COSPAS-SARSAT
GEOLUT COMMISSIONING STANDARD

C/S T.010
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COSPAS-SARSAT GEOLUT COMMISSIONING STANDARD

History

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1. INTRODUCTION

1.1 Overview

The GEOLUT commissioning standard shall be used to verify that a Geostationary local user terminal (GEOLUT) complies with the Cospas-Sarsat GEOLUT Performance Specification (C/S T.009). The national Administrations that wish to connect a new GEOLUT to the Cospas-Sarsat Network shall conduct the tests and provide the data, specified in this document to the Cospas-Sarsat Secretariat.

1.2 Scope

This standard specifies the testing and reporting requirements for the commissioning of a Cospas-Sarsat GEOLUT. Section 2 defines the general commissioning process, section 3 describes the evaluation of the operational requirements, section 4 specifies the evaluation of functional and processing requirements and section 5 specifies the evaluation of performance requirements. The annexes define the test data format requirements, and the content and format of the commissioning report which is to be submitted to the Cospas-Sarsat Secretariat.

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1.3 Reference Documents

The latest version of the following documents contain useful information applicable to GEOLUT commissioning:

a. C/S A.001, Cospas-Sarsat Data Distribution Plan (DDP);
b. C/S A.002, Cospas-Sarsat Mission Control Centres Standard Interface Description (SID);
c. C/S A.005, Cospas-Sarsat Mission Control Centre Performance Specification and Design Guidelines;
d. C/S A.006, Cospas-Sarsat MCC Commissioning Standard;
e. C/S T.001, Specification For Cospas-Sarsat 406 MHz Distress Beacons;
f. C/S T.002, Cospas-Sarsat LEOLUT Performance Specification and Design Guidelines;
g. C/S T.005, Cospas-Sarsat LEOLUT Commissioning Standard;
h. C/S T.006, Cospas-Sarsat Orbitography Network Specification;
i. C/S T.009, Cospas-Sarsat GEOLUT Performance Specification and Design Guidelines; and
j. C/S T.011, Description of the 406 MHz Payloads Used in the Cospas-Sarsat GEOSAR System.

-END OF SECTION 1-

2. GEOLUT COMMISSIONING

2.1 General

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

The commissioning requirements detailed herein verify the GEOLUT's ability to receive and process signals transmitting in the 406 MHz band in accordance with the Cospas-Sarsat GEOLUT Performance Specification and Design Guidelines (C/S T.009). Consequently each specification detailed in document C/S T.009 has associated commissioning requirements detailed herein. A matrix identifying the requirements in document C/S T.009 and the corresponding sections in this document is provided at Annex I. All tests required to commission the GEOLUT shall be conducted with the GEOLUT 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.

For multiple GEOLUT installations, each GEOLUT shall be commissioned individually and as if it were a stand-alone GEOLUT. A GEOLUT which is capable of operating with more than one type of GEOSAR satellite shall be commissioned separately for each type. The national Administration may conduct the testing and submit the commissioning reports for each of the GEOLUT / type of GEOSAR satellite combination to the Cospas-Sarsat Secretariat separately or at the same time.

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2.2 Pre-Test Requirements

Prior to commencing the testing portion of the commissioning programme, the national Administration conducting the tests shall co-ordinate with the appropriate authorities in its SAR region, as well as notify all affected Cospas-Sarsat MCCs, of the test periods and the test beacon location(s). This information shall also be provided to the Cospas-Sarsat Secretariat. The time and dates for performing commissioning tests should be chosen such that the operational impact of the testing on the LEOSAR system is minimized.

2.3 Test Data Collection

The GEOLUT commissioning process involves collecting specified numbers of error free 406 MHz beacon messages. As test transmissions in the 406 MHz band will be detected and processed by other LEOLUTs, GEOLUTs, and MCCs, it is desirable to complete the tests as quickly as possible in order to reduce the volume of non-emergency messages handled by other national Administrations.

2.4 Frequency Registration

Administrations should register their use of the downlink frequency band processed by their GEOLUTs with the International Telecommunication Union (ITU) in accordance with article 11 of the radio regulations. The information required to notify GEOLUTs 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. A separate GEOLUT notification should be filed with the ITU for each type of GEOSAR satellite with which the GEOLUT operates.

2.5 Data Collection Limitation

Only the data collected from those GEOSAR satellites that comply with the document Description of the 406 MHz Payloads Used in the Cospas-Sarsat System (C/S T.011) should be used for the statistical data analysis. Data for GEOLUT commissioning purposes should be collected only from commissioned GEOSAR satellites, and not from GEOSAR satellites in initial operational capability (IOC) status.

2.6 Submission of Results

The national Administration wishing to commission a GEOLUT into the Cospas-Sarsat System, shall submit a commissioning report (as detailed at Annex A) and the data requested at Annex D to the Cospas-Sarsat Secretariat for 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 four 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.

Those items not in compliance with the specification shall be highlighted in the appropriate portions of the commissioning report.

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2.7 GEOLUT Commissioning and Integration

The decision to approve the commissioning of a GEOLUT will be based on the information contained in the GEOLUT commissioning report provided by the national Administration. The commissioning report will be reviewed by the Cospas-Sarsat Secretariat and submitted to the Joint Committee. The GEOLUT will be integrated into the Cospas-Sarsat Ground Segment as described in Annex F and Annex G.

2.8 Confirmation of Requirements

The national Administration shall confirm compliance to all requirements detailed in this document with either a measurement, verification, declaration, or combination of these methods. The exact method of confirming compliance for each requirement is summarized at Annex I.

A measurement requires the national Administration to conduct a test and include the supporting data as part of the commissioning report. 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. A declaration of compliance confirms that specific requirements are met although not necessarily tested as part of the commissioning process. Conformance to all requirements shall be documented in the commissioning report.

2.9 Change of Location

If the location of a commissioned GEOLUT has been changed, the responsible national Administrations shall ensure that the GEOLUT continues to satisfy C/S T.009 requirements prior to resuming operations. Additionally, the national Administrations shall:

a) confirm that the level of local interference does not adversely affect GEOLUT performance;
b) verify the performance of the communication links in the new location;
c) verify the performance of the antenna and RF subsystems; and
d) update the technical file of the GEOLUT commissioning report (Appendix 1 to Annex A refers) by providing a declaration that the GEOLUT satisfies C/S T.009 requirements and the following information, to the Cospas-Sarsat Secretariat:
    i. Antenna Characteristics (Annex A, Appendix 1, section A.2.1),
    ii. General GEOLUT 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 GEOLUT Support Equipment Description (Annex A, Appendix 1, section A.2.3) - identify any changes to the list of frequency reference beacons, or indicate “no change” if the configuration has not been changed,
    iv. General Capabilities (Annex A, Appendix 1, section A.2.3) - identify any changes to the general capabilities of the GEOLUT, or indicate “no change” if appropriate,
    v. Communications Capability (Annex A, Appendix 1, section A.4),
    vi. Coverage (Annex A, Appendix 1, section A.5),
    vii. Location (Annex A, Appendix 1, section A.6).

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-END OF SECTION 2-

3. EVALUATION OF OPERATIONAL REQUIREMENTS

3.1 GEOLUT Data Availability

The GEOLUT 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 GEOLUT, the GEOLUT shall be considered unavailable for that time period.

