL < 0.15$ $0.93 \leq NC_1/NL \leq 0.97$ $NC_2/NL < 0.01$	3.3.1.4		M	Results reported but will not be judged as pass or fail criteria during EOC.
5.11	Processing Anomalies	$< 1x10^{-4}$	3.3.1.5		M	Results reported but will not be judged as pass or fail criteria during EOC. Processing anomalies that consist of a single burst from a single satellite shall be identified separately.

Notes:
(#) Testing of Configuration 4 is not required for MEOLUT commissioning until the test velocity (in brackets) is finalized for Configuration 4, but could be provided if available.
(*) Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

A.2 Results of Measurements

This section contains the detailed results of measurements summarized in section A.1. Each of the requirements is referred to in the report by the report reference number. The test procedure column identifies the reference in this document, where the detailed test procedure and pass/fail criteria are provided.

General part

Report Ref #	Title	Test Procedure
2.1	**Operational Requirements**	
2.1.1	MEOLUT Data Availability (A)	B.1

C/S T.001 Beacons

Report Ref #	Title	Test Procedure
2.2	**Functional and Processing Requirements**	
2.2.1	Bit Rate Tolerance Check	D.1.2
2.2.2	Bit Verification (test code sequence BV1 - BV2 - BV3)	D.2.1
2.2.3	Beacon Message Validation (test code sequence MV1 - MV2 - MV5 - MV6)	D.2.1
2.2.4	Invalid Message Processing (test code sequence IMP1)	D.2.1
2.2.5	Beacon Message Processing (test code sequence LP1 - LP2 - LP3 - LP4)	D.2.1
2.2.6	Return Link Test (test code sequence RL1)	D.2.1
2.2.7	Multiple valid message processing	
2.2.8	C/S T.001 ELT(DT) functional validation script	D.3.2.2
2.3	**Performance Requirements**	
2.3.1	**Stand Alone Statistics**	
2.3.1.1	Beacon Detection Probability (T) Non ELT(DT) Beacons	C.2.1
2.3.1.2	Beacon Detection Probability (T) ELT(DT) Beacons	C.2.2
2.3.1.3	Probability of DOA Location (PDL)	C.2.3
2.3.1.4	Location Accuracy	C.2.4
2.3.1.5	Expected Horizontal Error / Quality Factor	C.2.6
2.3.1.6	Processsing Anomalies	C.2.7
2.3.2	**MEOLUT Data Exchange**	
2.3.2.1	Beacon Detection Probability (T) Non ELT(DT) Beacons	C.2.1
2.3.2.2	Beacon Detection Probability (T) ELT(DT) Beacons	C.2.2
2.3.2.3	Probability of DOA Location (PDL)	C.2.3
2.3.2.4	Location Accuracy	C.2.4
2.3.2.5	Expected Horizontal Error / Quality Factor	C.2.5
2.3.2.6	TOA/FOA Measurement Accuracy	C.2.6
2.3.2.7	Processsing Anomalies	C.2.7
2.3.3	**Combined Non-MEOSAR Satellite Statistics**	
2.3.3.1	Beacon Detection Probability (T) Non ELT(DT) Beacons	C.2.1
2.3.3.2	Beacon Detection Probability (T) ELT(DT) Beacons	C.2.2
2.3.3.3	Probability of DOA Location (PDL)	C.2.3
2.3.3.4	Location Accuracy	C.2.4
2.3.3.5	Expected Horizontal Error / Quality Factor	C.2.6
2.3.3.6	Processsing Anomalies	C.2.7

C/S T.018 Beacons

Report Ref #	Title	Test Procedure
3.1	**Operational Requirements (same as 2.1)**	
3.2	**Functional and Processing Requirements**	
3.2.1	Message Recovery (test code sequence MR1 - MR2)	D.2.2
3.2.2	Bit Verification (test code sequence BV1)	D.2.2
3.2.3	Invalid Message Processing (test code sequence IMP1)	D.2.2
3.2.4	Message Association (test code sequence MA1)	D.2.2
3.2.5	Return Link Test (test code sequence RL1)	D.2.2
3.2.6	C/S T.018 ELT(DT) functional validation script	D.3.4.2
3.3	**Performance Requirements**	
3.3.1	**Stand Alone Statistics**	
3.3.1.1	Beacon Detection Probability (T) Non ELT(DT) Beacons	C.3.1
3.3.1.2	Beacon Detection Probability (T) ELT(DT) Beacons	C.3.2
3.3.1.3	Probability of DOA Location (PDL)	C.3.3
3.3.1.4	Location Accuracy	C.3.4
3.3.1.5	Expected Horizontal Error / Quality Factor	C.3.5
3.3.1.6	Processsing Anomalies	C.3.7
3.3.2	**MEOLUT Data Exchange**	
3.3.2.1	Beacon Detection Probability (T) Non ELT(DT) Beacons	C.3.1
3.3.2.2	Beacon Detection Probability (T) ELT(DT) Beacons	C.3.2
3.3.2.3	Probability of DOA Location (PDL)	C.3.3
3.3.2.4	Location Accuracy	C.3.4
3.3.2.5	Expected Horizontal Error / Quality Factor	C.3.5
3.3.2.6	TOA/FOA Measurement Accuracy	C.3.6
3.3.2.7	Processsing Anomalies	C.3.7
3.3.3	**Combined Non-MEOSAR Satellite Statistics**	
3.3.3.1	Beacon Detection Probability (T) Non ELT(DT) Beacons	C.3.1
3.3.3.2	Beacon Detection Probability (T) ELT(DT) Beacons	C.3.2
3.3.3.3	Probability of DOA Location (PDL)	C.3.3
3.3.3.4	Location Accuracy	C.3.4
3.3.3.5	Expected Horizontal Error / Quality Factor	C.3.5
3.3.3.6	Processsing Anomalies	C.3.7

Table A.4: MEOLUT Test Beacon Location Table

Beacon Number	Beacon Identifier	Longitude (Degrees East)	Latitude (Degrees North)	Altitude (metres)
1				
2				
3				
4				
5				
6				
7				
8				
…				
n				

A.3 MEOLUT Critical Changes Implementation

The implementation status of the MEOLUT critical changes decided by the Council shall be reported in Table A.5 *provided in the MEOLUT commissioning report.*

Table* A.5*: Implementation Status of MEOLUT Critical Changes

Reference	*Brief Description*	*Status (Implemented/Not implemented/Date of future implementation)*
MEOLUT-1		
MEOLUT-2		
…		
MEOLUT-N		

Appendix 1 - Technical File

A.1 General

This appendix defines LUT information to be provided by national Administrations for LUT commissioning. The following information is required as a minimum:

A.2 LUT Hardware Description

A.2.1 Antenna Characteristics

a) number and type(s) of antennas

b) gain/temperature ratio (G/T) at 5˚ elevation angle above the local horizon, and actual elevation angle at which the G/T was measured

c) operational limitations

d) dedicated or shared

e) site-horizon profile

f) operational-tracking (elevation) limits

g) downlink frequency (S/L band)

Table A.6: MEOLUT Antenna Location Table

Antenna Number	Antenna Diameter (if applicable) (m)	Longitude (Degrees East)	Latitude (Degrees North)	Altitude (m)
1				
2				
3				
4				
5				
6				
7				
8				
…				
n				

A.2.2 General LUT Indoor Equipment Description

a) equipment complement
b) stand alone, shared, or collocated with MCC
c) LUT manufacturer and model number
d) status and alarm functions
e) location – latitude, longitude, altitude

A.2.3 General Capabilities

a) specific processing capability
b) spectrum monitoring capability
c) optional capabilities

A.3 Processing

a) specific-performance capability
b) manufacturer specifications
c) processing bandwidth, signal sensitivity and beacon processing capacity of each data channel

A.4 Communications Capability – internal and external

a) primary-mode configuration
b) backup-mode configuration

A.5 Coverage Area

Describe the Declared Coverage Area of the MEOLUT system.

The description of the Declared Coverage Area shall be accompanied, if applicable, with the following:

1) Satellite tracking schedule used;
2) Description of DCA as:
   a) the latitude and longitude values of the DCA contour, and/or
   b) the coverage radius around the MEOLUT;
3) Graphical plots of performance analysis or simulation should:
   a) Indicate the DCA,
   b) Provide a legend of all colors and/or scales used;
4) Beacon characteristics including transmission pattern;
5) Simulation time period and step size;

6) Simulation grid size;

7) List the C/S T.019 performance requirements used as criteria to determine the DCA;

8) Performance and modelling assumptions and their dependencies, such as:

   a) Detection performance as a function of elevation angle or received signal strength,

   b) Standard deviation (1 sigma) TOA and FOA accuracy, as a function of beacon elevation angle or received signal strength,

   c) A description of methodology used for location accuracy assessment at a given grid node (e.g., statistical EHE calculation or modelling of the complete detection and location process used by the MEOLUT);

9) A description of any empirical basis for performance assumptions such as type of test sources (beacon simulator or operational beacons).

A.6 MEOLUT Network

For a networked MEOLUT, this section shall include a list of all the other MEOLUTs that exchange data with this MEOLUT and their status (commissioned or not).

A.7 MEOLUT Designated Reference Beacons List

This section shall include the list of all designated QMS reference beacons, as described in document C/S A.003, that are planned for use for the QMS of the MEOLUT[2].

- END OF ANNEX A -

[2] A list of available designated QMS reference beacons is available on the Cospas-Sarsat website.

ANNEX B

STATISTICS FOR OPERATIONAL REQUIREMENTS

B.1 MEOLUT Data Availability (A)

Measurement during the commissioning period

MEOLUT data availability measures the probability of receiving complete and accurate MEOLUT data at the MCC. Availability (A) is expressed as a percentage and is calculated by dividing the amount of operational time (OT) by the time required to be in operation (OTR). The time required to be in operation (OTR), expressed in hours, is 24 times the number of days in the commissioning period inclusive of all maintenance downtime. Downtime (DT) is that period of time when the performance of the MEOLUT is below the minimum requirements specified in document C/S T.019 over the Declared Coverage Area in the configuration for which the MEOLUT was commissioned. Therefore:

A = (OT / OTR) * 100 = (1 - (DT / OTR)) * 100 and shall be greater than 95.

Prediction

A reliability analysis shall be performed and the results reported to verify that the MEOLUT will meet the availability requirement. The analysis shall be based on industry standard methodology using Mean Time Between Failure (MTBF) and Mean Time To Repair (MTTR) values for all the components and interfaces comprising the MEOLUT.

- END OF ANNEX B -

ANNEX C

STATISTICS FOR PERFORMANCE REQUIREMENTS

C.1 Commissioning Status

C.1.1 General

This annex describes the statistics to be provided to the Cospas-Sarsat Secretariat when commissioning a MEOLUT.

For the 406 MHz solution statistics, the report must include a list of all 406 MHz beacons used for the statistical data analysis.

C.2 C/S T.001 Beacon Statistics

C.2.1 Beacon Detection Probability (T)

Statistics will be generated using the test script identified in Annex D.3.1 to meet the following requirements:

Calculate:

$T = N / B$

where:

N = number of 10-minute windows for which the MEOLUT produced a valid message within 10 minutes from the first beacon message transmission for each beacon ID

B = total number of 10-minute windows (not overlapping) within the duration of the beacon activation period[3] for each beacon ID

The test script will be executed a minimum of four times producing a minimum of 1,200 bursts in 4x25=100 windows.

The value of T using data from all test beacon IDs shall be 0.99 or greater.

Detection Probability statistics shall be provided for each motion configuration defined in section C.2.4.

[3] A MEOLUT shall not use information from past 10-minute windows to improve beacon message detection in subsequent 10-minute windows (this might require a specific MEOLUT test set up to force a reset of the detection mechanism)

C.2.2 ELT(DT) Beacon Detection Probability (T(DT))

Statistics will be generated using the test script identified in Annex D.3.2.1 to meet the following requirements:

Calculate:

T(DT) = N / B

where:

N = number of 1-minute windows for which the MEOLUT produced a complete message within 1-minute from the first beacon message transmission for each beacon ID

B = total number of 1-minute windows (not overlapping) within the duration of the beacon activation period for each beacon ID

The value of T(DT) using data from all test beacon IDs shall be 0.99 or greater.

C.2.3 Probability of DOA Location (PDL)

Single Burst

Statistics will be generated using the test script identified in Annex D.3.1 to meet the following requirements:

PDL = M/N

where:

M = number of DOA single-burst locations produced by the MEOLUT for a test beacon, within three minutes of the single burst transmission

N = total number of beacon bursts transmitted by the test beacons

PDL shall be 0.90 or greater

PDL shall be 0.75 or greater (EOC)

Within 10 minutes

Within 20 minutes (EOC)

Statistics will be generated using the test script identified in Annex D.3.1 to meet the following requirements:

PDL = M/N

where:

M = number of beacons that produced a DOA location within 10 minutes from the first beacon message transmission

N = total number of test beacons (i.e., the maximum value of YY within the script)

PDL shall be 0.98 or greater.

A set of single-burst and 10-minute PDL statistics shall be provided for each motion configuration defined in section C.2.4.

