COSPAS-SARSAT ELECTRO GEOSAR PERFORMANCE EVALUATION PLAN

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ELECTRO GEOSAR PERFORMANCE EVALUATION PLAN

History

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1. INTRODUCTION

The Federal State Unitary Enterprise "Lavochkin Association" has installed 406 MHz Search and Rescue (SAR) repeaters on the Electro meteorological geostationary satellite. This instrument will be made available for use in the Cospas-Sarsat GEOSAR system after the completion of initial satellite on-orbit tests. Because this satellite was still under development when the Cospas-Sarsat GEOSAR demonstration and evaluation programme was conducted, the performance of its SAR instrument has yet to be evaluated. In light of this, it is expected that an Electro GEOSAR performance evaluation programme be conducted to:

a. establish Electro GEOSAR / GEOLUT performance;

b. validate specification and commissioning requirements for GEOLUTs which operate with the Electro GEOSAR payload; and

c. verify the perfomance and, if appropriate, commission the current Electro GEOLUT (Moscow) into the Cospas-Sarsat System.

1.1 Purpose of Document

The purpose of this document is to provide:

a. test procedures for assessing the performance of GEOLUTs which operate with the Electro SAR instrument;

b. guidelines for analysing the test results; and

c. guidelines, procedures and schedule for managing the Electro GEOSAR performance evaluation programme and reporting the results.

1.2 Background

From 1996 to 1998 Cospas-Sarsat conducted a demonstration and evaluation (D&E) programme to determine the suitability of using satellites in geostationary orbit equipped with SAR instruments to process the signals from Cospas-Sarsat 406 MHz distress beacons. This programme, hereafter referred to as the GEOSAR D&E, was implemented using the GOES series of satellites provided by the USA, the INSAT-2 satellites provided by India, and experimental ground segment equipment provided by Canada, Chile, India, Spain and the United Kingdom. The GEOSAR D&E demonstrated that GEOSAR satellites provided a significant enhancement to the Cospas-Sarsat system. Following from this conclusion, in October 1998 the Cospas-Sarsat Council decided that the 406 MHz GEOSAR system components should be incorporated into the Cospas-Sarsat System as soon as possible.

During the period that the GEOSAR D&E was being conducted, new GEOSAR repeaters were developed by EUMETSAT and installed on the MSG meteorological geostationary satellite series. Since the technical characteristics of the MSG SAR instrument were different from SAR instrument on the GOES satellites, additional test were performed to establish MSG GEOSAR/GEOLUT performance, and any special GEOLUT specifications and commissioning requirements. The results of these tests were approved by Cospas-Sarsat in October 2004.

Following the deployment of a third type of 406 MHz GEOSAR payload onboard INSAT-3A by the Republic of India and the signature of an Memorandum of Understanding between the Cospas-Sarsat Programme and the Republic of India on the provision of Cospas-Sarsat GEOSAR services in February 2007, ISRO conducted an INSAT GEOSAR D&E test campaign including the commissioning of the Bangalore GEOLUT in 2009. The results of INSAT GEOSAR D&E evaluation were approved in October 2009 while the Bangalore GEOLUT was commissioned in early 2010.

With the deployment of a new 406 MHz GEOSAR payload type onboard Electro satellites by the Russian Federation, there is a need to conduct tests with Cospas-Sarsat GEOLUTs to establish Electro GEOSAR / GEOLUT performance, and any special GEOLUT specification and commissioning requirements. The Cospas-Sarsat Council is expecting that the Electro performance evaluation programme should be based on the technical (T) series of tests defined in the GEOSAR D&E Plan, as amended to address anticipated Electro performance.

The Moscow GEOLUT will participate in the Electro GEOSAR performance evaluation programme. The commissioning of the GEOLUT is to be performed as part of the Electro GEOSAR performance evaluation.

The administrations of France and Turkey have volunteered to participate in the Electro GEOSAR performance evaluation programme. France and Turkey have also announced that they will provide beacon simulator signals for some of the proposed tests.