3.2 Data Requirements

The national Administration shall verify that the GEOLUT satisfies the data requirements detailed at document C/S T.009. This will ensure that the GEOLUT provides the data necessary for the associated MCC to distribute alert data according to the document C/S A.002 (SID). This shall be verified and noted in the appropriate section of the GEOLUT commissioning report.

3.3 Satellite Tracking Capability

The national Administration shall conduct tests and record the measurements in accordance with Annex B, to demonstrate that the GEOLUT is capable of continuously receiving the downlink signal from the GEOSAR satellite. In addition, the national Administration shall declare that the GEOLUT is capable of detecting and processing beacon signals in the entire uplink bandwidth that is used by the selected GEOSAR satellite for operational beacons.

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3.4 Satellite Visibility

The national Administration shall verify the elevation angle between the GEOLUT and all the satellites with which it may operate, and report this information in the appropriate section of the GEOLUT commissioning report.

3.5 Status and Alarm

The national Administration shall describe the status and alarm functions of the GEOLUT and declare compliance to the appropriate section of document C/S T.009 (GEOLUT specification) in the GEOLUT commissioning report.

3.6 RF Radiation and Emissions

The national Administration shall verify that the GEOLUT 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 GEOLUT commissioning report.

3.7 Interference

The national Administration shall verify the GEOLUT's ability to operate in the presence of interfering

signals in the beacon to GEOSAR uplink signal, the GEOSAR to GEOLUT downlink signal, and in the GEOLUT's local site environment. Conformance to this specification shall be documented in the GEOLUT commissioning report.

3.8 Data Archiving

The national Administration shall describe the data archiving capability of the GEOLUT and declare compliance in the appropriate section of the GEOLUT commissioning report.

- END OF SECTION 3 -

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4. EVALUATION OF FUNCTIONAL AND PROCESSING REQUIREMENTS

4.1 Functional Requirements

4.1.1 Antenna and RF Subsystem

The national Administration shall verify and document in the GEOLUT commissioning report that the antenna and RF subsystem of the GEOLUT can acquire and continuously receive the downlink signal from the GEOSAR satellite(s) with which the GEOLUT will operate.

4.1.2 Time and Frequency Reference Subsystems

The national Administration shall declare, in the GEOLUT commissioning report, the GEOLUT's ability to satisfy time and frequency reference requirements detailed in document C/S T.009.

The GEOLUT may use one or more reference beacon signals to maintain the frequency stability required to meet the specification. The identification of any such reference beacon(s) shall be included in the GEOLUT Commissioning Report.

4.1.3 MCC Interface

The national Administration shall verify that the GEOLUT provides timely alert data of the level of quality and detail as specified in document C/S T.009. This will enable the associated MCC to satisfy the requirements of documents C/S A.002 (SID) and C/S A.005 (MCC Specification). This verification shall be documented in the GEOLUT commissioning report.

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4.2 Processing Requirements

The national Administration shall conduct tests and, record the results in the appropriate section of the commissioning report, which confirm the GEOLUTs compliance to the "processing requirements" detailed in document C/S T009.

These tests require the GEOLUT to process the 406 MHz data described at Annex C in the manner prescribed. The processing consists of bit verification, message validation, message processing and transmission. The specific beacon test messages contained at Annex C 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 in the manner and at the frequencies described at Annex C. Alternatively, national Administrations may arrange for the simulators in the United States or France to uplink the messages contained at Annex C.

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 shall

not prevent the GEOLUT 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 -

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5. EVALUATION OF PERFORMANCE REQUIREMENTS

5.1 Performance Requirements Testing

The national Administration shall conduct tests and record the associated measurements to demonstrate that the GEOLUT satisfies the following C/S T.009 performance specifications:

a) processing performance;
b) frequency measurement; and
c) capacity.

The detailed test procedures, required analysis, and reporting requirements are detailed at Annex B.

The identifier(s) of the test or reference beacon(s) used to evaluate the frequency stability of the GEOLUT shall be reported in the Commissioning Report. None of these test beacons may be any of the beacon(s) used as a frequency reference beacon (as described in paragraph 4.1.2)

5.2 Performance Requirements Verification

The national Administration shall verify that the GEOLUT satisfies the System downlink fading specification and the requirement concerning false alerts caused by processing anomalies, detailed in document C/S T.009. This verification shall be documented in the GEOLUT commissioning report.

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ANNEXES TO
COSPAS-SARSAT
GEOLUT COMMISSIONING STANDARD

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ANNEX A - GEOLUT COMMISSIONING REPORT

Country or National Administration: _____

Location of GEOLUT: _____

Cospas-Sarsat Identifier: _____

Start of Commissioning Period: _____

End of Commissioning Period: _____

Section 1.0 contains a summary of the commissioning results as well as the declarations (D) and the verifications (V) by the national Administration for requirements not specifically measured.

The organization of the summary table follows the requirements contained in document C/S T.009. Section 2.0 contains the results of measurements (M) used to support the results presented in section 1.0. A copy of the associated data is provided in ASCII format as required by document C/S T.010. A technical description of the GEOLUT is presented in Appendix 1.

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1.0 Summary Table

Table A.1 - GEOLUT Commissioning Summary Data Table (General Part)

Paragraph in C/S T.009	Requirement or Test	Pass Criteria	Result	Pass/ Fail	Method of Compliance	Declaration/Verification or Comments
3.1	GEOLUT Data Availability	A≥0.95			M	
3.2	Data Requirements	C/S T.009 refers	N/A		V	
3.3	Satellite Tracking Capability	L=0 (applicable for satellites with downlink carrier) Full BW			M or D D	Measurement for carrier lock (L) is only applicable for satellites with a downlink carrier. For satellites without a downlink carrier a declaration is required that the GEOLUT maintains satellite track at all times. Declaration is required for full GEOSAR satellite bandwidth (BW) processing.
3.4	Satellite Visibility	EL≥5°			V	If EL < 5 °, include description of RF noise suppression system in the technical file

Paragraph in C/S T.009	Requirement or Test	Pass Criteria	Result	Pass/ Fail	Method of Compliance	Declaration/Verification or Comments
3.5	Status and Alarm Reporting	C/S T.009 refers	N/A		D	
3.6	RF Radiation and Emissions	C/S T.009 refers	N/A		V	
3.7	Interference	C/S T.009 refers	N/A		V	
3.8	Data Archiving	C/S T.009 refers	N/A		D	
4.1.1	Antenna and RF Subsystem	C/S T.009 refers	N/A		V	
4.1.2	Time and Frequency Reference Subsystems	TA≤10 msec FS≥$5x10^{9}$ (15 mins)			D	TA = Time Accuracy FS = Frequency Stability
4.1.3	MCC Interface	C/S T.009 refers	N/A		V	

M-Measurement, D-Declaration, and V-Verification
The definitions of Measurement, Declaration, and Verification are provided at section 2.8

Table A.2 - GEOLUT Commissioning Summary Data Table (C/S T.001 Beacons Part)

Paragraph in C/S T.009	Requirement or Test	Pass Criteria	Result	Pass/ Fail	Method of Compliance	Declaration/Verification or Comments
See Paragraph 2.2.4.B to C/S T.001	Bit Rate Tolerance Check Test - BR1	M/N > 0.75	n/a		M	
4.2.2.1	Beacon Message Recovery Test MR1 Beacon Message Recovery Test MR2	See Annex C to C/S T.010 See Annex C to C/S T.010			M M	
4.2.3.1	Bit Verification Test BV1	See Annex C to C/S T.010			M	
	Bit Verification Test BV2	See Annex C to C/S T.010			M	
	Bit Verification Test BV3	See Annex C to C/S T.010			M	
4.2.4.1	Beacon Message Validation Test MV1	See Annex C to C/S T.010			M	
4.2.5.1 4.2.5.2 4.2.5.3	Beacon Message Processing Test MP1	See Annex C to C/S T.010			M	
4.2.6	Redundant Alert Data	C/S T.009 refers			V	
4.2.7	Updated Location Data	C/S T.009 refers			V	
4.2.8	Bit Shifted Beacon Messages	0			V	Does not produce bit-shifted messages.