C.2.4 Location Accuracy

Single burst solutions

Statistics will be generated using the test script identified in Annex D.3.1 (the test script will be executed a minimum of four times producing a minimum of 1,200 bursts), or a test beacon for moving configurations to meet the following requirements:

Configuration 1: static beacon

M/N shall be greater than or equal to the following:

0.90 where:

M = number of solutions within 5 km

N = number of solutions

EOC Requirements

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 5 km

N = number of solutions

M/N shall be greater than or equal to the following:

0.90 where:

M = number of solutions within 10 km

N = number of solutions

Configuration 2: nearly-static beacon (velocity = 0.4 m/s)

M/N shall be greater than or equal to the following:

0.90 where:

M = number of solutions within 5 km

N = number of solutions

Configuration 3*.1*: *(low speed)* slow-moving beacon (velocity = 2 m/s)

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 10 km

N = number of solutions

0.95 where:

M = number of solutions within 20 km

N = number of solutions

Configuration 3.2: (low speed) slow-moving beacon (velocity = 5 m/s)

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 10 km

N = number of solutions

0.95 where:

M = number of solutions within 20 km

N = number of solutions

Configuration 4[4]: (medium speed) slow-moving beacon (velocity = [5 to 10] m/s)

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 10 km

N = number of solutions

0.95 where:

M = number of solutions within 20 km

N = number of solutions

Configuration *5*~~4~~[5]: fast-moving beacon (velocity > ~~[~~10~~]~~ m/s)

M/N shall be greater than or equal to the following:

0.90 where:

M = number of solutions within TBD km

N = number of solutions

For each configuration, a histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 1 km increments from 0 to 20 km. All solutions with an error greater than 20 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

Solutions within 10 minutes
Solutions within 20 minutes (EOC)

Statistics will be generated using the test script identified in Annex D.3.1, or a test beacon for moving configurations, to meet the following requirements:

Configuration 1: static beacon

M/N shall be greater than or equal to the following (M and N are solutions produced within 10 minutes from the first beacon message transmission):

0.95 where:

M = number of solutions within 5 km

N = number of solutions

0.98 where:

M = number of solutions within 10 km

N = number of solutions

[4] Testing of Configuration 4 is not required for MEOLUT commissioning until the test velocity (in brackets) is finalized for Configuration 4, but could be provided if available.

[5] Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

Configuration 2: nearly-static beacon (velocity = 0.4 m/s)

M/N shall be greater than or equal to the following (M and N are solutions produced within 10 minutes from the first beacon message transmission):

0.95 where:

M = number of solutions within 5 km

N = number of solutions

0.98 where:

M = number of solutions within 10 km

N = number of solutions

Configuration 3*.1*: *(low speed)* slow-moving beacon (velocity = 2 m/s*)*

M/N shall be greater than or equal to the following) (M and N are solutions produced within 10 minutes from the first beacon message transmission):

0.75 where:

M = number of solutions within 5 km

N = number of solutions

0.95 where:

M = number of solutions within 7 km

N = number of solutions

Configuration 3.2: (low speed) slow-moving beacon (velocity = 5 m/s)

M/N shall be greater than or equal to the following) (M and N are solutions produced within 10 minutes from the first beacon message transmission):

0.75 where:

M = number of solutions within 5 km

N = number of solutions

0.95 where:

M = number of solutions within 7 km

N = number of solutions

Configuration 4[6]: (medium speed) slow-moving beacon (velocity = [5 to 10] m/s)

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 10 km

N = number of solutions

0.95 where:

M = number of solutions within 20 km

N = number of solutions

Configuration ~~4~~5[7]: fast-moving beacon (velocity > ~~[~~10~~]~~ m/s)

M/N shall be greater than or equal to the following) (M and N are solutions produced within 10 minutes from the first beacon message transmission):

[6] Testing of Configuration 4 is not required for MEOLUT commissioning until the test velocity (in brackets) is finalized for Configuration 4, but could be provided if available.

[7] Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

0.95 where:
M = number of solutions within TBD km
N = number of solutions
0.98 where:
M = number of solutions within TBD km
N = number of solutions

For each configuration, a histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 1 km increments from 0 to 20 km. All solutions with an error greater than 20 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

The location selection methodology, if any, used to generate the 10-minute location accuracy statistics shall be documented in the MEOLUT commissioning report[8].

C.2.5 Expected Horizontal Error / Quality Factor

For each test configuration in section C.2.4, compare each beacon DOA location produced by the MEOLUT with the known location of the test beacon to derive the actual location error.

Check that the Expected Horizontal Error is as follows:

$NC_{1/10}^{1/10}/NL < 0.15$

$0.93 \prec\leq NC_1^1/NL \prec\leq 0.97$

$NC_2^2/NL < 0.01$

With:

$NC_{1/10}^{1/10}$ = number of locations with a location error < EHE/10

NC_1^1 = number of locations with a location error < EHE

NC_2^2 = number of locations with a location error > 2 x EHE

NL = total number of locations

In addition to each test configuration, EHE results should be reported for different location categories (containing at least 1,000 locations each), in order to avoid any averaging effect of the results. These categories[9] are:

- Single-burst locations *for at least one static primary test beacons within the DCA*,
- *Single-burst locations for at least one primary test slow-moving beacon within the DCA,*
- Multi-burst locations *for at least one static primary test beacons within the DCA*,
- *Multi-burst locations for at least one primary test slow-moving beacon within the DCA,*
- ~~Locations on static beacons,~~
- ~~Locations on moving beacons,~~
- Locations for *other available* test *beacons and for all active* ~~or~~ reference beacons located inside the DCA,

[8] *E.g., all locations produced by the MEOLUT are used, or locations with lowest EHE values over 10 minutes, or with higher number of bursts or satellites, or last solution received in the 10 minute window, other.*
[9] *Testing for fast-moving beacon to be determined.*

- Locations for *at least one other* ~~available~~ test *beacon if available and for all active* ~~or~~ reference beacons located outside the DCA*, which were detected by the MEOLUT under test*.

Plot the cumulative distribution of location error normalized by the EHE~~,~~ *for each category tested from the above list. Include with each plot the* EHE limit mask *as illustrated in Figure C.1 below. In this figure, points 1, 2, 3 and 4 bound the EHE mask, and the dotted curve is an example of a hypothetical cumulative distribution plot that would meet the performance requirement. The reported cumulative distribution for each plot must pass below point 1, between points 2 and 3, and above point 4 in order to meet the required performance*.

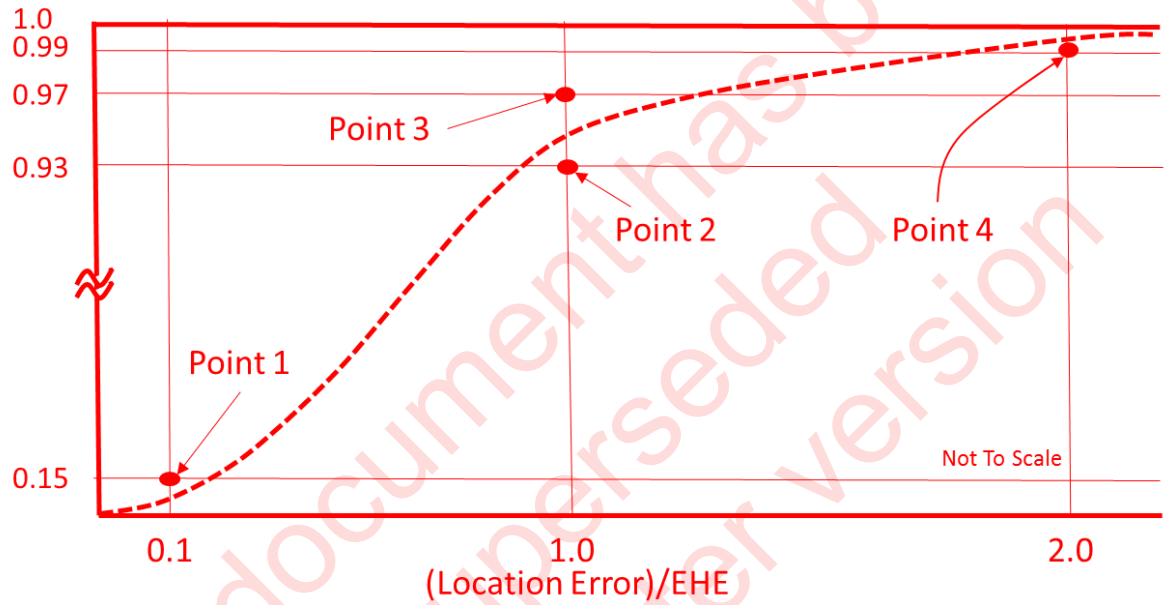


Figure* C.1*: (Location Error)/EHE Cumulative Distribution

C.2.6 TOA/FOA Measurement Accuracy

For each received beacon transmission received on each satellite channel:

1. Filter out beacon transmissions received with received C/N_0 less than 34.8 dBHz or greater than 37.8 dBHz.
2. Determine the TOA and FOA measurement error using the known beacon position.

From the beacon log data as defined in Annex E (in particular the transmission time and frequency of the transmitted bursts), calculate:

1. The standard deviation of the error of the TOA and FOA measurements for all filtered beacon messages.
2. The bias of the mean of the error of the TOA and FOA measurements.

The standard deviation of the error shall be:

Better than 25 microseconds for TOA
Better than 0.20 Hz for FOA

The bias of the mean of the error shall be:

Less than 2.5 microseconds for TOA
Less than 0.02 Hz for FOA

C.2.7 Processing Anomalies

From the beacon message data table (see section E.3), collect detected C/S T.001 beacon messages received on the transmitted test beacon frequency ± 2 kHz.
Count all messages (NM).
Count all anomalies (NA) which are defined as any beacon 15 hex ID that does not match exactly the 15 hex ID of the beacons known to transmit within the test beacon frequency ± 2 kHz (e.g., test beacons, reference beacons, etc.).
Determine the probability (PA) to detect an anomaly:

$PA = NA / NM$

Check that PA is less than 10^{-4}.

C.3 C/S T.018 Beacon Statistics

C.3.1 Beacon Detection Probability (T)

Statistics will be generated using the test script identified in Annex D.3.3.1 to meet the following requirements:

Calculate:

$T = N / B$

where:

N = number of 30-second windows for which the MEOLUT produced a valid message within 30-seconds from the first beacon message transmission for each beacon ID
B = total number of 30-second windows (not overlapping) within the duration of the beacon activation period or each beacon ID

The value of T using data from all test beacon IDs shall be 0.999 or greater.

Detection Probability statistics shall be provided for each motion configuration defined in section C.2.4.

C.3.2 ELT(DT) Beacon Detection Probability (T(DT))

Statistics will be generated using the test script identified in Annex D.3.4.1 to meet the following requirements:

Calculate:

$T(DT) = N / B$

where:

N = number of 1-minute windows for which the MEOLUT produced a valid message within 1-minute from the first beacon message transmission for each beacon ID
B = total number of 1-minute windows (not overlapping) within the duration of the beacon activation period for each beacon ID

The value of T(DT) using data from all test beacon IDs shall be 0.99 or greater.

C.3.3 Probability of DOA Location (PDL)

Single Burst

Statistics will be generated using data resulting from the execution of all the test scripts identified in Annexes D.3.3.1, D.3.3.2, D.3.3.3 and D.3.3.4 to meet the following requirements:

PDL = M/N

where:
M = number of DOA single-burst locations produced by the MEOLUT for a test beacon, within three minutes of the single burst transmission.
N = total number of beacon messages transmitted by the test beacons

PDL shall be 0.95 or greater

Within 30 seconds

Statistics will be generated using the test script identified in Annex D.3.3.1 to meet the following requirements:

PDL = M/N

where:
M = number of beacons that produced a DOA location
N = total number of test beacons

PDL shall be 0.98 or greater.

Within 5 minutes

Statistics will be generated using the test script identified in Annex D.3.3.2 to meet the following requirements:

PDL = M/N

where:
M = number of beacons that produced a DOA location
N = total number of test beacons

PDL shall be 0.98 or greater.

Within 30 minutes

Statistics will be generated using the test script identified in Annex D.3.3.3 to meet the following requirements:

PDL = M/N

where:
M = number of beacons that produced a DOA location
N = total number of test beacons

PDL shall be 0.98 or greater.

A set of single-burst and 10-minute PDL statistics shall be provided for each motion configuration defined in section C.2.4.

C.3.4 Location Accuracy

Single burst solutions

Statistics will be generated using data resulting from the execution of all the test scripts identified in Annexes D.3.3.1, D.3.3.2, D.3.3.3 and D.3.3.4 to meet the following requirements:

Configuration 1: static beacon
M/N shall be greater than or equal to the following:
0.95 where:
M = number of solutions within 5 km
N = number of solutions

Configuration 2: nearly-static beacon (velocity = 0.4 m/s)
M/N shall be greater than or equal to the following:
0.95 where:
M = number of solutions within 5 km
N = number of solutions

Configuration 3*.1*: *(low speed)* slow-moving beacon (velocity = 2 m/s)
M/N shall be greater than or equal to the following:
0.95 where:
M = number of solutions within TBD km
N = number of solutions

Configuration 3.2: (low speed) slow-moving beacon (velocity = 5 m/s)
M/N shall be greater than or equal to the following:
0.70 where:
M = number of solutions within 10 km
N = number of solutions
0.95 where:
M = number of solutions within 20 km

N = number of solutions

Configuration 4[10]: (medium speed) slow-moving beacon (velocity = [5 to 10] m/s)

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 10 km

N = number of solutions

0.95 where:

M = number of solutions within 20 km

N = number of solutions

Configuration ~~4~~5[11]: fast-moving beacon (velocity > ~~[~~10~~]~~ m/s)

M/N shall be greater than or equal to the following:

0.95 where:

M = number of solutions within TBD km

N = number of solutions

For each configuration, a histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 1 km increments from 0 to 20 km. All solutions with an error greater than 20 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

Solutions within 30 seconds after beacon activation

Statistics will be generated using the test script identified in Annex D.3.3.1 to meet the following requirements:

Configuration 1: static beacon

M/N shall be greater than or equal to the following:

0.97 where:

M = number of solutions within 5 km

N = number of solutions

Configuration 2: nearly-static beacon (velocity = 0.4 m/s)

M/N shall be greater than or equal to the following:

0.97 where:

M = number of solutions within 5 km

N = number of solutions

Configuration 3*.1*: *(low speed)* slow-moving beacon (velocity = 2 m/s)

M/N shall be greater than or equal to the following:

0.97 where:

M = number of solutions within TBD km

N = number of solutions

[10] Testing of Configuration 4 is not required for MEOLUT commissioning until the test velocity (in brackets) is finalized for Configuration 4, but could be provided if available.