1.3 Responsibilities

The Joint Stock Company "Russian Space Systems" (JSC RSS) is the Russian organization responsible for the implementation and operation of the Electro GEOSAR system. JCS RSS will be responsible for assessing the performance of the Electro SAR payload and will be responsible for confirming the operational status of the SAR payload during the test period. Operators of commissioned GEOSAR ground stations participating in the Electro GEOSAR D&E are responsible for conducting the tests as described herein, and to produce a report in the format specified at Annex A for the consideration of the Cospas-Sarsat Joint Committee.

1.4 Schedule

The chart at Annex J provides the major milestones of the Electro GEOSAR Performance Evaluation Programme.

- END OF SECTION 1 -

2. ELECTRO GEOSAR PERFORMANCE EVALUATION GOALS AND OBJECTIVES

2.1 Performance Evaluation Goals

The goals of the performance evaluation programme are to:

a. characterize the technical performance of the Electro GEOSAR system and confirm that SAR payload and GEOLUT systems are effective for providing useful 406 MHz alert data; and

b. validate specification and commissioning requirements for GEOLUTs which will operate with the Electro satellite.

As part of this evaluation program the Moscow GEOLUT will have to be tested in accordance with the commissioning requirements detailed in document C/S T.010 "Cospas-Sarsat GEOLUT Commissioning Standard", and if appropriate, will be commissioned into the Cospas-Sarsat System.

2.2 Objectives

The programme has been subdivided into specific objectives. Each objective is addressed by conducting specific tests and analysing the results. Most of the tests require a beacon simulator whose power output and message content can be controlled and varied. The tests will be conducted over several weeks to collect enough data to provide statistically valid results.

An overview of each objective is listed below, the detailed descriptions of these objectives are provided in section 3.2.

T-1 Processing Threshold, System Margin, and Beacon Message Processing Performance
Determine the processing threshold, processing performance, system margin and the performance in respect of long format beacon messages for GEOLUTs which operate with the Electro payload. The beacon test signals used to assess these parameters do not include beacon messages that collide with each other.

T-2 Time to Produce Valid and Confirmed Messages
Determine the statistical distribution of the time required for the GEOLUT to produce valid and confirmed beacon messages. The beacon test signals used to assess this parameter do not include beacon messages which collide with each other.

T-3 Carrier Frequency Measurement Accuracy
Determine how accurately the beacon carrier frequency can be determined by the Electro GEOSAR / GEOLUT system. The beacon test signals used to assess this parameter do not include beacon messages which collide with each other.

T-4 Electro GEOLUT Channel Capacity
Assess the capability of the GEOSAR system to handle multiple simultaneously active distress beacons in a single 406 MHz channel. This parameter is assessed by generating traffic loads which include beacon messages which collide with each other.

T-5 Impact of Interference
Monitor the band for the presence of interference while the tests are being performed, in order to understand any anomalies in the results and to illustrate the ability of the GEOSAR system to provide valid messages in the presence of interference and noise in the frequency bands used by the Electro GEOSAR system.

T-6 Impact of Interference From LEOSAR Satellites
Assess the impact of interference from LEOSAR satellite downlink signals on the ability of the GEOLUT to produce valid and confirmed alert messages.

T-7 Electro GEOLUT Network Performance
To verify that although at any given time some GEOLUTs may be affected by interference from the LEOSAR system, expected GEOSAR alerts will be reliably provided by other GEOLUTs in the Electro ground segment.

T-8 Processing Anomalies
Assess the performance of the GEOLUT in respect of the production of processing anomalies.

T-9 Electro Coverage
Estimate the geographic coverage of the Electro GEOSAR system.

C-1 Commissioning of the Electro GEOLUT (Moscow)
Verify the comliance of the Electro GEOLUT to the Cospas-Sarsat perfomance and design guidelines (specified in C/S T.009) by performing the tests specified in the GEOLUT Commissioning Standard (C/S T.010) and reporting results in the appropriate format to the Cospas-Sarsat Joint Committe for evaluation.