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Paragraph in C/S T.009	Requirement or Test	Pass Criteria	Result	Pass/ Fail	Method of Compliance	Declaration/Verification or Comments
4.2.9	Special National Processing Requirements	C/S T.009 refers	N/A		D,V	Confirm that special national requirements do not affect international operational data quality.
5.1.1	Processing Performance Test PP1	95% of beacons within 5 minutes (23 beacons)			M	
5.2	Frequency Measurement	95% of Alerts ≤ 2 Hz			M,V	Measurement to confirm 95% within 2 Hz. Verification that measurement based on most recent frequency data.
5.3	Capacity	20 beacons			V	
5.4	Processing Anomalies				V	
5.5	Downlink Fading	LM > 0 dB			V	Provide the Link Margin (LM) calculation in the technical file.

M-Measurement, D-Declaration, and V-Verification
The definitions of Measurement, Declaration, and Verification are provided at section 2.8

Table A.3 - GEOLUT Commissioning Summary Data Table (C/S T.018 Beacons Part)

Section in C/S T.009	Requirement or Test	Pass Criteria	Result	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
4.2.2.1	Beacon Message Recovery - MR1	See Annex C.1.2 to C/S T.010			M	
	Beacon Message Recovery - MR2	See Annex C.1.2 to C/S T.010			M	
4.2.3.2	Bit Verification - BV1	See Annex C.1.2 to C/S T.010			M	
4.2.5.4 4.2.5.5	Beacon Message Processing – MP1	See Annex C.1.2 to C/S T.010			M	
4.2.6	Redundant Alert Data	C/S T.009 refers			V	
4.2.7	Updated Location Data	C/S T.009 refers			V	
4.2.8	Bit Shifted Beacon Messages	0			V	Does not produce bit-shifted messages.
4.2.9	Special National Processing Requirements	C/S T.009 refers			D,V	Confirm that special national requirements do not affect international operational data quality.
5.1	Processing Performance – Test PP1	TBD			M	
	Signal sensitivity	Signal sensitivity better than [30.55] dB-Hz			D	
5.2	Frequency Measurement				V	Frequency measurement shall be provided, but no

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Section in C/S T.009	Requirement or Test	Pass Criteria	Result	Pass/ Fail	Method of Compliance	Declaration / Verification or Comments
						frequency accuracy requirement is defined.
5.3	Capacity	140 beacons	n/a		D	
5.4	Processing Anomalies				V	
5.5	Downlink Fading	LM > 0 dB			V	Provide the Link Margin (LM) calculation in the technical file.
5.6.5	Processing Bandwidth	406.006 to 406.094 MHz			D	
5.6.6	Acquisition Frequency Range	Beacon with a deviation from the center frequency of 406.05 ± 1.65 kHz			*D*	

2.0 Results of Measurements

This section contains the detailed results of the measurements summarized in section 1.0. Each requirement, and its associated test procedure, is further described in the annex and section as referenced below. For example, the detailed procedures for conducting the GEOLUT Data Availability Test is described at Annex B section B.3.1 to document C/S T.010.

Detailed statistical results for the following measurements shall be provided.

B.3.1 GEOLUT Data Availability (A)

B.3.2 Satellite Tracking Capability

B.4 Processing Requirements (comprised of Message Recovery (MR), Bit Verification (BV), Message Validation (MV), and Message Processing (MP) beacon simulator tests)

B.5.1 Processing Performance (PP1)

B.5.2 Frequency Measurement (including the identifier(s) of the beacon(s) used to verify the frequency stability).

3.0 Other Information

3.1 Confirmation that the test beacons and/or beacon simulators used for the commissioning tests satisfy the requirements stated in C/S T.001.

3.2 A list of all 406 MHz beacon messages used for the commissioning tests (see Annex B.2).

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Appendix 1 Technical File

A.1 GENERAL

This appendix defines the GEOLUT information to be provided by the national Administration for GEOLUT commissioning. The following minimum information is required.

A.2 GEOLUT HARDWARE DESCRIPTION

A.2.1 ANTENNA CHARACTERISTICS

a. size and type of antenna

b. the gain to noise temperature ratio (G/T) measured at an elevation angle greater than five (5) degrees above the local horizon. The actual elevation angle at which the G/T was measured shall be reported. If the elevation angle is less than five degrees, include a description of the RF noise suppression system used by the GEOLUT

c. operational limitations

d. dedicated or shared antenna system

e. link margin calculation for each type of GEOSAR satellite with which the GEOLUT will operate

A.2.2 GENERAL GEOLUT INDOOR EQUIPMENT DESCRIPTION

a. GEOLUT manufacturer and model number

b. equipment complement

c. stand alone, shared, or co-located with a LEOLUT and/or MCC

A.2.3 GENERAL GEOLUT SUPPORT EQUIPMENT DESCRIPTION

a. Frequency stability reference beacon identifier(s).

A.2.4 GENERAL CAPABILITIES

a. processing capability (indicate the upper and lower frequency limits of the 406.0 to 406.1 MHz SAR band that the GEOLUT will process). If the processing bandwidth is selectable, indicate what selections are available

b. interference monitoring capability

c. a description of the GEOLUT's status and alarm capabilities

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A.3 PROCESSING

a. specific performance capability

b. manufacturer's specifications

c. false alert from processing anomaly suppression mechanism

d. bit shift suppression mechanism

e. a general description of the GEOLUT's implementation of the beacon message confirmation process

A.4 COMMUNICATIONS CAPABILITY

a. primary mode configuration

b. secondary (backup) mode configuration

A.5 COVERAGE

a. list all GEOSAR satellites of the selected type with which the GEOLUT is designed to operate

b. elevation angle to each GEOSAR satellite of the same type with which the GEOLUT could operate

c. operational tracking (azimuth and elevation) limits of motion

A.6 LOCATION

a. latitude and longitude of the antenna unit. This location shall be given to within 100 meters and shall be given with respect to the Bureau International de l'Heure (BIH) Geodetic Reference System with a reference ellipsoid semi-major axis of 6378137 meters and a flattening (ellipticity) of 1/298.2572

b. altitude above mean sea level in meters

A.7 GEOLUT TO MCC ALERT MESSAGES

Copies of the GEOLUT to MCC alert messages associated with the signals emitted by the beacon simulator shall be included in this section. These messages shall be annotated to highlight the alert and the associated test signal.