[11] Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

Configuration 3.2: (low speed) slow-moving beacon (velocity = 5 m/s)

M/N shall be greater than or equal to the following) (M and N are solutions produced within 10 minutes from the first beacon message transmission):

0.75 where:

M = number of solutions within 5 km

N = number of solutions

0.95 where:

M = number of solutions within 7 km

N = number of solutions

Configuration 4[12]: (medium speed) slow-moving beacon (velocity = [5 to 10] m/s)

M/N shall be greater than or equal to the following:

0.70 where:

M = number of solutions within 10 km

N = number of solutions

0.95 where:

M = number of solutions within 20 km

N = number of solutions

Configuration ~~4~~5[13]: fast-moving beacon (velocity > ~~[~~10~~]~~ m/s)

M/N shall be greater than or equal to the following:

0.97 where:

M = number of solutions within TBD km

N = number of solutions

For each configuration, a histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 1 km increments from 0 to 20 km. All solutions with an error greater than 20 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

Solutions within 5 minutes after beacon activation

Statistics will be generated using the test script identified in Annex D.3.3.2 to meet the following requirements:

Configuration 1: static beacon

M/N shall be greater than or equal to the following:

0.97 where:

M = number of solutions within 1 km

N = number of solutions

Configuration 2: nearly-static beacon (velocity = 0.4 m/s)

[12] Testing of Configuration 4 is not required for MEOLUT commissioning until the test velocity (in brackets) is finalized for Configuration 4, but could be provided if available.

[13] Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

M/N shall be greater than or equal to the following:
0.97 where:
M = number of solutions within 1 km
N = number of solutions

Configuration 3*.1*: *(low speed)* slow-moving beacon (velocity = 2 m/s)
M/N shall be greater than or equal to the following:
0.95 where:
M = number of solutions within TBD km
N = number of solutions

Configuration 3.2: (low speed) slow-moving beacon (velocity = 5 m/s)
M/N shall be greater than or equal to the following) (M and N are solutions produced within 10 minutes from the first beacon message transmission):
0.75 where:
M = number of solutions within 5 km
N = number of solutions
0.95 where:
M = number of solutions within 7 km
N = number of solutions

Configuration 4[14]: (medium speed) slow-moving beacon (velocity = [5 to 10] m/s)
M/N shall be greater than or equal to the following:
0.70 where:
M = number of solutions within 10 km
N = number of solutions
0.95 where:
M = number of solutions within 20 km
N = number of solutions

Configuration ~~4~~5[15]: fast-moving beacon (velocity > ~~[~~10~~]~~ m/s)
M/N shall be greater than or equal to the following:
0.97 where:
M = number of solutions within TBD km
N = number of solutions

For each configuration, a histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 0.2 km increments from 0 to 10 km. All solutions with an error greater than 10 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

[14] Testing of Configuration 4 is not required for MEOLUT commissioning until the test velocity (in brackets) is finalized for Configuration 4, but could be provided if available.
[15] Testing of Configuration 5 is not required for MEOLUT commissioning until the location accuracy performance requirement (noted TBD) is finalized.

Solutions within 30 minutes after beacon activation

Statistics will be generated using the test script identified in Annex D.3.3.3 to meet the following requirements:

Configuration 1: static beacon

M/N shall be greater than or equal to the following:
0.97 where:
M = number of solutions within 0.1 km
N = number of solutions

Configuration 2: nearly-static beacon (velocity = 0.4 m/s)

M/N shall be greater than or equal to the following:
0.97 where:
M = number of solutions within 0.1 km
N = number of solutions

For each configuration, a histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 20 m increments from 0 to 1 km. All solutions with an error greater than 1 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

Solutions after 30 minutes after beacon activation

Statistics will be generated using the test script identified in Annex D.3.3.4 to meet the following requirements:

M/N shall be greater than or equal to the following:
0.97 where:
M = number of solutions within 0.1 km
N = number of solutions

A histogram for the location accuracy of the correct solutions shall be provided. The histogram shall be in 20 m increments from 0 to 1 km. All solutions with an error greater than 1 km shall be individually listed and an explanation for the error provided. The cumulative distribution function based on the histogram shall also be provided.

C.3.5 Expected Horizontal Error / Quality Factor

For each test configuration in section C.3.4, compare each beacon DOA location produced by the MEOLUT with the known location of the test beacon to derive the actual location error.

~~Check that the Expected Horizontal Error is greater than the actual location error with a probability in the range 0.93-0.97 as follows:~~

~~NC = number of locations with an actual location error < Expected Horizontal Error~~
~~NL = total number of locations~~
~~0.93 < NC/NL <0.97~~

Check that the Expected Horizontal Error is as follows:

$NC_{1/10}^{1/10}/NL < 0.15$

$0.93 \leq NC_1^1/NL \leq 0.97$
$NC_2^2/NL < 0.01$

With:

$NC_{1/10}^{1/10}$ = number of locations with a true location error < EHE/10
NC_1^1 = number of locations with a true location error < EHE
NC_2^2 = number of locations with a true location error > 2 x EHE
NL = total number of locations

In addition to each test configuration, EHE results should be reported for different location categories (containing at least 1,000 locations each), in order to avoid any averaging effect of the results. These categories[16] are:

- Single-burst locations *for at least one static primary test beacon within the DCA*,
- *Single-burst locations for at least one primary test slow-moving beacon within the DCA,*
- Multi-burst locations *for at least one static primary test beacon within the DCA*,
- *Multi-burst locations for at least one primary test slow-moving beacon within the DCA,*
- ~~Locations on static beacons,~~
- ~~Locations on moving beacons,~~
- Locations for *other available* test *beacons and for all active* ~~or~~ reference beacons located inside the DCA,
- Locations for *at least one other* ~~available~~ test *beacon if available and for all active* ~~or~~ reference beacons located outside the DCA*, which were detected by the MEOLUT under test*.

Plot the cumulative distribution of location error normalized by the EHE *for each category tested from the above list. Include with each plot the* EHE limit mask *as illustrated in Figure C.1 from section C.2.5. In this figure, points 1, 2, 3 and 4 bound the EHE mask, and the dotted curve is an example of a hypothetical cumulative distribution plot that would meet the performance requirement. The reported cumulative distribution for each plot must pass below point 1, between points 2 and 3, and above point 4 in order to meet the required performance*.

C.3.6 TOA/FOA Measurement Accuracy

For each received beacon message:

1. Filter out messages with received C/N_0 less than [30.55] dBHz or greater than [33.55] dBHz.
2. Determine the TOA and FOA measurement error using the known beacon position.

From the beacon log data as defined in Annex E (in particular the transmission time and frequency of the transmitted bursts), calculate:

1. The standard deviation of the error of the TOA and FOA measurements for all filtered beacon messages.
2. The bias of the mean of the error of the TOA and FOA measurements.

The standard deviation of the error shall be:

Better than [1] microseconds for TOA
Better than [0.2] Hz for FOA

[16] *Testing for fast moving beacon to be determined.*

The bias of the mean of the error shall be:

Less than [0.2] microseconds for TOA

Less than [0.02] Hz for FOA

C.3.7 Processing Anomalies

From the beacon message data table (see section E.3), collect detected C/S T.018 beacon messages received within ± 10 Hz from the expected received test-beacon frequency[17].

Count all messages (NM).

Count all anomalies (NA) which are defined as any beacon 23hex ID that does not match exactly the 23 hex ID of the beacons known to transmit within the test beacon frequency 10 Hz (e.g., test beacons, reference beacons, etc.).

Determine the probability (PA) to detect an anomaly:

PA = NA / NM

Check that PA is less than 10^{-4}.

- END OF ANNEX C -

[17] The expected received test beacon frequency depends on the beacon-to-satellite geometry, and thus is a function of the satellite channel; the expected received frequency of the test beacons or beacon simulator shall be then determined for each satellite channel, to allow the collection of received messages within ± 10 Hz of the expected received test beacon frequency.

ANNEX D

BEACON SIMULATOR TEST SCRIPT

D.1 Test Messages to be Transmitted for Beacon Message Processing

D.1.1 C/S T.001 Beacons

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date/Time (UTC)	Transmitted 30 Hex Transmitted Message (15 Hex Identifier, bits 26-85)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
Bit Rate Tolerance Check (BR)									
BR1	[TBD]	406.064	[TBD]	96EEF9DA0A2BA9EB5F96F400000F19 (2DDDF3B414FFBFF)	0	0	0	0	Transmit 20 bursts at the lower end of the permissible Bit Rate Range (396 bps)
	[TBD]	406.064	[TBD]	96EEF9DA0A2BA9EB5F96F400000F19	0	0	0	0	Transmit 20 bursts at the higher end of the permissible Bit Rate Range (404 bps)
Bit Verification (BV)									
BV1	USA	406.064	[TBD]	56EE1100000000037E540000000000 (ADDC22000000000)	2	0	n/a	n/a	USA, User Test coded beacon with two (2) bit errors introduced at bits 44 and 48 in PDF-1.
BV2	USA	406.064	[TBD]	D6E10E1A4324920458B9D555555555 (ADC21C348649240)	0	0	0	0	USA, Orbitography beacon with a pattern of A01" in the long message. No bit errors
		406.064	[TBD]	D6E10E1A4324920458B9D555555555	0	0	0	0	Same as above
BV3	USA	406.064	[TBD]	D6EEAAAAAAAAAAA2EA1A24E14CD2F4 (ADDD55555555554)	0	0	0	1	USA, User Test coded beacon with encoded position (39, -76.86667) in PDF-2. One bit error at bit 138.

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date/Time (UTC)	Transmitted 30 Hex Transmitted Message (15 Hex Identifier, bits 26-85)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
Message Validation (MV)									
MV1	USA	406.064	[TBD]	D6EE1100000000265F1424DB4CEFBF (ADDC22000000004)	2	0	0	2	USA, User Test coded beacon with encoded position (38.8667, -76.933) in PDF-1 *and PDF-2*. Two (2) bit errors at bits 44 and 48 in PDF-1. Two (2) bit errors at bits 133 and 134 in BCH-2
		406.064		D6EE0011100000265F1424DB4CE3BF	3	0	0	0	Three (3) bit errors at bits 52, 56 and 60 in PDF-1.
MV2	USA	406.064	[TBD]	96EE0000002729A5E22BB61B842E0A (2DDC000000FFBFF)	0	0	0	0	USA, Standard Location Protocol Test coded beacon with encoded position (38.884, -76.931) in PDF-1 and PDF-2.
		406.064		96EE0000002729A5E22BB61B842E0A	0	0	0	0	Same as above
		406.064		96EE0000002729A5E22BB61B842E0A	0	0	0	0	Same as above
		406.064	[TBD]	96EE00000029299B91383601261D93	0	0	0	0	Position updated to (40.996, -76.851).
		406.064		96EE00000029299B91383601261D9F	0	0	0	2	Two (2) bit errors at bits 141 and 142 in BCH-2.
MV5	France	406.064	[TBD]	8E3E0000002B80372E8B968E01107B (1C7C000000FFBFF)	0	0	0	0	France, Standard Location Test Encoded position (43.559, 1.482) in PDF-1 and PDF-2. Fixed Bit 107 in error Bits 107-110=0101 instead of 1101
MV6	France	406.064	[TBD]	8E3F00000AE2017508A9BE0F380330 (1C7E00003F81FE0)	0	0	0	0	France, National Location Test Protocol Encoded position (43.559, 1.482) in PDF-1 and PDF-2 Bit 109 in error. Bit 107-109= 111 instead of 110
Invalid Message Processing (IMP)									
IMP1	France	406.064	[TBD]	8E3E0780002B80372E8BB68E011E5C (PDF1: 1C7C0F000057006)	4	0	0	0	Transmission power 40 dBm France, Test User Four (4) bit errors at bits 46, 47,48 and 49 in PDF-1.

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date/Time (UTC)	Transmitted 30 Hex Transmitted Message (15 Hex Identifier, bits 26-85)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
Location Protocol Processing (LP)									
LP1	France	406.064	[TBD]	8E3E0000007FDFFC77A376000003DD (1C7C000000FFBFF)	0	0	0	0	France, Standard Location Protocol Test coded beacon with default encoded position in PDF-1 and 0s in PDF-2.
		406.064		8E3E0000007FDFFC77A376000003DD	0	0	0	0	Same as above
		406.064		8E3E0000007FDFFC77A376000003DD	0	0	0	0	Same as above
		406.064		8E3E0000002B80372E8BB68E011E5C	0	0	0	0	Encoded position (43.559, 1.482) in PDF-1 and PDF-2
		406.064		8E3E0000002B80372E8BB68E011E5C	0	0	0	0	Same as above
		406.064		8E3E0000002B80372E8BB68E011E5C	0	0	0	0	Same as above
LP2	France	406.064	[TBD]	8E3F00000AA20175813BB60F380F6B (1C7E00003F81FE0)	0	0	0	0	Encoded position (42.559, 1.482) in PDF-1 and PDF-2
		406.064		8E3F00000AA20175813BB60F380F6B	0	0	0	0	Same as above
		406.064		8E3F00000AA20175813BB60F380F6B	0	0	0	0	Same as above
		406.064		8E3F00000AE2017508A9B60F380F6B	0	0	0	0	France, National Location Protocol Test coded beacon with encoded position (43.559, 1.482) in PDF-1 and PDF-2
		406.064		8E3F00000AE2017508A9B60F380F6B	0	0	0	0	Same as above
		406.064		8E3F00000AE2017508A9B60F380F6B	0	0	0	0	Same as above
LP3	USA	406.064	[TBD]	D6EE1F1E1E1E1E06A383EFE0FF0146 (ADDC3C3C3C3C3C0)	1	0	0	0	USA, User Test coded beacon with user default information in PDF-2. One (1) bit error at bit 48 in PDF-1
		406.064		D6EE1F1E1E1E1E06A383E4E14CD2BE	1	0	0	2	Updated user information in PDF-2. One (1) bit error in bit 48 in PDF-1 and two (2) bit errors at bits 141 and 143 in BCH-2.
		406.064		D6EE1F1E1E1E1E06A383E4E14CD2BE	1	0	0	2	One (1) bit error in bit 48 in PDF-1 and two (2) bit errors at bits 141 and 143 in BCH-2.
		406.064		D6EE1F1E1E1E1E06A383E4E14CD2B4	1	0	0	0	One (1) bit error in bit 48 in PDF-1.