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- END OF ANNEX A -

ANNEX B - STATISTICAL REQUIREMENTS

B.1 GENERAL

This annex describes the test procedures, and the statistical elements that the national Administration is to provide to the Cospas-Sarsat Secretariat for all tests and measurements required to commission a GEOLUT. Data used to create these statistics must satisfy the criteria for inclusion detailed at Annex E. A list of all 406 MHz beacons used for the statistical analysis shall be provided in accordance with section B.2. The statistical information provided to the Cospas-Sarsat Secretariat shall be summarised and included in the main portion of the commissioning report, as described at Annex A. Additionally, the analysis and calculations used to derive the summarised information shall be documented, and also included in the commissioning report as detailed at Annex A.

B.2 406 MHZ BEACONS USED

All 406 MHz beacon messages used in the generation of these statistical results / analysis shall be listed in the commissioning report. Furthermore, except for the special signals generated to test the limits of the GEOLUT's capabilities, the national Administration shall confirm that the beacon signals and messages generated satisfied the requirements of document C/S T.001 (beacon specification).

B.3 OPERATIONAL REQUIREMENTS - STATISTICAL DATA ELEMENTS

B.3.1 GEOLUT DATA AVAILABILITY (A)

This test shall be conducted by monitoring the GEOLUT operational performance during a 7 day period (minimum), with a view to determining GEOLUT availability. The GEOLUT data availability (A) is defined as: $A = [1-(DT/T)] \times 100$ and shall be greater than or equal to 95, where T = test period and DT = elapsed time during the test period, during which any GEOLUT basic function or requirement cannot be performed.

The values for A, DT, and T shall be reported.

B.3.2 SATELLITE TRACKING CAPABILITY

This test shall be conducted by monitoring the duration that the GEOLUT lost carrier lock on the GEOSAR satellite's downlink carrier signal during a seven day period (minimum) of operational use. L = the elapsed time that the GEOLUT lost carrier lock on the GEOSAR satellite's downlink carrier signal during the test period. L shall be equal to zero.

The value for L and the duration of the test period shall be reported.

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B.4 PROCESSING REQUIREMENTS - STATISTICAL DATA ELEMENTS

This test demonstrates the GEOLUT's ability to satisfy the processing requirements documented in section 4.2 of document C/S T.009.

The preferred procedure to be used to validate these requirements is by using a beacon simulator to transmit a series of beacon message test scripts detailed at Annex C. The resulting alert data produced by the GEOLUT shall be analysed and compared to the expected results for each script. The national Administration shall report the following in a tabular format:

a. the identification of each test script (provided to the national Administration by the beacon simulator provider);

b. the date and time that each beacon activation occurred;

c. the expected result(s) for each beacon activation;

d. the actual result(s) produced by the GEOLUT for each beacon activation; and

e. an indication of whether the GEOLUT satisfied the applicable processing requirements.

If a suitable beacon simulator is not available, then this test may be performed using a software simulator connected directly to the GEOLUT (as opposed to beacon simulators which radiate signals). The beacon simulator shall replicate the beacon message test scripts that were developed for the beacon simulator. These test scripts are detailed at Annex C.

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B.5 PERFORMANCE REQUIREMENTS - STATISTICAL DATA ELEMENTS

B.5.1 PROCESSING PERFORMANCE

This test demonstrates the GEOLUT's ability to satisfy the processing performance requirements detailed in document C/S T.009.

The preferred procedure to validate this requirement is to use a beacon simulator to radiate the beacon message test scripts detailed at Annex C. Before the test scripts are activated, the national Administration shall liaise with the provider of the beacon simulator to calibrate the radiated power level of the beacon simulator to produce the required C/No at the GEOLUT. Upon completion of the test, the resulting alert data produced by the GEOLUT shall be analysed and compared to the expected results for each script. The national Administration shall report the following:

a. the identification of each test script (provided to the national Administration by the beacon simulator provider);

b. the date and time that each test script was run;

c. the beacon alert message transmitted for each beacon activation;

d. the actual beacon alert message produced by the GEOLUT for each beacon activation;

e. the time duration required by the GEOLUT to provide a suitable valid message; and

f. an indication of whether the GEOLUT satisfied the applicable processing requirements.

If a suitable beacon simulator is not available, then this test may be performed using real beacons whose output power can be adjusted. If this procedure is used, then the number of beacon signals, their duration, and power levels shall replicate the beacon test scripts detailed at Annex C.

B.5.2 FREQUENCY MEASUREMENT

This test measures the ability of the GEOLUT to measure the transmitted frequency of beacons signals to the specifications detailed in document C/S T.009.

The preferred procedure to validate this requirement is to use orbitography or reference beacons with known frequency performance characteristics. For each valid beacon message processed by the GEOLUT, the difference between GEOLUT measured frequency and the actual transmitted frequency shall be calculated and documented. The largest, average and smallest frequency differences shall be reported. Furthermore, the ratio of messages with frequency measurements accurate to within 2 Hz to the total number of valid beacon messages shall be calculated and documented. This ratio shall be 0.95 or better. The frequency specifications of the orbitography or reference beacons used in this test shall be confirmed and reported. A minimum of 100 measurements shall be made for this test.

If suitable orbitography or reference beacons are not within the satellite coverage area then a beacon simulator can be used. The simulator shall radiate the beacon messages detailed at Annex C. For each valid beacon message processed by the GEOLUT, the difference between GEOLUT measured frequency and the actual transmitted frequency shall be calculated and documented. The largest, average and smallest frequency differences shall be reported. Furthermore, the ratio of messages with frequency measurements accurate to within 2 Hz to the total number of valid beacon messages shall be calculated and documented. This ratio shall be 0.95 or better. The frequency specifications of the beacon simulator shall be confirmed and reported.

The identifier(s) of the test or reference beacon(s) used to verify the frequency stability of the GEOLUT shall be reported in the commissioning report.