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date/Time (UTC)	Transmitted 30 Hex Transmitted Message (15 Hex Identifier, bits 26-85)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
LP4	USA	406.064	[TBD]	96EF000049C14CD260D5F608380389 (2DDE0000BF81FE0)	0	0	0	0	USA, National Location Protocol Test Coded beacon with encoded position (38.996, -76.851).
		406.064		96EF000049C14CD260D5F608380389	0	0	0	0	Same as above.
		406.064		96EF000049814CD2E947F608380389	0	0	0	0	Encoded position (37.996, -76.851) updated.
		406.064		96EF000049814CD2E947F60838038F	0	0	0	2	Two (2) bit errors in bits 142 and 143.
		406.064		96EF000049814CD2E947F6083803E9	0	0	0	2	Two (2) bit errors in bits 138 and 139.
Return Link (RL)									
RL1	France	406.064	[TBD]	8E3DC990004AE01ABB608866E0E91B (1C7B932000BFDFF)	0	0	0	0	RLS Location protocol encoded position (43.558, 1.484) in PDF-1 and PDF-2. The message shall be transmitted 12 times with a repetition period of 50 seconds.
		406.064	[TBD]	8E3DC990004AE01ABB608A66E0E5DF (1C7B932000BFDFF)	0	0	0	0	RLS Acknowledgment Message. The message shall be transmitted 12 times with a repetition period of 50 seconds.

D.1.2 C/S T.018 Beacons

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date/Time (UTC)	Transmitted 63 Hex Transmitted Message (23 Hex Identifier)	Number of Bit Errors		Comments
					PDF	BCH	
Message Recovery (MR)							
MR1	[TBD]	406.05	[TBD]	0035DB0038C95C7BE00BD8CE0003A000400BFFF0000004C0058AAAB8F5AB72E (9C74035DB00F0001D000200)	0	0	Transmit bursts with normal mode PRN
		406.05	[TBD]	8035DB0038C95C7BE00BD8CE0003A000402BFFF0000004C0058EE26F73C57BD (9C74035DB00F0001D000201)	0	0	Transmit bursts with self-test mode PRN
MR2	[TBD]	406.047	[TBD]	0035DB0038C95C7BE00BD8CE0003A000404BFFF0000004C005823B17F977608 (9C74035DB00F0001D000202)	0	0	Transmit 20 bursts at the lower limit of the processing bandwidth
		406.053	[TBD]	0035DB0038C95C7BE00BD8CE0003A000406BFFF0000004C0058673C07F1969B (9C74035DB00F0001D000203)	0	0	Transmit 20 bursts at the upper limit of the processing bandwidth
Bit Verification (BV)							
BV1	[TBD]	406.05	[TBD]	0035DB0038C95C7BE00BD8CE0F03A000440BFFF0000004C0058DC1D3FDC8F3E (9C74035DB00F0001D000220)	4	2	Transmit bursts with 6 bit errors on PDF+BCH
Invalid Message Processing (IMP)							
IMP1	[TBD]	406.05	[TBD]	0035DB0038C95C7BE00BD8CE0F13A000440BFFF0000004C0058DC1D3FDC8F3E (9C74035DB00F0789D000220)	5	2	Transmit bursts with 7 bit errors on PDF+BCH
Message Association (MA)							
MA1	[TBD]	406.05	[TBD]	0035DB0038D95C7BE00BD8CE0003A0004607FFF0000004C0059D4CA91301F1C (9C74035DB00F0001D000230)	1	0	1 burst with rotating fields #0
		406.05	[TBD]	3035DB0038D95C7BE00BD8CE0003A0004607FFF1546004E340058303AAC591F (9C74035DB00F0001D000230)	2	0	1 burst with rotating fields #1
		406.05	[TBD]	0035DB0038D9527BE00BD8CE0003A0004607FFF2202000000007C293A73E425 (9C74035DB00F0001D000230)	3	0	1 burst with rotating fields #2
		406.05	[TBD]	0035DB0038D9537BE00BD8CE0003A0004607FFF3000000000005C88D4AB605D (9C74035DB00F0001D000230)	4	0	1 burst with rotating fields #3
		406.05	[TBD]	0035DB0038D953FBE00BD8CE0003A0004604000FFFFFFFFFFFE26F3B2D9A480 (9C74035DB00F0001D000230)	5	0	1 burst with rotating fields #15
				Return Link (RL)			

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date/Time (UTC)	Transmitted 63 Hex Transmitted Message (23 Hex Identifier)	Number of Bit Errors		Comments
					PDF	BCH	
RL1	France	406.05	[TBD]	0035DB0038D95C7BE00BD8CE0003A0004807FFF0000004C005897BFDA16D56B (9C74035DB00F0001D000240) 0035DB0038D95C7BE00BD8CE0003A0004807FFF2202000000003F5C71552E52 (9C74035DB00F0001D000240)	0	0	Each message shall be transmitted 6 times alternating (at 30 seconds intervals) between the two beacon messages resulting in 12 bursts in total.
		406.05	[TBD]	0035DB0038D95C7BE00BD8CE0003A0004807FFF0000004C005897BFDA16D56B (9C74035DB00F0001D000240) 0035DB0038D95C7BE00BD8CE0003A0004807FFF2203000000003F5C71552E52 (9C74035DB00F0001D000240)	0	0	RLS Acknowledgment Message. Each message shall be transmitted 6 times alternating (at 30 seconds intervals) between the two beacon messages resulting in 12 bursts in total.

D.2 Expected Processing

D.2.1 C/S T.001 Beacons

Test Code Sequence	Message to be Transmitted by MEOLUT	Encoded Location	Comments
BR1	96EEF9DA0A2BA9EB5F96F400000F19	n/a	MEOLUT sends a valid message to the MCC.
BV1	56EE0000000000037E540000000000	n/a	MEOLUT should correct two bit errors and transmit corrected message to the MCC.
BV2	D6E10E1A4324920458B9D555555555	n/a	MEOLUT should transmit orbitography beacon message without error correcting the long message.
BV3	D6EEAAAAAAAAAAA2EA1A24E14CD2B4	39, -76.86667	MEOLUT should correct error at bit 138 and transmit alert to the MCC.
MV1	D6EE0000000000265F1424FFFFFFFF D6EE0000000000265F1424DB4CE3BF	n/a 38.8667, -76.933	For the first burst, MEOLUT corrects the beacon message (message is valid but not complete) and transmits the corrected message to the MCC with bits 113 to 144 all set to "1". For the second burst, MEOLUT corrects the beacon message (message is confirmed and complete) and transmits the corrected message to the MCC.
MV2	96EE0000002729A5E22BB61B842E0A *96EE00000029299B91383601261D93* *96EE00000029299B913836FFFFFFFF*	38.884, -76.931 *40.996, 76.851* *n/a*	*For the first burst, the* MEOLUT sends *a~~the first~~* complete, confirmed message to the MCC and calculates ~~*Doppler*~~ *DOA* position. *For the fourth burst the MEOLUT sends a complete, confirmed message to the MCC and calculates ~~Doppler~~DOA position.* *For the fifth burst the MEOLUT sends a confirmed but incomplete message to the MCC and calculates ~~Doppler~~DOA position.~~The 15hexID of the alert message is "2DDC000000FFBFF".~~*
MV5	8E3E0000002B80372E8BBFFFFFFFFF	n/a	MEOLUT sends a confirmed invalid message with an independent location to the MCC without bit correction in PDF1+BCH1 and with bits 107 to 144 set to "1".~~The 15hexID of the alert message is "1C7C00000057006".~~
MV6	8E3F00000AE2017508A9BFFFFFFFFF	n/a	MEOLUT sends a confirmed invalid message with an independent location to the MCC without bit correction in PDF1+BCH1 and with bits 107 to 144 set to "1".~~The 15hexID of the alert message is "1C7E000015C402E".~~
IMP1	Case 1: no message transmitted Case 2: 8E3E0780002B80372E8BBFFFFFFFFF	n/a	Two outcomes are possible for this test: Case 1: If 2 or less matching invalid messages, MEOLUT shall filter out messages. Case 2: If 3 or more matching invalid messages, MEOLUT sends a confirmed invalid message with an independent location to the MCC without bit correction in PDF1+BCH1 and with bits 107 to 144 set to "1". ~~The 15hexID of the alert message is "1C7C0F000057006".~~

Test Code Sequence	Message to be Transmitted by MEOLUT	Encoded Location	Comments
LP1	*8E3E0000007FDFFC77A376000003DD* 8E3E0000002B80372E8BB68E011E5C	*Default location* 43.559, 1.482	MEOLUT sends *two confirmed messages with the* updated ~~d~~ *of the encoded position*~~,~~ confirmed message for Standard Location Protocol beacon to MCC *and calculates* ~~*Doppler*~~*DOA position associated with both messages*.
LP2	*8E3F00000AA20175813BB60F380F6B* *8E3F00000AE2017508A9B60F380F6B* ~~*8E3800000AE20177ECCB360F380F6B*~~	*42.559, 1.482* 43.559, 1.482	MEOLUT sends updated, confirmed message for National Location Protocol beacon to MCC *and calculates* ~~*Doppler*~~*DOA position*.
LP3	1. D6EE1~~F~~E1E1E1E1E06A383EFE0FF0146 2. and/or 3. D6EE1E1E1E1E1E06A383E4FFFFFFFF 4.D6EE1E1E1E1E1E06A383E4E14CD2B4	n/a	MEOLUT sends: From transmitted burst #1: a confirmed or unconfirmed complete message (depending on the number matching received messages). From transmitted bursts #2 or #3 : a confirmed incomplete message with PDF-2 defaulted with bits 113 to 144 set to "1". Which burst is sent depends on which message is confirmed. If no confirmation is achieved, then no message is sent. From transmitted bursts #4: a confirmed or unconfirmed complete message (depending on the number matching received messages) with updated user information in new PDF-2.
LP4	96EF000049C14CD260D5F608380389 96EF000049814CD2E947F608380389 *96EF000049814CD2E947F6FFFFFFFF*	38.996, -76.851 37.996, -76.851 *n/a*	MEOLUT sends complete, confirmed message with an independent location to the MCC *and calculates* ~~*Doppler*~~*DOA position*. For the third burst MEOLUT sends complete, confirmed message to the MCC *and calculates* ~~*Doppler*~~*DOA position*. *For the fourth and fifth burst, the MEOLUT sends a confirmed but incomplete message to MCC depending on which message is confirmed and calculates* ~~*Doppler*~~*DOA position.*
RL1	8E3DC990004AE01ABB608866E0E91B 8E3DC990004AE01ABB608A66E0E5DF	43.558, 1.484	Forward Link message: MEOLUT sends at least one complete message to the MCC. Acknowledgment message: MEOLUT sends at least one complete acknowledgment message to the MCC.

D.2.2 C/S T.018 Beacons

Test Code Sequence	Message to be Transmitted by MEOLUT	Encoded Location	Comments
MR1	0035DB0038C95C7BE00BD8CE0003A000400BFFF0000004C0058AAAB8F5AB72E	43.56049, 1.48083	MEOLUT sends message with normal mode PRN to the MCC and filters out self-test mode PRN.
MR2	0035DB0038C95C7BE00BD8CE0003A000404BFFF0000004C005823B17F977608 and 0035DB0038C95C7BE00BD8CE0003A000406BFFF0000004C0058673C07F1969B	43.56049, 1.48083	MEOLUT records message and sends it to the MCC.
BV1	0035DB0038C95C7BE00BD8CE0003A000440BFFF0000004C0058DC1D3FDC8F3D	43.56049, 1.48083	MEOLUT should correct 6 bit errors and transmit corrected message.
IMP1	Case 1: no message transmitted Case 2: 0035DB0038C95C7BE00BD8CE0F13A000440BFFF0000004C0058DC1D3FDC8F3E	n/a	Two outcomes are possible for this test: Case 1: If 2 or less matching invalid messages, MEOLUT shall filter out messages. Case2: If 3 or more matching invalid messages, MEOLUT calculates and sends a location solution with a confirmed invalid message to the MCC without bit correction in PDF+BCH. The 23hexID of the alert message is “9C74035DB00F0789D000220”.
MA1	0035DB0038D95C7BE00BD8CE0003A0004607FFF0000004C0058D4CA91301F1C 0035DB0038D95C7BE00BD8CE0003A0004607FFF1546004E340058303AAC591F 0035DB0038D95C7BE00BD8CE0003A0004607FFF2202000000007C293A73E425 0035DB0038D95C7BE00BD8CE0003A0004607FFF3000000000005C88D4AB605D 0035DB0038D95C7BE00BD8CE0003A0004604000FFFFFFFFFFFE26F3B2D9A480	43.56049, 1.48083	MEOLUT corrects beacon messages and transmits corrected message to MCC even if the EHE does not decrease. The 23hexID of all alert messages is “9C74035DB00F0001D000230”.
RL1	0035DB0038D95C7BE00BD8CE0003A0004807FFF0000004C005897BFDA16D56B 0035DB0038D95C7BE00BD8CE0003A0004807FFF2202000000003F5C71552E52 0035DB0038D95C7BE00BD8CE0003A0004807FFF0000004C005897BFDA16D56B 0035DB0038D95C7BE00BD8CE0003A0004807FFF2203000000003F5C71552E52	43.56049, 1.48083 43.56049, 1.48083	Forward Link message: MEOLUT sends at least one valid message for each rotating field (#0 and #2) to the MCC. Acknowledgment message: MEOLUT sends at least one valid acknowledgment message for each rotating field (#0 and #2) to the MCC. The 23hexID of all alert messages is “9C74035DB00F0001D000240”.