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- END OF ANNEX B -

ANNEX C - BEACON SIMULATOR TEST SCRIPT

C.1 TEST MESSAGES TO BE TRANSMITTED

C.1.1 C/S T.001 BEACONS

Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date /Time (UTC)	Transmitted 30 Hex Transmitted Code (9-bit Frame Synchronization)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
Bit Rate Tolerance Check (BR)									
BR1	[TBD]	406.025	[TBD]	96EEF9DA0A2BA9EB5F96F400000F19	0	0	0	0	Transmit 20 bursts at the higher end of the permissible Bit Rate Range (396 bps)
	[TBD]	406.025	[TBD]	96EEF9DA0A2BA9EB5F96F400000F19	0	0	0	0	Transmit 20 bursts at the lower end of the permissible Bit Rate Range (404 bps)
Message Recovery (MR)									
MR1	USA	406.025	6 Bursts 50s spacing	56EE0000000000477BEAC000000000 (1 1010 1111)	0	0	n/a	n/a	USA, User Test coded beacon with two bit errors in 9-bit frame synchronization at bits 16 and 17.
MR2	USA	406.027	6 Bursts 50s spacing	96EF000049C14CD260D5F608380389 (0 1101 0000)	0	0	0	0	USA, National Location Protocol Test Coded beacon with encoded position (38.995, -76.851) with the last eight bits of the frame synchronization inverted.
Bit Verification (BV)									
BV1	USA	406.025	x	56EE1100000000037E540000000111 (0 0010 1111)	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. Spurious data in BCH-2.
		406.025	x + 50s	56EE0000000000037E540000000111 (0 0010 1111)	0	0	n/a	n/a	USA, User Test coded beacon with no bit errors.
		406.025	x + 100s	56EE1100000000037E540000000111 (0 0010 1111)	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. Spurious data in BCH-2.
		406.025	x + 150s	56EE0000000000037E540000000111 (0 0010 1111)	0	0	n/a	n/a	USA, User Test coded beacon with no bit errors.
		406.025	x + 200s	56EE1100000000037E540000000111 (0 0010 1111)	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. Spurious data in BCH-2.
		406.025	x + 250s	56EE0000000000037E540000000111 (0 0010 1111)	0	0	n/a	n/a	USA, User Test coded beacon with no bit errors.
BV2	USA	406.027	6 Bursts 50s spacing	D6E10E1A4324920458B9D555555555 (0 0010 1111)	0	0	0	0	USA, Orbitography beacon with a pattern of A01" in the long message. No bit errors.
BV3	USA	406.025	20 Bursts 50s spacing	D6EEAAAAAAAAAAA2EA1A24E14CD2F4 (0 0010 1111)	0	0	0	1	USA, User Test coded beacon with encoded position (38.885, -76.931) in PDF-2. One bit error at bit 138.

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Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date /Time (UTC)	Transmitted 30 Hex Transmitted Code (9-bit Frame Synchronization)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
Message Validation (MV)									
MV1	USA	406.025	6 Bursts 50s spacing	96EE0000002729A5E22BB61B872E0A (0 0010 1111)	0	0	2	0	USA, Standard Location Protocol Test coded beacon with encoded position (38.855, -76.931) in PDF-1 and PDF-2.
Message Processing									
MP1	USA	406.023	x	96EFFFFFDFC0FF01F6E8B30000090E (0 0010 1111)	0	0	0	0	USA, National Location Protocol Test coded beacon with default position.
		406.023	x + 50s	96EFFFFFDFC0FF01F6E8B30000090E (0 0010 1111)	0	0	0	0	Same as above.
		406.023	x + 100s	96EFFFFFDFC0FF01F6E8B30000090E (0 0010 1111)	0	0	0	0	Same as above.
		406.023	x + 150s	96EFFFFFDFC0FF01F6E8B30000090E (0 0010 1111)	0	0	0	0	Same as above.
		406.023	x + 200s	96EFFFFFDFC0FF01F6E8B30000090E (0 0010 1111)	0	0	0	0	Same as above.
		406.023	x + 250s	96EFFFFFDFC0FF01F6E8B30000090E (0 0010 1111)	0	0	0	0	Same as above.
		406.023		96EFFFFFC9C14CE4BAA57708080AA8 (0 0010 1111)	0	0	0	0	USA, National Location Protocol Test coded beacon with updated position (38.995, -76.931).
		406.023		96EFFFFFC9C14CE4BAA57708080AA8 (0 0010 1111)	0	0	0	0	Same as above.
		406.023		96EFFFFFC9C14CE4BAA57708080AA8 (0 0010 1111)	0	0	0	0	Same as above.
		406.023		96EFFFFFC9C14CE4BAA57708080AA8 (0 0010 1111)	0	0	0	0	Same as above.
		406.023		96EFFFFFC9C14CE4BAA57708080AA8 (0 0010 1111)	0	0	0	0	Same as above.
		406.023		96EFFFFFC9C14CE4BAA57708080AA8 (0 0010 1111)	0	0	0	0	Same as above.
Processing Performance									
PP1	USA	406.02700	6 Bursts Start at x	56EE000004000002510CC000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 2 in bits 40-63.
		406.02704	6 Bursts Start at x + 2s	56EE0000060000061D9CC000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 3 in bits 40-63.
		406.02708	6 Bursts Start at x + 4s	56EE00000A0000056C758000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 5 in bits 40-63.
		406.02712	6 Bursts Start at x + 6s	56EE00000E000004432D4000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 7 in bits 40-63.
		406.02716	6 Bursts Start at x + 8s	56EE000016000002A0FFC000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 11 in bits 40-63.
		406.02720	6 Bursts Start at x + 10s	56EE00001A000001D1168000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 13 in bits 40-63.

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Test Code Sequence	Simulator	Transmit Frequency (MHz)	Date /Time (UTC)	Transmitted 30 Hex Transmitted Code (9-bit Frame Synchronization)	Number of Bit Errors				Comments
					PDF-1	BCH-1	PDF-2	BCH-2	
PP1 (cont'd)	USA (cont'd(	406.02724	6 Bursts Start at x + 12s	56EE000022000007FE7AC000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 17 in bits 40-63.
		406.02728	6 Bursts Start at x + 14s	56EE000026000006D1220000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 19 in bits 40-63.
		406.02732	6 Bursts Start at x + 16s	56EE00002E0000048F938000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 23 in bits 40-63.
		406.02736	6 Bursts Start at x + 18s	56EE00003A0000011DA84000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 29 in bits 40-63.
		406.02740	6 Bursts Start at x + 20s	56EE00003E00000032F08000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 31 in bits 40-63.
		406.02744	6 Bursts Start at x + 22s	56EE00004A000004F5080000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 37 in bits 40-63.
		406.02748	6 Bursts Start at x + 24s	56EE00005200000216DA8000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 41 in bits 40-63.
		406.02752	6 Bursts Start at x + 26s	56EE00005600000339824000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 43 in bits 40-63.
		406.02756	6 Bursts Start at x + 28s	56EE00005E0000016733C000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 47 in bits 40-63.
		406.02760	6 Bursts Start at x + 30s	56EE00006A00000439B6C000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 53 in bits 40-63.
		406.02764	6 Bursts Start at x + 32s	56EE000076000003F53C8000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 59 in bits 40-63.
		406.02768	6 Bursts Start at x + 34s	56EE00007A00000084D5C000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 61 in bits 40-63.
		406.02772	6 Bursts Start at x + 36s	56EE0000860000052F67C000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 67 in bits 40-63.
		406.02776	6 Bursts Start at x + 38s	56EE00008E00000771D64000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 71 in bits 40-63.
		406.02780	6 Bursts Start at x + 40s	56EE000092000000BD5C0000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 73 in bits 40-63.
		406.02784	6 Bursts Start at x + 42s	56EE00009E000003CCB54000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 79 in bits 40-63.
		406.02788	6 Bursts Start at x + 44s	56EE0000A6000005E3D90000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 83 in bits 40-63.
		406.02792	6 Bursts Start at x + 46s	56EE0000B200000071E2C000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 89 in bits 40-63.
		406.02796	6 Bursts Start at x + 48s	56EE0000C200000599428000000000 (0 0010 1111)	0	0	0	0	USA Test coded beacon, decimal value 97 in bits 40-63.