D.3 Test Messages to be Transmitted for Performance Testing

D.3.1 General Performance Script for C/S T.001 Beacons

This annex provides a description of the beacon signals that have to be transmitted in order to generate the statistics for performance requirements described in Annex C. The script is comprised of 25 beacon IDs simultaneously active and each transmitting 12 bursts. The transmissions shall only use an unallocated channel of the 406 MHz frequency bandwidth. No beacon bursts shall overlap in time, and each beacon ID shall transmit at a fixed repetition period of 50 seconds without randomization.

The 15 Hex ID of beacon events are coded as follows: 9C9D0000YYD0037.

- 9C9D0: fixed value for all beacon events (this is an example using a French country code),
- YY : beacon event serial 01 to 25,
- D00: fixed value for all beacon events,
- 37: signifies nominal transmission power of 37 dBm,
- the transmitted frequency of each beacon event shall be $f_t = f_0 - 5450 + (YY - 1) * (2*5450)/(25-1)$ Hz (rounded to Hz), with f_0 being the center frequency of the beacon frequency channel used.

The first beacon (YY=01) shall transmit its first burst at time T_0. The second beacon (YY=02) shall transmit its first burst at T_0+2 seconds, the third beacon (YY=03) shall transmit its first burst at To+4 seconds, and so on, with the 25th beacon (YY=25) transmitting its first burst at T_0+48 seconds. The first beacon (YY=01) shall transmit its second burst at T_0+50 seconds, and the script shall continue as such until the 25th beacon (YY=25) transmits its 12th burst at T_0+598 seconds. Hence, one execution of this script shall produce a total of 300 bursts.

The appropriate country code is to be coded within the 15 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the inverted frame synchroniser pattern.

D.3.2 C/S T.001 ELT(DT) Beacons Scripts

D.3.2.1 Performance Evaluation Script

The script is comprised of 25 beacon IDs, each transmitting 63 bursts, with a fixed repetition rate of 28.5 seconds and beacon event separated by 1 s. The transmissions shall not use an operational channel of the 406 MHz bandwidth, but the transmission frequency shall be spread so that it covers a range of 10.9 kHz with a resolution of 412.5 Hz.

The script shall be repeated for a duration of at least 4 hours to allow various geometric configurations and tracking plan.

The 15 Hex ID of beacon events are coded as follows: 1C538 0ZZYY 3FDFF,

- 1C538: fixed value for all beacon events (this is an example using a French country code 226),
- YY: beacon event serial 01 to 25,
- D: fixed value for all beacon events,
- ZZ: frequency shift factor between 0 and 27 (the transmitted frequency shall be ft = f_0 +ZZ x 412.5 Hz, with f_0 = 406.058600 MHz the nominal frequency). A correspondence between ZZ and YY is given in the table below,
- FF: 37, signifies nominal transmission power of 37 dBm.

The appropriate country code is to be coded within the 15 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the inverted frame synchronization pattern (self-test mode).

The following table give additional guidance about the test script to be used:

15 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency ZZ
1C538 00001 3FDFF	0	37	0
1C538 01402 3FDFF	1	37	14
1C538 00703 3FDFF	2	37	7
1C538 02204 3FDFF	3	37	22
1C538 00105 3FDFF	4	37	1
1C538 01506 3FDFF	5	37	15
1C538 00807 3FDFF	6	37	8
1C538 02308 3FDFF	7	37	23
1C538 00209 3FDFF	8	37	2
1C538 01610 3FDFF	9	37	16
1C538 00911 3FDFF	10	37	9
1C538 02412 3FDFF	11	37	24
1C538 00313 3FDFF	12	37	3
1C538 01714 3FDFF	13	37	17
1C538 01015 3FDFF	14	37	10
1C538 02516 3FDFF	15	37	25
1C538 00417 3FDFF	16	37	4
1C538 01818 3FDFF	17	37	18
1C538 01119 3FDFF	18	37	11
1C538 02620 3FDFF	19	37	26
1C538 00521 3FDFF	20	37	5
1C538 01922 3FDFF	21	37	19
1C538 01223 3FDFF	22	37	12
1C538 02724 3FDFF	23	37	27
1C538 00625 3FDFF	24	37	6
1C538 00001 3FDFF	28.5	37	0
1C538 01402 3FDFF	29.5	37	14
…	…	…	…

D.3.2.2 Functional Validation Script

This script aims at validating specific management of ELT(DT) alerts at MEOLUT level.
The script is composed of one beacon transmitting the following sequence:

- 24 nominal bursts with 5 second repetition rate,
- 18 nominal bursts with 10 second repetition rate,
- 6 nominal bursts with 28.5 second repetition rate,
- 10 cancellation bursts with 10 second repetition rate,
- no transmission during 2 minutes,
- 24 nominal bursts with 5 second repetition rate,
- 18 nominal bursts with 10 second repetition rate,
- 6 nominal bursts with 28.5 second repetition rate.

The transmissions shall not use an operational channel of the 406 MHz bandwidth and shall be transmitted with a nominal power of 37 dBm. Beacon message should be encoded using normal mode and ELT(DT) test protocol in bits 41 and 42.

The bits 26 to 85 of transmitted messages of the simulated beacon for nominal transmissions is coded as follow: 1C538 ABCDE LLLLL:

- 1C538: fixed value for all beacon events (this is an example using a French country code 226),
- ABCDE: fixed value for all beacon events,
- LLLLL: latitude and longitude value, changing from burst to burst, consistent with linear motion at a speed of 1,200 km/h.

Additional beacon message definition:

- since the encoded location is encoded over PDF1 and PDF2 fields, both fields shall be constructed to provide a location that changes from burst to burst, consistent with horizontal motion at a speed of 1,200 km/h,
- the “means of activation” bits in PDF-2 should be set to ‘01’,
- the ‘encoded altitude’ bits should be set to a constant value of ‘0010’,
- the encoded location freshness bits should be set to ‘11’.

The bits 26 to 85 of transmitted messages (using hexadecimal representation) of the simulated beacon for cancellation transmission is coded as follow: 1C538 ABCDE 7EBFA:

- 1C538: fixed value for all beacon events (this is an example using a French country code 226),
- ABCDE: fixed value for all beacon events,
- 7EBFA: fixed value for cancellation message.

Note: the fixed bits of PDF-2 for cancellation message shall be set according to the beacon cancelation message definition in document C/S T.001.

D.3.3 General Performance Script for C/S T.018 Beacons

Performance scripts described in this section shall be transmitted in self-test mode to avoid any disruption of the operational System.

D.3.3.1 30-Second Script

This is a script for the first 30 seconds of beacon activation, to evaluate the detection and location performance for single burst and at 30 seconds from beacon activation.

This annex provides a description of the beacon signals that have to be transmitted in order to generate the statistics for performance requirements described in Annex C. The script is comprised of 4 beacon IDs, each transmitting 6 bursts with a repetition period of 5 seconds. The beacon IDs will increment from 1 to 100 in sets of 4 and then restart.

The 23 Hex ID of beacon events are coded as follows: ADF7 XXXX DNN~~N~~*F* 0PPD B000 001,

- ADF7: fixed value for all beacon events (this is an example using a USA country code),
- XXXX : beacon event ID 1 to 4, 5 to 8, …, 81 to 84, …, 97 to 100, 1 to 4, …,
- NN~~N~~ = total number of bursts (fixed value) to be transmitted for each beacon ID during each execution of the script (6),
- PP = transmitted power,
- FF: transmitted frequency that shall be $f_t = f_0 - 1650 + (XXXX -1) * (2*1650)/(100-1)$ Hz, with f_0 = 406.05 MHz (rounded to Hz),
- CRA: Chip Rate Accuracy, shall be so that CRA = 0.6*sin(pi/2*(XXXX-1)) chips/s,
- CRV: Chip Rate Variation, shall be so that CRV = 0.6*sin(pi/2*INT((XXXX-1)/4)) chips/s².

The appropriate country code is to be coded within the 23 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the Test Protocol bit set to “1”.

23 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency FF (Hz)	Chip rate accuracy CRA (chips/s)	Chip rate variation CRV (chips/s²)
ADF7 0001 ~~D006~~*D06F* 0PPD B000 001	0.0	PP	406048350	0	0
ADF7 0002 ~~D006~~*D06F* 0PPD B000 001	1.1	PP	406048383	0.6	0
ADF7 0003 ~~D006~~*D06F* 0PPD B000 001	2.2	PP	406048417	0	0
ADF7 0004 ~~D006~~*D06F* 0PPD B000 001	3.3	PP	406048450	-0.6	0
ADF7 0001 ~~D006~~*D06F* 0PPD B000 001	5.0	PP	406048350	0	0

23 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency FF (Hz)	Chip rate accuracy CRA (chips/s)	Chip rate variation CRV (chips/s²)
ADF7 0002 ~~D006~~*D06F* 0PPD B000 001	6.1	PP	406048383	0.6	0
ADF7 0003 ~~D006~~*D06F* 0PPD B000 001	7.2	PP	406048417	0	0
ADF7 0004 ~~D006~~*D06F* 0PPD B000 001	8.3	PP	406048450	-0.6	0
…	…	…		…	…
ADF7 0001 ~~D006~~*D06F* 0PPD B000 001	25.0	PP	406048350	0	0
ADF7 0002 ~~D006~~*D06F* 0PPD B000 001	26.1	PP	406048383	0.6	0
ADF7 0003 ~~D006~~*D06F* 0PPD B000 001	27.2	PP	406048417	0	0
ADF7 0004 ~~D006~~*D06F* 0PPD B000 001	28.3	PP	406048450	-0.6	0
ADF7 0005 ~~D006~~*D06F* 0PPD B000 001	30.0	PP	406048483	0	0.6
ADF7 0006 ~~D006~~*D06F* 0PPD B000 001	31.1	PP	406048517	0.6	0.6
ADF7 0007 ~~D006~~*D06F* 0PPD B000 001	32.2	PP	406048550	0	0.6
ADF7 0008 ~~D006~~*D06F* 0PPD B000 001	33.3	PP	406048583	-0.6	0.6
…	…	…			…
ADF7 0097 ~~D006~~*D06F* 0PPD B000 001	745.0	PP	406051550	0	0.6
ADF7 0098 ~~D006~~*D06F* 0PPD B000 001	746.1	PP	406051583	0.6	0.6
ADF7 0099 ~~D006~~*D06F* 0PPD B000 001	747.2	PP	406051617	0	0.6
ADF7 0100 ~~D006~~*D06F* 0PPD B000 001	748.3	PP	406051650	-0.6	0.6
ADF7 0001 ~~D006~~*D06F* 0PPD B000 001	750.0	PP	406048350	0	0
ADF7 0002 ~~D006~~*D06F* 0PPD B000 001	751.1	PP	406048383	0.6	0
ADF7 0003 ~~D006~~*D06F* 0PPD B000 001	752.2	PP	406048417	0	0
ADF7 0004 ~~D006~~*D06F* 0PPD B000 001	753.3	PP	406048450	-0.6	0
…	…	…	…		

D.3.3.2 5-Minute Script

This is a script for the first 5 minutes of beacon activation, to evaluate the location performance for single burst and at 5 minutes.

This annex provides a description of the beacon signals that have to be transmitted in order to generate the statistics for performance requirements described in Annex C. The script is comprised of 4 beacon IDs each transmitting 6 bursts with a repetition period of 5 seconds followed by 9 bursts with a repetition period of 30 seconds. The beacon IDs will increment from 1 to 16 in sets of 4 and then restart.

The 23 Hex ID of beacon events are coded as follows: ADF7 XXXX DNN~~N~~*F* 0PPD B000 001

- ADF7: fixed value for all beacon events (this is an example using a USA country code),
- XXXX : beacon event ID, 1 to 4, 5 to 8, 9 to 12, 13 to 16, 1 to 4, …,
- NN~~N~~ = total number of bursts (fixed value) to be transmitted for each beacon ID during each execution of the script (15),
- PP = transmitted power,
- FF: transmitted frequency that shall be $f_t = f_0 - 1650 + (XXXX -1) * (2*1650)/(16-1)$ Hz, with f_0 = 406.05 MHz (rounded to Hz),
- CRA: Chip Rate Accuracy, shall be so that CRA = 0.6*sin(pi/2*(XXXX-1)) chips/s,

- CRV: Chip Rate Variation, shall be so that CRV = 0.6*sin(pi/2*INT((XXXX-1)/4)) chips/s².

The appropriate country code is to be coded within the 23 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the Test Protocol bit set to "1".