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C.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]	See MR1 script defined in section D.1.2 of document C/S T.020	0	0	Transmit bursts with normal mode PRN
MR2	[TBD]	406.047	[TBD]	See MR2 script defined in section D.1.2 of document C/S T.020	0	0	Transmit 20 bursts at the lower limit of the processing bandwidth
Bit Verification (BV)							
BV1	[TBD]	406.050	[TBD]	See BV1 script defined in section D.1.2 of document C/S T.020	4	2	Transmit bursts with 6 bit errors on PDF+BCH
Message Processing (MP)							
MP1	FR	406.050	x	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E (9C77FFF1B00F00000000000)			France, National Location Protocol Test coded beacon with default position.
		406.050	x + 50s	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E (9C77FFF1B00F00000000000)			Same as above.
		406.050	x + 100s	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E (9C77FFF1B00F00000000000)			Same as above.
		406.050	x + 150s	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E (9C77FFF1B00F00000000000)			Same as above.
MP1 (cont)		406.050	x + 200s	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E (9C77FFF1B00F00000000000)			Same as above.
		406.050	x + 250s	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E (9C77FFF1B00F00000000000)			Same as above.

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		406.050	x + 300s	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C0 05811CA719BE531 (9C77FFF1B00F00000000000)			France, National Location Protocol Test coded beacon with updated position (Toulouse, 43.56049, -1.48083).
		406.050	x + 350s	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C0 05811CA719BE531			Same as above.
		406.050	x + 400s	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C0 05811CA719BE531 (9C77FFF1B00F00000000000)			Same as above.
		406.050	x + 450s	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C0 05811CA719BE531			Same as above.
		406.050	x + 500s	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C0 05811CA719BE531 (9C77FFF1B00F00000000000)			Same as above.
		406.050	x + 550s	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C0 05811CA719BE531 (9C77FFF1B00F00000000000)			Same as above.
[Processing Performance (PP)]							
[PP1]	USA			See C/S T.018 Performance Evaluation Script defined in section D.3 in document C/S T.020			

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C.2 EXPECTED PROCESSING

C.2.1 C/S T.001 BEACONS

Test Code Sequence	Message to be Transmitted by GEOLUT	Comments
BR1	96EEF9DA0A2BA9EB5F96F400000F19	GEOLUT sends a valid message to the MCC.
MR1	n/a	GEOLUT should suppress these messages due to bit errors in the frame synchronization.
MR2	n/a	GEOLUT should suppress these messages due to the inverted frame synchronization.
BV1	56EE0000000000037E540000000000	GEOLUT should correct bit errors in PDF-1 and set bits 113 to 144 all to “0” for short format message.
BV2	D6E10E1A4324920458B9D555555555	GEOLUT should transmit orbitography beacon message without error correcting the long message.

Test Code Sequence	Message to be Transmitted by GEOLUT	Comments
BV3	D6EEAAAAAAAAAAA2EA1A24E14CD2B4	GEOLUT should correct error at bit 138 and transmit alert to MCC.
MV1	96EE0000002729A5E22BB6FFFFFFFF	GEOLUT should set bits 113 to 144 all to "1".
MP1	96EFFFFFDFC0FF01F6E8B30000090E	GEOLUT should transmit the confirmed message with default position.
	96EFFFFFC9C14CE4BAA57708080AA8	GEOLUT should transmit confirmed, completed updated message.
PP1	Various	GEOLUT should be able to process at least 23 beacons and transmit to MCC.

C.2.2 C/S T.018 BEACONS

Test Code Sequence	Message to be Transmitted by GEOLUT	Comments
MR1	n/a	GEOLUT should suppress these messages due to bit errors in the frame synchronization.
MR2	n/a	GEOLUT should suppress these messages due to the inverted frame synchronization.
BV1	See BV1 expected processing section C.2.2 of document C/S T.020	GEOLUT should correct bit errors using the BCH.
MP1	3FFF1B0038CFF83E0FFFC1FE00000000000BFFF000007FFFE50A0D7299FC30E	GEOLUT should transmit the confirmed message with default position.
	3FFF1B0038C95C7BE00BD8CE00000000000BFFF0000004C005811CA719BE531	GEOLUT should transmit confirmed, completed updated message.
[PP1	Various	GEOLUT should be able to process at least TBD beacons and transmit to MCC]

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C.3 REPORTING GUIDELINES

National Administrations shall complete the sections referencing 406 MHz beacon message processing requirements, processing performance, and system beacon capacity in the GEOLUT Commissioning Report provided at Annex A. A copy of the GEOLUT message to the associated MCC shall be included for each test code sequence which requires a message to be transmitted. The copies should be included in appendix 1 to the GEOLUT Commissioning Report. For situations where the GEOLUT to MCC message includes several alerts, the message shall be annotated in a manner which identifies the alert and its associated requirement (i.e. the alert associated with test bit verification 1 (BV1) should be highlighted and annotated with the words BV1).

-END OF ANNEX C-

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ANNEX D - DATA FORMAT

D.1 GENERAL

This annex describes the data format to be provided in ASCII format on a PC compatible floppy disk to the Cospas-Sarsat Secretariat when commissioning a GEOLUT. The data is to be provided in three separate files, one for the tracking database (section D.2), the solution data (section D.3), and the beacon database (section D.4). The data is to be provided in a comma (,) delimited format, and each field shall include an entry. If there is no data for any given field, then a blank space is to be inserted into the appropriate portion of the file. All solution data used in the commissioning testing shall be provided.

A description of the fields is provided below:

Field	Relative position of the field
Description	Description of the information provided
Format	Guidance on how the data should be provided (i.e. n - numeric character, s - sign, H - hexidecimal, and C - alphabetic character)
Width	The total number of bytes for the field. If this value includes a decimal point, the number to the right of the decimal point signifies the number of decimal places. For example, 5.3 would indicate a total width of 5 digits with one digit to the left of the decimal point, one occupied by the decimal point itself, and the remaining three digits to the right of the decimal point.

D.2 TRACKING DATABASE

Field	Description	Format	Width
1	GEOLUT ID	nnnn	4
2	Satellite ID	G or I and nn*	3
3	Start Time	dd/mm/yyyy/hh/min min/ss**	19
4	Stop Time	dd/mm/yyyy/hh/min min/ss	19

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* G or I represents GOES and INSAT respectively, and the nn captures the satellite number (i.e. G09 would represent GOES-9)

** Provide all dates and times in this format, with the time in UTC. Include slashes (/) as indicated in the format to show the separation in the time fields.

D.3 GEOLUT DATABASE FOR SOLUTION DATA

Field	Description	Format	Width
1	GEOLUT ID	nnnn	4
2	Location Name in plain text	CCC…CCC	10
3 (i)	Satellite ID	G or I and nn	3
	The data in fields 4 to 13 provides information pertaining to the transmitted signal for each beacon activation		
4	Beacon Script reference number	CCCCC	5
5	Beacon Script sequence number	CCCCC	5
6 (ii)	Beacon ID transmitted (15 hex)	HHH…HHH	15
7	Beacon data transmitted (30 hex)	HHH…HHH	30
8 (iii)	Transmit Location Latitude	snn.nnn	7.3
9 (iv)	Transmit Location Longitude	snnn.nnn	8.3
10	Encoded Location (Yes / No)	Y or N	1
11	Transmit Power in watts	n.n	3.1
12	Transmit Frequency in MHz	nnn.nnn	7.3
13	Time of activation (for each simulated or real activation)	see section D.2	19
14	Time of de-activation (for each simulated or real activation)	see section D.2	19
15	Number of bursts transmitted in activation	nn	2
16	Comments pertaining to transmitted signal	CCC…CCC	256
	The fields 17 to 29 provide data pertaining to the information determined / received by the GEOLUT for each beacon activation		
17(v)	Beacon message (as measured by the GEOLUT at the end of integration, 30 hex)	HHH…HHH	30
18	First valid beacon message transmitted to MCC, 30 hex)	HHH…HHH	30
19	First confirmed beacon message transmitted to MCC (30 hex)	HHH…HHH	30
20	Time valid message sent to MCC (leave blank if message not validated)	see section D.2	19
21	Time confirmed message sent to MCC (leave blank if message not confirmed)	see section D.2	19
22	Number of burst integrated to calculate alert	nn	2