23 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency FF (Hz)	Chip rate accuracy CRA (chips/s)	Chip rate variation CRV (chips/s²)
ADF7 0001 ~~D015~~ *D15F* 0PPD B000 001	0.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	1.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	2.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	3.3	PP	406049010	-0.6	0
ADF7 0001 ~~D015~~ *D15F* 0PPD B000 001	5.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	6.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	7.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	8.3	PP	406049010	-0.6	0
…	…	…		…	…
ADF7 0001 ~~D015~~ *D15F* 0PPD B000 001	25.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	26.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	27.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	28.3	PP	406049010	-0.6	0
ADF7 0001 ~~D015~~ *D15F* 0PPD B000 001	55.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	56.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	57.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	58.3	PP	406049010	-0.6	0
ADF7 0001 ~~D015~~ *D15F*-0PPD B000 001	85.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	86.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	87.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	88.3	PP	406049010	-0.6	0
…	…	…	…	…	…
ADF7 0001 ~~D015~~ *D15F* 0PPD B000 001	295.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	296.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	297.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	298.3	PP	406049010	-0.6	0
ADF7 0005 ~~D015~~ *D15F* 0PPD B000 001	300.0	PP	406049230	0	0.6
ADF7 0006 ~~D015~~ *D15F* 0PPD B000 001	301.1	PP	406049450	0.6	0.6
ADF7 0007 ~~D015~~ *D15F* 0PPD B000 001	302.2	PP	406049670	0	0.6
ADF7 0008 ~~D015~~ *D15F* 0PPD B000 001	303.3	PP	406049890	-0.6	0.6
…	…	…		…	…
ADF7 0013 ~~D015~~ *D15F* 0PPD B000 001	1195.0	PP	406050990	0	-0.6
ADF7 0014 ~~D015~~ *D15F* 0PPD B000 001	1196.1	PP	406051210	0.6	-0.6
ADF7 0015 ~~D015~~ *D15F* 0PPD B000 001	1197.2	PP	406051430	0	-0.6
ADF7 0016 ~~D015~~ *D15F* 0PPD B000 001	1198.3	PP	406051650	-0.6	-0.6
ADF7 0001 ~~D015~~ *D15F* 0PPD B000 001	1200.0	PP	406048350	0	0
ADF7 0002 ~~D015~~ *D15F* 0PPD B000 001	1201.1	PP	406048570	0.6	0
ADF7 0003 ~~D015~~ *D15F* 0PPD B000 001	1202.2	PP	406048790	0	0
ADF7 0004 ~~D015~~ *D15F* 0PPD B000 001	1203.3	PP	406049010	-0.6	0
…	…	…	…	…	…

D.3.3.3 30-Minute Script

This is a script for the first 30 minutes of beacon activation, to evaluate the location performance for single burst and at 30 minutes.

This annex provides a description of the beacon signals that have to be transmitted in order to generate the statistics for performance requirements described in Annex C. The script is comprised of 4 beacon IDs, each transmitting 6 bursts with a repetition period of 5 seconds followed by 59 bursts with a repetition period of 30 seconds. The beacon IDs will increment from 1 to 8 in sets of 4 and then restart to insure proper processing.

The 23 Hex ID of beacon events are coded as follows: ADF7 XXXX DNN~~N~~*F* 0PPD B000 001

- ADF7: fixed value for all beacon events (this is an example using a USA country code),
- XXXX : beacon event serial 1 to 4, 5 to 8, 1 to 4, …,
- NN~~N~~ = total number of bursts (fixed value) to be transmitted for each beacon ID during each execution of the script (65),
- PP = transmitted power,
- FF: transmitted frequency that shall be $f_t = f_0 - 1650 + (XXXX -1) * (2*1650)/(8-1)$ Hz, with f_0 = 406.05 MHz (rounded to Hz),
- CRA: Chip Rate Accuracy, shall be so that CRA = 0.6*sin(pi/2*(XXXX-1)) chips/s,
- CRV: Chip Rate Variation, shall be so that CRV = 0.6*sin(pi/2*INT((XXXX-1)/4)) chips/s².

The appropriate country code is to be coded within the 23 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the Test Protocol bit set to “1”.

23 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency FF (Hz)	Chip rate accuracy CRA (chips/s)	Chip rate variation CRV (chips/s²)
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	0.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	1.1	PP	406048821	0.6	0
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	2.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	3.3	PP	406049764	-0.6	0
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	5.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	6.1	PP	406048821	0.6	0
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	7.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	8.3	PP	406049764	-0.6	0
…	…	…	…	…	…
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	25.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	26.1	PP	406048821	0.6	0
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	27.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	28.3	PP	406049764	-0.6	0
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	55.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	56.1	PP	406048821	0.6	0

23 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency FF (Hz)	Chip rate accuracy CRA (chips/s)	Chip rate variation CRV (chips/s²)
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	57.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	58.3	PP	406049764	-0.6	0
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	85.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	86.1	PP	406048821	0.6	0
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	87.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	88.3	PP	406049764	-0.6	0
…	…	…		…	…
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	1795.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	1796.1	PP	406048821	0.6	0
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	1797.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	1798.3	PP	406049764	-0.6	0
ADF7 0005 ~~D065~~*D65F* 0PPD B000 001	1800.0	PP	406050236	0	0.6
ADF7 0006 ~~D065~~*D65F* 0PPD B000 001	1801.1	PP	406050707	0.6	0.6
ADF7 0007 ~~D065~~*D65F* 0PPD B000 001	1802.2	PP	406051179	0	0.6
ADF7 0008 ~~D065~~*D65F* 0PPD B000 001	1803.3	PP	406051650	-0.6	0.6
…	…	…		…	…
ADF7 0005 ~~D065~~*D65F* 0PPD B000 001	3595.0	PP	406050236	0	0.6
ADF7 0006 ~~D065~~*D65F* 0PPD B000 001	3596.1	PP	406050707	0.6	0.6
ADF7 0007 ~~D065~~*D65F* 0PPD B000 001	3597.2	PP	406051179	0	0.6
ADF7 0008 ~~D065~~*D65F* 0PPD B000 001	3598.3	PP	406051650	-0.6	0.6
ADF7 0001 ~~D065~~*D65F* 0PPD B000 001	3600.0	PP	406048350	0	0
ADF7 0002 ~~D065~~*D65F* 0PPD B000 001	3601.1	PP	406048821	0.6	0
ADF7 0003 ~~D065~~*D65F* 0PPD B000 001	3602.2	PP	406049293	0	0
ADF7 0004 ~~D065~~*D65F* 0PPD B000 001	3603.3	PP	406049764	-0.6	0
…	…	…	…	…	…

D.3.3.4 After 30-Minute Script

This is a script for transmission as after the 30 first minutes of beacon activation, to evaluation the location performance for single burst and after 30 minutes.

This annex provides a description of the beacon signals that have to be transmitted in order to generate the statistics for performance requirements described in Annex C. The script is comprised of 15 beacon IDs, each transmitting ~~60~~ *15* bursts with a repetition period of ~~30~~ *120* seconds. The beacon IDs will increment from 1 to 30 in sets of 15 and then restart.

The 23 Hex ID of beacon events are coded as follows: ADF7 XXXX DNN~~N~~*F* 0PPD B000 001

- ADF7: fixed value for all beacon events (this is an example using a USA country code),
- XXXX : beacon event serial 1 to 15, 16 to 30, 1 to 15, …,
- NN~~N~~ = total number of bursts (fixed value) to be transmitted for each beacon ID during each execution of the script (~~60~~*15*),
- PP = transmitted power,
- FF: transmitted frequency that shall be $f_t = f_0 - 1650 + (XXXX - 1) * (2*1650)/(30-1)$ Hz, with f_0 = 406.05 MHz (rounded to Hz),

- CRA: Chip Rate Accuracy, shall be so that CRA = 0.6*sin(pi/2*(XXXX-1)) chips/s,
- CRV: Chip Rate Variation, shall be so that CRV = 0.6*sin(pi/2*INT((XXXX-1)/4)) chips/s².

The appropriate country code is to be coded within the 23 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the Test Protocol bit set to "1".

23 Hex ID of Beacon	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency FF (Hz)	Chip rate accuracy CRA (chips/s)	Chip rate variation CRV (chips/s²)
ADF7 0001 ~~D060~~ *D15F* 0PPD B000 001	0	PP	406048350	0	0
ADF7 0002 ~~D060~~ *D15F* 0PPD B000 001	2	PP	406048464	0.6	0
ADF7 0003 ~~D060~~ *D15F* 0PPD B000 001	4	PP	406048578	0	0
…	…	…	…	…	…
ADF7 0015 ~~D060~~ *D15F* 0PPD B000 001	28	PP	406049943	0	-0.6
ADF7 0001 ~~D060~~ *D15F* 0PPD B000 001	~~30~~*120*	PP	406048350	0	0
…	…	…	…	…	…
ADF7 0001 ~~D060~~ *D15F* 0PPD B000 001	~~1770~~ *1680*	PP	406048350	0	0
…	…	…	…	…	…
ADF7 0015 ~~D060~~ *D15F* 0PPD B000 001	1798	PP	406049943	0	-0.6
ADF7 0016 ~~D060~~ *D15F* 0PPD B000 001	1800	PP	406050057	-0.6	-0.6
…	…	…	…	…	…
ADF7 0030 ~~D060~~ *D15F* 0PPD B000 001	1828	PP	406051650	0	-0.6
…	…	…	…	…	…
ADF7 0030 ~~D060~~ *D15F* 0PPD B000 001	~~3598~~ *3508*	PP	406051650	0	-0.6
ADF7 0001 ~~D060~~ *D15F* 0PPD B000 001	3600	PP	406048350	0	0
…	…	…	…	…	…

D.3.4 Scripts for C/S T.018 ELT(DT) Beacons

D.3.4.1 Performance Evaluation Script

Performance script described in this section shall be transmitted in self-test mode to avoid any disruption of the operational system.

The script is comprised of 25 beacon IDs, each transmitting 63 bursts, with a fixed repetition rate of 28.5 seconds and beacon events are separated by 1 second. The transmission frequency shall be spread around 406.05 MHz so that it covers a range of 3.3 kHz with a resolution of 412.5 Hz.

The script shall be repeated for a duration of at least 4 hours to allow various geometric configurations and tracking plan.

The 23 Hex ID of beacons events are coded as follows: 9C54 00YY DNN~~N~~*F* 0PPD BZZ0 001

- 9C54: fixed value for all beacon events (this is an example using a French country code 226),
- YY : beacon event serial 01 to 25,

- D: fixed value for all beacon events,
- NN~~N~~: total number of transmitted burst (fixed value) to be transmitted for each beacon ID during each execution of the script (63),
- PP: transmitted power,
- ZZ: frequency shift factor, between 0 and 8 (the transmitted frequency shall be $f_t = f_0 - 1650 + ZZ \times 412.5$ Hz, with $f_0 = 406.05$ MHz). A correspondence between ZZ and YY is given in the table below.

The appropriate country code is to be coded within the 23 Hex ID to indicate which beacon simulator is transmitting the burst.

The script of this test shall implement beacon messages using the normal spreading sequence with the Test Protocol bit 43 set to 1.

The following table give additional guidance about the test script to be used:

23 Hex ID	Time of Transmission T0 + XX s	Transmission Power (dBm)	Frequency ZZ
9C54 0001 ~~D063~~ *D63F* 0PPD B000 001	0	PP	0
9C54 0002 ~~D063~~ *D63F* 0PPD B080 001	1		8
9C54 0003 ~~D063~~ *D63F* 0PPD B010 001	2		1
9C54 0004 ~~D063~~ *D63F* 0PPD B070 001	3		7
9C54 0005 ~~D063~~ *D63F* 0PPD B020 001	4		2
9C54 0006 ~~D063~~ *D63F* 0PPD B060 001	5		6
9C54 0007 ~~D063~~ *D63F* 0PPD B030 001	6		3
9C54 0008 ~~D063~~ *D63F* 0PPD B050 001	7		5
9C54 0009 ~~D063~~ *D63F* 0PPD B000 001	8		0
9C54 0010 ~~D063~~ *D63F* 0PPD B080 001	9		8
9C54 0011 ~~D063~~ *D63F* 0PPD B010 001	10		1
9C54 0012 ~~D063~~ *D63F* 0PPD B070 001	11		7
9C54 0013 ~~D063~~ *D63F* 0PPD B020 001	12		2
9C54 0014 ~~D063~~ *D63F* 0PPD B060 001	13		6
9C54 0015 ~~D063~~ *D63F* 0PPD B030 001	14		3
9C54 0016 ~~D063~~ *D63F* 0PPD B050 001	15		5
9C54 0017 ~~D063~~ *D63F* 0PPD B000 001	16		0
9C54 0018 ~~D063~~ *D63F* 0PPD B080 001	17		8
9C54 0019 ~~D063~~ *D63F* 0PPD B010 001	18		1
9C54 0020 ~~D063~~ *D63F* 0PPD B070 001	19		7
9C54 0021 ~~D063~~ *D63F* 0PPD B020 001	20		2
9C54 0022 ~~D063~~ *D63F* 0PPD B060 001	21		6
9C54 0023 ~~D063~~ *D63F* 0PPD B030 001	22		3
9C54 0024 ~~D063~~ *D63F* 0PPD B050 001	23		5
9C54 0025 ~~D063~~ *D63F* 0PPD B040 001	24		4
9C54 0001 ~~D063~~ *D63F* 0PPD B000 001	28.5		0
9C54 0002 ~~D063~~ *D63F* 0PPD B080 001	29.5		8
…	…	…	…

D.3.4.2 Functional Validation Script

This script aims at validating specific management of ELT(DT) alerts at MEOLUT level.

The script is composed of one beacon transmitting the following sequence:

- 24 nominal bursts with 5 second repetition rate,
- 18 nominal bursts with 10 second repetition rate,
- 6 nominal bursts with 28.5 second repetition rate,
- 10 cancellation bursts with 10 second repetition rate,
- no transmission during 2 minutes,
- 24 nominal bursts with 5 second repetition rate,
- 18 nominal bursts with 10 second repetition rate,
- 6 nominal bursts with 28.5 second repetition rate.

The transmissions shall be done at 406.05 MHz.

The Hex ID of the simulated beacon for transmissions is coded as follow: 9C54 0000 D00~~0~~*F* 000D B000 001:

- 9C54: fixed value for all beacon events (this is an example using a French country code 226)

Additional beacon message definition:

- the encoded latitude/longitude in the main field of the message shall be constructed in the beacon message, consistent with horizontal beacon motion at 1,200 km/h,
- the rotating field shall be #1 with:
  - ‘Time of last encoded location’ should be all ones,
  - altitude of encoded location’ should be 0 m,
  - triggering event should be ‘1000’,
  - GNSS status should be 2D,
  - remaining battery capacity should be ‘11’.

The script of this test shall implement beacon messages using the normal spreading sequence with the Test Protocol bit 43 set to 1. For cancellation transmissions, the rotating field shall be #15 and the “method of deactivation” field shall be set to ‘01’.

- END OF ANNEX D –

ANNEX E

DATA FORMAT

E.1 General

This annex describes the data format to be provided in electronic files using ASCII format to the Cospas-Sarsat Secretariat when commissioning a MEOLUT. The data is to be provided in a comma separated value (csv) format, and each field shall include an entry. If there is no data for any given field, then the field can be empty. All solution data used in the commissioning testing shall be provided.

Data file shall use the suffix "_Ex.csv" (e.g., 2019-01-01_E2.csv for a MEOLUT satellite tracking file).

A description of the fields is provided below:

Field	Relative position of the data
Description	Description of the information provided
Detailed Format	Guidance on how the data should be provided
Type	C - Character, N - Numeric and L - Logical
Width	The total number of characters for the field
Dec	The total number of digits after the decimal point
MF#	Message Field as described in document C/S A.002 (SID)
Comments	

Table E.1: Description of the Fields

E.2 MEOLUT Satellite Tracking

The satellites tracked by the MEOLUT during the commissioning test period shall be documented using the following format.

Field	Description	Detailed Format	Type	Width	Dec	MF#	Comments
1	LUT ID	xxxx	N	4		11	
2	Antenna ID	xx	N	2		71	Note 1
3	Satellite ID	xxx	N	3		6	
4	AOS_Time (Acquisition of Signal) (UTC)	yyyy-mm-dd hh:mm:ss.xxx	C	23			
5	LOS_Time (Loss of Signal) (UTC)	yyyy-mm-dd hh:mm:ss.xxx	C	23			

Table E.2:MEOLUT Satellite Tracking

Note:

1 The antenna may be either:
   a. a traditional parabolic antenna that tracks a single satellite, or
   b. an antenna that may track multiple satellites simultaneously (e.g., a phased array).

   In either case, an antenna ID shall be provided.

E.3 Beacon Message Data

All beacon valid messages produced by the LUT for C/S T.001 and C/S T.018 beacons during the commissioning test period will be documented using the following format.

Field	Description		Detailed Format	Type	Width	Dec	MF#	Comments
1	Burst number (as collected)			N				
2	Raw/Full message (36 Hex) for C/S T.001 beacon, or raw/full message (63 Hex) for C/S T.018 beacon		h...h	C	36, or 63		77 for C/S T.001 beacons	Note 1
3	Beacon ID 15 Hex for C/S T.001 beacon, or 23 Hex for C/S T.018 beacon		h..h	C	15, or 23		22 for C/S T.001 beacons, or 92 for C/S T.018 beacons	
4	Time of beacon burst received (UTC)		yyyy-mm-dd hh:mm:ss.xxx	C	23	3		Note 2
5	FOA (Hz)		nnnnnnnnn.nnn	N	13	3	68	
6	Frequency Offset (Hz)		snnnnn.nnn	N	10	3	70	
7	TOA (UTC)		yyyy-mm-dd hh:mm:ss.xxxxxxxxx	C	29		67	
8	Time Offset (s)		n.nnnnnnnnn	N	11	9	69	
9	C/N_0 (dB.Hz)		nn.n	N	4	2	72	
10	Bit rate (bps)		nnn.nnn	N	7	3	73	
11	LUT ID - Antenna ID		nnnnnn	N	6		2-71	Note 3
12	Spacecraft ID		nnn	N	3		6	
13	Satellite position (km)	X	snnnnn.nnnn	N	11	4	75	Note 4
14		Y	snnnnn.nnnn	N	11	4		
15		Z	snnnnn.nnnn	N	11	4		
16	Satellite velocity (km/s)	X	snnn.nnnnnn	N	11	6	76	Note 5
17		Y	snnn.nnnnnn	N	11	6		
18		Z	snnn.nnnnnn	N	11	6		
19	BCH-1/BCH errors		n	1	1		91	Note 6
20	BCH-2 errors		n	1	1			Note 7

Table E.3: Beacon Message Data

Notes:

1 For C/S T.018 beacons, field 2 is composed of the 250-bit C/S T.018 raw/full message, which shall be left padded (to form a 63 Hex character) with the following two bits:

- bit 1: self-test indicator based on PRN sequence detected by the MEOLUT (0 = normal mode, 1 = self-test mode), followed by
- bit 2: 0.

2 The time of beacon burst received (UTC) is the time at which the burst is received at MEOLUT.

3 The LUT ID followed by the antenna ID to form a 6-digit field. The antenna may be a traditional parabolic antenna that tracks a single satellite or an antenna that may track multiple satellites simultaneously (e.g., a phased array). In either case, an antenna ID shall be included.

4 Associated satellite position data and associated reference frame (preferably Earth-Centered Earth-Fixed frame) may be provided or optionally disclosed.

5 Associated satellite velocity data and associated reference frame (preferably Earth-Centered Earth-Fixed frame) may be provided or optionally disclosed.

6 For C/S T.001 beacons, this field gives the number of corrected errors by BCH-1. The number of errors is comprised between 0 and 3. For C/S T.018 beacons, this field gives the number of corrected errors by the BCH error correcting code. The number of errors is comprised between 0 and 6.

7 For C/S T.001 beacons, this field gives the number of corrected errors by BCH-2. The number of errors is comprised between 0 and 2. If not applicable (because of a short message or a protocol that do not use BCH-2), this field shall be left empty. For C/S T.018 beacons, this field shall be left empty.

E.4 LUT Database for Solution Data

All the location solutions produced by the LUT for the beacon IDs reported in the commissioning report during the commissioning test period shall be documented according to the format defined.

Field	Description	Detailed Format	Type	Width	Dec	MF#	Comments
1	Solution ID		N				Note 1
2	LUTID	nnnn	N	4		2	
3	Time stamp of 1st burst used for location (UTC)	yyyy-mm-dd hh:mm:ss.xxx	C	23		14a	
4	Time stamp of last burst used for location (UTC)	yyyy-mm-dd hh:mm:ss.xxx	C	23		14b	
5	Time of location computation or time solution sent (UTC)	yyyy-mm-dd hh:mm:ss.xxx	C	23		3	
6	Beacon ID 15 Hex for C/S T.001 beacon, or 23 Hex for C/S T.018 beacon	h..h	C	15, or 23		22, or 92	
7	Estimated TransmissionFrequency	406.nnnnnnnn	N	12	8		Note 2

Field	Description	Detailed Format	Type	Width	Dec	MF#	Comments
8	Full message 36 Hex for C/S T.001 beacon, or 63 Hex for C/S T.018 beacon	h...h	C	36, or 63		77, or [90]	[note for MF#90]
9	Number of bursts used	nn	N	2		80	Note 3
10	Data used T/F/D	a	C	1			Note 4
11	LUT ID - Antenna IDs	nnnnnn ... nnnnnn	N			2-71	Note 5
12	Number of packets used to derive the solution	nnn	N	2		88	Note 6
13	Number of satellites used to derive the solution	nnn	N	3		Derived from MF#14	
14	Satellite IDs	nnn ... nnn	N			83	Note 7
15	JDOP	nn.nn	N	5	2		
16	Expected Horizontal Error	nnn.nn	N	7	3	89	
17	Location methodology	a - a	C	1			Note 8
18	Latitude(degree)	snn.nnnnn	M	9	5	25	Note 9
19	Longitude (degree)	snnn.nnnnn	N	10	5	26	Note 10
20	Altitude (km)	nn.nnnnnn	N	9	6	82	
21	Location error (km)	nnnn.nnn	N	8	3		Note 11
22	Course (degrees)	nnn	N	3	0		Note 12
23	Horizontal Speed Magnitude (m/s)	nnn.n	N	5	1		
24	Vertical Speed Magnitude (m/s)	snnn.n	N	6	1		
25	TOA residual standard deviation (s)	n.nnnnnnnnn	N	11	9		Note 13
26	FOA residual standard deviation (Hz)	nn.nnn	N	6	3		
27	Comment		C				

Table E.4: MEOLUT Solution Data

Notes:

1 This number has not to be generated by the LUT.

2 This value is an estimation of the beacon transmission frequency calculated as part of the location process.

3 Number of bursts used in location computation.

4 T – TDOA only, F – FDOA only, D – TDOA/FDOA.

5 A list of LUT ID - Antenna ID (field 11 of Table E.3) separated by spaces.

6 A packet is a burst received from a specific satellite/antenna combination (channel) with an associated TOA/FOA. A single transmitted burst can result in many packets received at a MEOLUT dependent on the number of available satellite data channels.

7 A list of satellite IDs separated by spaces. The satellites shall be listed in the same sequence as the LUT ID - Antenna ID specified in field 11.

8 Location methodology in the format "overall method – multi-burst method" where:

- "overall method" describes the type of location algorithm used.
  For example:

- P2Dd: position only in 2D with default altitude value,
- P2Dm: position only in 2D with altitude data obtained from a Digital Elevation Model,
- P3D: position only with altitude estimation,
- P2D/V3D: position in 2D and velocity in 3D,
- P3D/V3D: position in 3D and velocity in 3D,

- "multi-burst method" describes the type of multi-burst accumulation used.
  For example:
  - Global: use all TOA/FOA data available from multiple bursts to calculate a single location,
  - Average: an average of successive single-burst locations.

9 Latitude to be provided in decimal and ± format (i.e., without North or South indication).
10 Longitude to be provided in decimal and ± format (i.e., without East or West indication).
11 Can be empty.
12 Velocity estimation, when available, shall be with respect to the estimate location and may be provided or optionally disclosed. If not provided, leave it empty.
13 Can be set to 0 or to a default value if the number of measurements is equal to the number of unknowns, and may be provided or optionally disclosed. If not provided, leave it empty.

E.5 MCC message log table

All the location and detection solutions produced by the LUT and intended to be sent to the MCC during the commissioning test period shall be documented according to the same format provided in section E.4. If no location is available, the location fields (e.g., latitude, longitude, DOP etc.) would be empty.

SIT messages listed in Table 3.1 of document C/S T.019 shall be collected and provided as part of the data package.

E.6 Beacon Database Description

Field	Description	Detailed Format	Type	Width	Dec	MF#	Comments
1	Beacon Number	nn	N	2			
2	Location		C	11			
3	Beacon ID 15 Hex for C/S T.001 beacon, or 23 Hex for C/S T.018 beacon	h..h	C	15, or 23			
4	Beacon latitude	snn.nnnnn	N	9	5	25	
5	Beacon longitude	snnn.nnnnn	N	10	5	26	
6	Beacon altitude (km)	snn.nnn	N	7			
7	Type of Beacon		C	4			
8	Country Code		C	3			

Field	Description	Detailed Format	Type	Width	Dec	MF#	Comments
9	Activation Time	yyyy-mm-dd hh:mm:ss.xxx	N	23			
10	Deactivation Time	yyyy-mm-dd hh:mm:ss.xxx	N	23			
11	Actual Time “On”	yyyy-mm-dd hh:mm:ss.xxx	N	23			
12	Actual Time “Off”	yyyy-mm-dd hh:mm:ss.xxx	N	23			
	Comments		C				

Table E.6: Beacon Database Description

E.7 Beacon Test Script Log

All the beacon scripts used during the LUT commissioning test period shall be documented according using the following format.

Field	Description	Detailed Format	Type	Width	Dec	Comments
1	Transmission Time (UTC)	yyyy-mm-dd hh:mm:ss.xxxxxxxxx	N	29		
2	Beacon ID 15 Hex for C/S T.001 beacon, or 23 Hex for C/S T.018 beacon	h.h	C	15, or 23		
3	Full message 36 Hex for C/S T.001 beacon, or 63 Hex for C/S T.018 beacon	h…h	C	36, or 63		Note 1
4	Transmitted power (dBm)	nn	N	2		
5	Transmitted frequency (MHz)	nnn.nnnnnn	N	10		
6	Beacon latitude (deg)	snn.nnnnn	N	9	5	
7	Beacon longitude (deg)	snnn.nnnnn	N	10	5	
8	Beacon altitude (m)	nnnn	N	4		
9	Course (degrees)	nnn	N	3	0	Note 2
10	Horizontal Speed Magnitude (m/s)	nnn.n	N	5	1	
11	Vertical Speed Magnitude (m/s)	snnn.n	N	6	1	
12	Comments		C			

Table E.7: Beacon Test Script Log

Notes:

1 For C/S T.018 beacons, field 3 is composed of the 250-bit C/S T.018 raw/full message, which shall be left padded (to form a 63 Hex character) with the following two bits:

- bit 1: self-test indicator based on PRN sequence transmitted in the beacon script (0 = normal mode, 1 = self-test mode), followed by
- bit 2: 0.