Field	Description	Format	Width
23	Time of first burst used in integration	see section D.2	19
24	Time of last burst used in integration	see section D.2	19

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25	Received signal frequency in MHz	nnn.nnn	7.3
26	Received signal to noise density ratio in dB-Hz	nn.n	4.1
27 (iii)	Beacon location latitude (only for encoded location transmissions	snn.nnn	7.3
28 (iv)	Beacon location longitude (only for encoded location transmissions)	snnn.nnn	8.3
29	Value of frame synchronisation bits	nnnnnnnnn	9

(i) G or I represents GOES or INSAT respectively, and the nn captures the satellite number (i.e. G09 would represent GOES-9).

(ii) For tests involving location protocols with updates to the location during the test, each update shall be reported as a separate beacon activation.

(iii) The sign (s) is positive (+) for northern latitudes and negative (-) for southern latitudes.

(iv) The sign (s) is positive (+) for eastern longitudes and negative (-) for western longitudes.

(v) This is the value of the beacon message as measured/determined by the GEOLUT at the end of the integration process. The value of the message shall be that which was measured/processed directly by the GEOLUT (i.e. with no changes to bits 113 to 144 for unconfirmed location protocol long messages).

D.4 BEACON DATABASE DESCRIPTION

Field	Description	Format	Width
1 (i)	Beacon Simulator ID	CCC…CCC	10
2 (ii)	Location Latitude	snn.nnn	7.3
3 (iii)	Location Longitude	snnn.nnn	8.3
4 (iv)	Beacon ID	HHH…HHH	15

(i) Provide identifier of simulator, or provide a blank space if a real beacon was used.

(ii) The sign (s) is positive (+) for northern latitudes and negative (-) for southern latitudes.

(iii) The sign (s) is positive (+) for eastern longitudes and negative (-) for western longitudes.

(iv) Use the 15 hex ID associated with the beacon or simulator.

-END OF ANNEX D-

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ANNEX E - TEST CONDITIONS

E.1 GENERAL

This annex defines the test conditions, and criteria for including and excluding test result data in the GEOLUT commissioning report.

E.2 BEACONS

All tests performed for GEOLUT commissioning purposes shall be conducted using type approved Cospas-Sarsat beacons coded with the test protocol or a beacon simulator (where appropriate). The sole exception is when specific tests cannot be conducted with type approved beacons (i.e. processing threshold test). Except for the frequency measurement test, orbitography or reference beacons that are in the GEOSAR satellite's uplink field of view are not to be used for commissioning tests.

The concept of a beacon activation is used in the test procedures detailed at Annex B and the data requested at Annex D. A beacon activation is defined as the beacon's signal being transmitted through a GEOSAR satellite for a predetermined number of times at the beacon burst repetition rate defined in document C/S T.001, and a GEOLUT output message being generated and the beacon's signal being turned off. In this manner a beacon activation is to represent and/or simulate how a beacon would be used operationally. If the same beacon signal is to be reused later, sufficient time between the activations must be allowed for the previous beacon's signal to be removed from the GEOLUT's processor memory.

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E.3 SOLUTION STATISTICS

GEOLUT output messages meeting one or more of the following criteria shall be eliminated from the statistics:

a. messages known to have been interfered with by other emitters in the 406 MHz band in the GEOSAR satellite's uplink field of view;

b. messages received from beacons located such that their elevation angle to the GEOSAR satellite is less than four (4) degrees from the local horizon; and

c. messages known to have been received during periods of interference by the LEOSAR satellites with the GEOSAR satellites' downlink signals.

In cases where the GEOLUT was not able to satisfy document C/S T.009 requirements or the minimum standards for testing as documented herein because of situations described above, then the affected tests shall be redone.

E.4 SOLUTION DATA

The GEOLUT output messages shall be provided for all test and orbitography beacons used during the test period

-END OF ANNEX E-

ANNEX F - GEOLUT COMMISSIONING - PRINCIPLES AND POLICIES

F.1 REFERENCES

The Cospas-Sarsat Council approved the general principles of its commissioning policy for GEOLUTs, provided hereunder in Sections F.2, F.3, and F.4, at its Twenty-First Session.

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 standards and design guidelines of GEOLUTs and MCCs are defined in documents C/S T.009 and C/S A.005, respectively.

F.2.3 Cospas-Sarsat criteria and test methods for verifying that GEOLUTs and MCCs meet these standards are defined in documents C/S T.010 and C/S A.006, respectively.

F.2.4 The responsible Agency or Administration installing or planning to operate a new GEOLUT 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 four weeks prior to the Joint Committee meeting. Reports submitted less than four 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.

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F.2.7 This commissioning and reporting procedure shall be implemented by all Cospas-Sarsat Ground Segment operators, including Parties to the International Cospas-Sarsat Programme Agreement, for commissioning new GEOLUTs 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 GEOLUT and the MCC operator with the Cospas-Sarsat Programme has been notified in accordance with the standard procedure, unless otherwise agreed by the Council.

F.3 GEOLUT COMMISSIONING

The following principles govern the implementation of the Cospas-Sarsat GEOLUT Commissioning Standard (C/S T.010):

F.3.1 The implementation of the commissioning procedure defined in document C/S T.010 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 For a GEOLUT to be commissioned it must be connected to its associated MCC.

F.3.4 The GEOLUT/MCC interface is tested as part of the GEOLUT commissioning.

F.3.5 If the test results in the commissioning report submitted by the operating Agency or Administration do not demonstrate full compliance with document C/S T.009 (GEOLUT performance specification), corrective action shall be taken.

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.009 (GEOLUT performance specification), the alert data derived from the new GEOLUT can be immediately used by the associated MCC for distribution in accordance with the Cospas-Sarsat Data Distribution Plan (C/S A.001).

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F.3.7 Once the alert data derived from the new GEOLUT begins to be used by the associated MCC, a change of System status shall be distributed 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 GEOLUT.

F.4 STATUS OF THE COSPAS-SARSAT GROUND SEGMENT

F.4.1 After their commissioning, GEOLUTs are listed and described as appropriate in the applicable System documents and the "Cospas-Sarsat System Data" document.

F.4.2 The Cospas-Sarsat GEOLUTs commissioned in the Cospas-Sarsat System shall be listed on the Cospas-Sarsat website *www.cospas-sarsat.org*.

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ANNEX G - GUIDELINES FOR INTEGRATION OF NEW GEOLUTS IN THE COSPAS-SARSAT SYSTEM

The introduction of new GEOLUTs 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
b) the technical control of the development of the Cospas-Sarsat LUTs.

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

1. Installation of New Equipment - The new GEOLUT(s) equipment should be sited to provide for good reception from the GEOSAR satellite with which it is to operate. The location of the GEOLUT(s) should also allow for reliable communications with the associated MCC.