2 these fields are optional and can be left empty if the beacon velocity is not known.

- END OF ANNEX E -

ANNEX F

MEOLUT COMMISSIONING - PRINCIPLES AND POLICIES

F.1 References

The Cospas-Sarsat Council approved the general principles of its commissioning policy for MEOLUTs, provided hereunder in sections F.2, F.3 and F.4.

F.2 General

The following principles govern the commissioning of Cospas-Sarsat Ground Segment equipment:

F.2.1 A State which has notified its association with the Cospas-Sarsat Programme as a Ground Segment Provider assumes the responsibility "to adhere to the technical specifications and operating procedures set by the Council for the purpose of ensuring adequate System performance" and "to provide, as agreed with the Council, appropriate performance data in order to confirm compatibility of its Ground Segment equipment with the System" (section 3.1 of the Letter of Notification).

F.2.2 Cospas-Sarsat performance specification and design guidelines for MEOLUTs and MCCs are defined in documents C/S T.019 and C/S A.005, respectively.

F.2.3 Cospas-Sarsat criteria and test methods for verifying that MEOLUTs and MCCs meet these standards are defined in documents C/S T.020 and C/S A.006, respectively.

F.2.4 The responsible Agency or Administration installing and planning to operate a new MEOLUT or MCC shall plan and conduct appropriate tests, in accordance with the applicable Cospas-Sarsat standards, which may form part of its own acceptance testing.

F.2.5 A commissioning report, including the results of the commissioning tests defined by Cospas-Sarsat, shall be submitted to the Cospas-Sarsat Secretariat, for review by the Joint Committee. The commissioning report must be submitted six weeks prior to the Joint Committee meeting. Reports submitted less than six weeks in advance will be considered at the subsequent Joint Committee meeting.

F.2.6 After review of the commissioning report, the Joint Committee makes appropriate recommendations to the Cospas-Sarsat Council. Formal commissioning is recorded at the subsequent Council meeting, after approval of the Joint Committee recommendation by the Council.

F.2.7 This commissioning and reporting procedure shall be implemented by all Cospas-Sarsat Ground Segment Providers, including Parties to the International Cospas-Sarsat Programme

Agreement, for commissioning new MEOLUTs and MCCs or new equipment or functions which have a significant impact on the Cospas-Sarsat Ground Segment operation.

F.2.8 The cost of implementing the commissioning procedure and reporting to the Cospas-Sarsat Joint Committee is borne by the operating Agency or Administration installing the equipment to be commissioned.

F.2.9 Ground Segment equipment will be commissioned into the Cospas-Sarsat System only if the formal association of the MEOLUT and MCC operator with the Cospas-Sarsat Programme has been notified in accordance with the standard procedure, unless otherwise agreed by the Council.

F.3 LUT Commissioning

The following principles govern the implementation of the Cospas-Sarsat MEOLUT Commissioning Standard (C/S T.020):

F.3.1 The implementation of the commissioning procedure defined in document C/S T.020 is the responsibility of the operating Agency or Administration.

F.3.2 The operating Agency or Administration will be responsible for equipment which may be required for performing the commissioning tests.

F.3.3 A MEOLUT may be commissioned as a stand-alone system, independent of an MCC. However, MEOLUT commissioning may take place at the same time that the associated MCC is being commissioned.

F.3.4 The MEOLUT/MCC interface is part of the MEOLUT commissioning. Therefore, it shall be tested as part of the MEOLUT commissioning procedure.

F.3.5 If the test results in the commissioning report submitted by the operating Agency or Administration do not demonstrate full compliance document C/S T.019, corrective action shall be taken by the operating Agency or Administration.

F.3.6 If the test results in the commissioning report submitted by the operating Agency or Administration do demonstrate full compliance with document C/S T.019, the alert data derived from the new MEOLUT can be immediately used by the associated MCC for distribution in accordance with document C/S A.001.

F.3.7 Once the alert data derived from the new MEOLUT begins to be used by the associated MCC, a change of System status shall be notified to all MCCs by the associated MCC, in accordance with the procedure of document C/S A.001.

F.3.8 The Joint Committee shall, at its following meeting, review the commissioning report and recommend to the Cospas-Sarsat Council, as appropriate, formal commissioning of the MEOLUT.

F.4 Status of the Cospas-Sarsat Ground Segment

F.4.8 After their commissioning, MEOLUTs are listed and described as appropriate in the applicable System documents and the "Cospas-Sarsat System Data" document.

F.4.8 The Cospas-Sarsat MEOLUTs commissioned in the Cospas-Sarsat System shall be listed on the Cospas-Sarsat website www.cospas-sarsat.int.

- END OF ANNEX F -

ANNEX G

GUIDELINES FOR INTEGRATION OF NEW MEOLUTS IN THE COSPAS-SARSAT SYSTEM

The introduction of new MEOLUTs in the Cospas-Sarsat System is supervised by the Technical Working Group (TWG) of the Cospas-Sarsat Joint Committee whose objectives include:

a) the improvement of the overall performance of the Cospas-Sarsat Ground Segment; and

c) the technical control of the development of the Cospas-Sarsat LUTs.

The guidelines hereunder, and Figure G.1, provide procedures for integrating a new MEOLUT into the Cospas-Sarsat Ground Segment.

1. Installation of New Equipment - The new MEOLUT(s) equipment should be sited to allow the widest possible horizon and to maximize coverage of national SRRs as well as the entire Cospas-Sarsat System. The location of the MEOLUT(s) should also allow for reliable communications with the associated MCC.

2. Ground Segment Description and MEOLUT Coverage - The national Administration should ensure that a description of the new MEOLUT(s) along with (1) coordinates, (2) address, (3) frequencies and (4) MEOLUT antenna masks are provided to the Cospas-Sarsat Secretariat.

   The national Administration should also ensure that their MEOLUT(s) are properly registered with the International Telecommunications Union (ITU). The forms provided in Annex H to this document should be completed and forwarded to ITU through the appropriate national authorities.

3. Commissioning Test - For new Ground Segment Providers, the MEOLUT Commissioning tests may be scheduled to coincide with the MCC commissioning tests. In any case, the MEOLUT should be connected to the MCC and tested in its operational configuration , including optional capabilities, if used. However, statistics for optional capabilities shall be collected separately.

   The MEOLUT Operator should ensure that test beacon(s) capable of transmitting the test code sequences contained in Annex D is (are) available for the commissioning test, or the MEOLUT Operator should coordinate with beacon simulator providers in the USA or France for the transmission of such code sequences. If test beacons/simulators cannot be used during the commissioning test, the MEOLUT Operator should ensure that an alternative method of confirming compliance is identified.

   The relevant sections of this document describe the operational, functional and processing, and performance requirements to be tested. During the test, the data from the MEOLUT(s) should be transmitted to the associated MCC, however, the data should be suppressed by the MCC and not transmitted within the Cospas-Sarsat System.

4. Preparation of Commissioning Report - The results of the tests, along with the proper declarations and verifications for items not specifically tested, should be documented in a commissioning report. Annex A to this document contains the format of the commissioning report.

The commissioning report should include as a minimum the information requested in this document and in the format contained in Annex A. In addition, information to explain or clarify results should also be included in the commissioning report.

Any anomaly, or failure to meet a requirement, observed during the commissioning test should be corrected and the requirement re-tested. After the MEOLUT satisfies the requirements of document C/S T.019, the completed commissioning report should be submitted by the national Administration to the Cospas-Sarsat Secretariat.

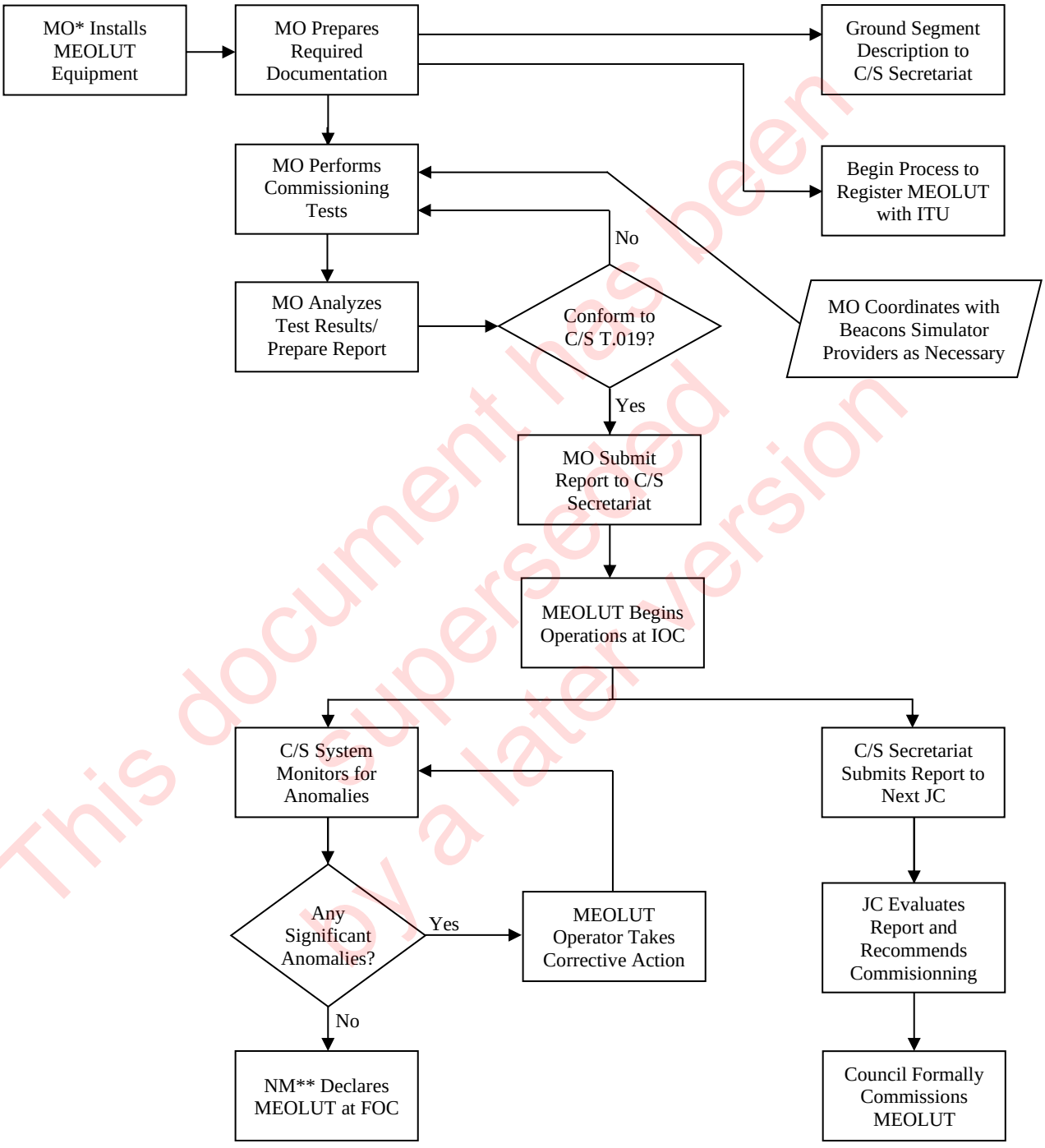
5. Initial Operational Capability (IOC) - If the commissioning test has been completed successfully, and the commissioning report has been forwarded to the Cospas-Sarsat Secretariat, the MEOLUT may begin operations in an IOC status. However, the MEOLUT cannot reach IOC status prior to the MCC IOC date if the associated MCC is also in the commissioning process. The national Administration, through its associated MCC, should notify all Ground Segment Operators of a MEOLUT's IOC status via a System Status message.

   The IOC phase allows a thorough review of the MEOLUT performance. However a MEOLUT shall not remain in an IOC phase for more than one year. MEOLUTs that have not reached FOC within one year will be considered not operational, and documented as "Under Development". To regain IOC status the MEOLUT will require a retest of the elements which prevented it from reaching FOC. The MEOLUT then must operate again in an IOC phase prior to reaching FOC. All Cospas-Sarsat Ground Segment Operators should monitor the data from new MEOLUTs for any significant anomalies that could impact Cospas-Sarsat operations.

6. Full Operational Capability (FOC) - If after 90 days of operation in an IOC state no anomalies are detected in the performance of the MEOLUT, the MEOLUT should be declared at FOC by the appropriate nodal MCC. The transition of a MEOLUT from an IOC status to a FOC status ensures that the MEOLUT performs to Cospas-Sarsat standards and does not negatively impact System operations.

7. Formal Commissioning - The Joint Committee reviews the commissioning report and, pending additional details or explanations, submits the report to the Cospas-Sarsat Council. The Council accepts the commissioning report and the MEOLUT is formally commissioned in the Cospas-Sarsat Ground Segment.

Figure G.1: Overview of MEOLUT Integration



* MO: MEOLUT operator
** NO: Nodal MCC

- END OF ANNEX G -

ANNEX H

GUIDELINES FOR REGISTRATION OF NEW MEOLUTS WITH ITU

[This Annex shall be taken from the corresponding Annex of document C/S T.005 (LEOLUT Commissioning Standard) or document C/S T.010 (GEOLUT Commissioning Standard), with the appropriate changes made to ensure that all references to LEOLUTs or GEOLUTs are changed to MEOLUTs.]

- END OF ANNEX H -

- END OF DOCUMENT -

Cospas-Sarsat Secretariat
1250 Boul. René-Lévesque West, Suite 4215, Montreal (Quebec) H3B 4W8 Canada
Telephone: +1 514 500 7999 / Fax: +1 514 500 7996
Email: mail@cospas-sarsat.int
Website: www.cospas-sarsat.int