2. GEOLUT Description - The national Administration should ensure that a description of the new GEOLUT(s) along with (1) co-ordinates, (2) address, and (3) uplink frequency bandwidth are provided to the Cospas-Sarsat Secretariat.

   The national Administration should also ensure that their GEOLUT(s) is (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 GEOLUT Commissioning tests may be scheduled to coincide with the MCC commissioning tests. In any case, the GEOLUT should be connected to the MCC and tested in its operational configuration.

   The GEOLUT Operator should ensure that test beacon(s) capable of transmitting the test code sequences contained in Annex C is (are) available for the commissioning test, or the GEOLUT Operator should co-ordinate 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 GEOLUT 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 GEOLUT(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.

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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 GEOLUT satisfies the requirements of document C/S T.009, "Cospas-Sarsat GEOLUT Performance Specification and Design Guidelines," 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 GEOLUT may begin operations in an IOC status. However, the GEOLUT 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 GEOLUT's IOC status via a System Status message.

   The IOC phase allows a thorough review of the GEOLUT performance. However a GEOLUT shall not remain in an IOC phase for more than one year. GEOLUTs that have not reached FOC within one year will be considered not operational, and documented as "Under Development". To regain IOC status the GEOLUT will require a retest of the elements which prevented it from reaching FOC. The GEOLUT then must operate again in an IOC phase prior to reaching FOC. All Cospas-Sarsat Ground Segment Operators should monitor the data from new GEOLUTs 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 GEOLUT, the GEOLUT should be declared at FOC by the appropriate nodal MCC. The transition of a GEOLUT from an IOC status to a FOC status ensures that the GEOLUT 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 GEOLUT is formally commissioned in the Cospas-Sarsat Ground Segment.

8. GEOLUTs with Limited Data Availability - A GEOLUT which does not satisfy document C/S T.009 data availability requirements (e.g. GEOLUTs which share equipment with LEOLUTs) will be authorised to provide their alert data into the System upon the successful completion of the GEOLUT commissioning tests. Such GEOLUTs will follow the integration process described in this annex for full time GEOLUTs, however, such equipment will not be reported as operational GEOLUTs when reporting the status of the System.

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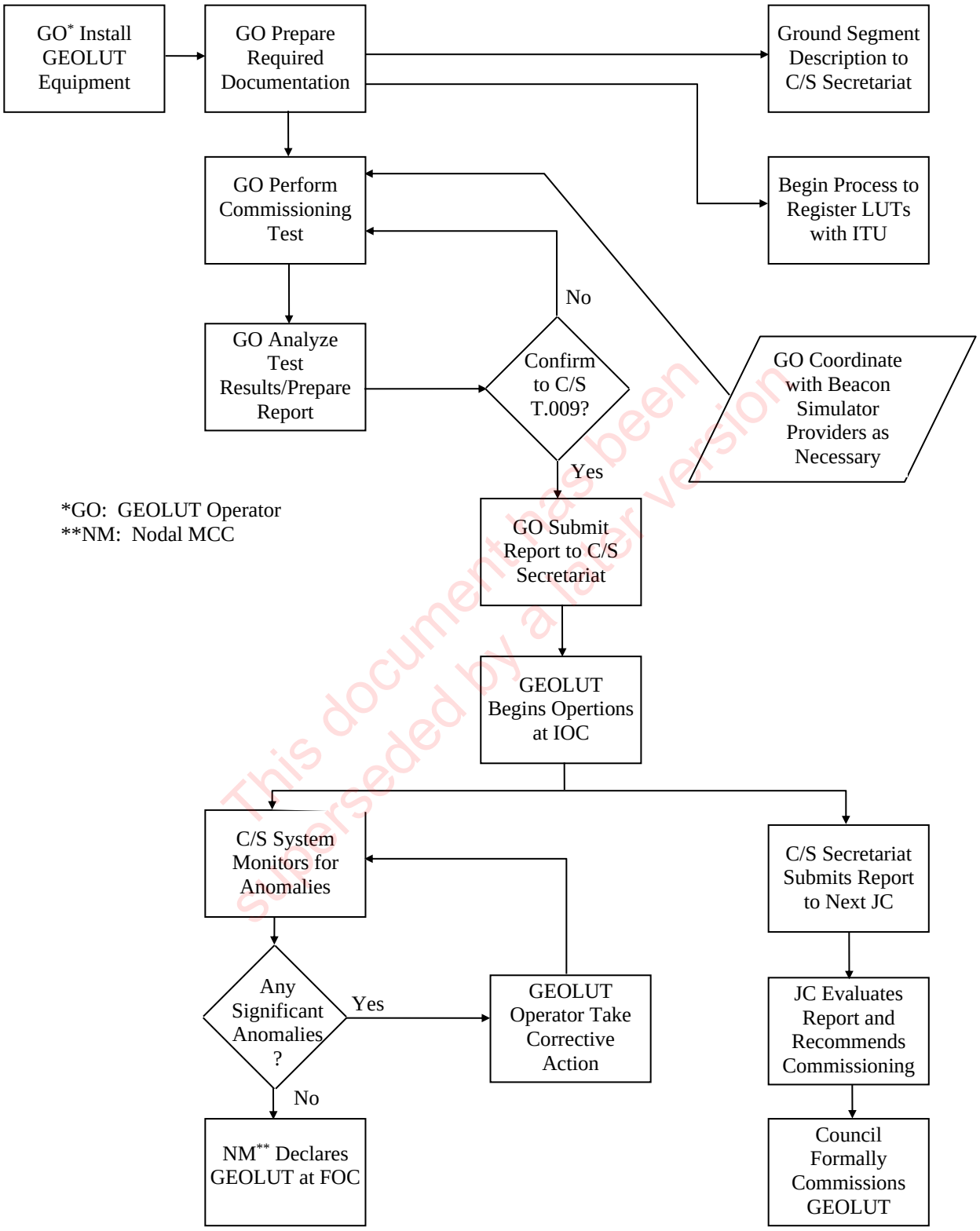

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Figure G.1: Overview of GEOLUT Integration

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ANNEX H - GUIDELINES FOR REGISTRATION OF GEOLUTS WITH ITU

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ANNEX I - GEOLUT REQUIREMENTS MATRIX

Requirement / Specification	Section in C/S T.009	Section in C/S T.010	Method of Compliance in C/S T.010
GEOLUT Availability	3.1	3.1	M
Data Requirements	3.2	3.2	V
Satellite Tracking Capability	3.3	3.3	M or D, D
Satellite Visibility	3.4	3.4	V
Status and Alarm Reporting	3.5	3.5	D
RF Radiation and Emissions	3.6	3.6	V
Interference	3.7	3.7	V
Antenna and RF Subsystem	4.1.1	4.1.1	V
Time and Frequency Reference System	4.1.2	4.1.2	D
MCC Interface	4.1.3	4.1.3	V
Processing Requirements	4.2	4.2	M
Processing Performance	5.1	5.1.a	M
Frequency Measurement	5.2	5.1.b	M
Capacity	5.3	5.1.c	V
Processing Anomalies	5.4	5.2	V
Downlink Fading	5.5	5.2	V

M - Measurement, D- Declaration, V - Verification
The definitions of Declaration and Verification are provided at section 2.8

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