- END OF SECTION 2 -

3. ELECTRO PERFORMANCE EVALUATION METHODOLOGY

3.1 General Evaluation Methodology

All participants in the Electro GEOSAR performance evaluation programme are requested to conduct their testing and evaluation in accordance with the common set of guidelines and procedures as defined below.

a. Russia, with the support of France and Turkey, is responsible for scheduling all the tests that require the support of the beacon simulator (T1, T2, T3, T4, T6 and T7) and for providing this information to the operators of participating commissioned GEOLUTs.

b. Prior to conducting any tests that do not require the simulator, the participating GEOLUT operators should liaise with Russia to confirm that there are no reported problems with the satellite which could affect test results.

c. Each participating GEOLUT operator should produce an Electro GEOSAR Performance Evaluation Report in the format described at Annex A.

d. Distress alerts from operational beacons generated by GEOLUTs participating in the Electro evaluation programme should not be released into the Cospas-Sarsat System until the respective GEOLUT operator has confirmed that the GEOLUT does not produce processing anomalies.

Every effort should be made to ensure that the use of real or simulated beacon signals in support of the Electro Performance Evaluation Plan will not generate distress alert messages which might be interpreted in the existing LEOSAR and GEOSAR systems as real alerts.

3.2 Detailed Description of Objectives

This section provides the following for each objective of the Electro GEOSAR Performance Evaluation Programme:

a. test procedures,
b. data collection requirements, and
c. data reduction/analysis requirements.

To simplify the testing and to reduce the number of 406 MHz test transmissions, test procedures have been developed which share test transmissions. For example the output produced by the GEOLUT resulting from the test transmissions for test T-1, is also used for evaluating the performance of the GEOLUT in respect of the time to produce valid and confirmed messages (T-2), and frequency measurement accuracy performance (T-3).

To ensure that the alert messages generated by the GEOLUTs can be correlated to the test signal transmissions, GEOLUT operators should confirm that the time of day setting in the GEOLUT is correct before conducting each test.

3.2.1 T-1: Processing Threshold, System Margin, and Beacon Message Processing Performance

The processing threshold, processing performance and the system margin are "figures of merit" of the GEOLUT.

Processing Threshold
The processing threshold is the value of the minimum carrier to noise density ratio (C/No) in dBHz at the GEOLUT processor for which the GEOLUT is able to produce a valid message for 99% of the beacon events (the lower this value the more sensitive the GEOLUT).

System Margin
The system margin is the difference of C/No (in dB) between a nominal beacon, with an EIRP of 37 dBm, and a beacon operating at the GEOLUT processing threshold.

Valid Message Processing Performance
The processing performance requirement documented in C/S T.009 is that GEOLUTs should be capable of producing valid messages within 5 minutes of beacon activation 95% of the time, for all beacon signals whose C/No as measured at the GEOLUT is greater than 26 dB-Hz. This test will determine the C/No, for which the Electro GEOLUT can produce a valid message for beacon event within 5 minutes of beacon activation 95% of the time.

Long Message Processing Performance
At present Cospas-Sarsat has no GEOLUT specification requirement in respect of producing complete and confirmed long messages[1]. Nevertheless, with the increased use of location

[1] Note: Definitions of Valid, Complete and confirmed messages are provided in C/S T.009 "Cospas-Sarsat Geolut Performance Specification and Design Guidelines".

protocol beacons using the long message format, it is necessary to assess the Electro system performance in this regard.

3.2.1.1 Methodology and Data Collection

This test assesses the GEOLUT performance in respect of its ability to produce single valid, complete and confirmed complete distress beacon messages as a function of the beacon power transmitted in the direction of the Electro satellite (beacon EIRP).

A beacon simulator is used to replicate distress beacons that transmit long format messages at specific EIRPs, for a duration necessary to transmit 25 bursts for each beacon ID. Hereafter the term "beacon event" is used to describe a beacon being active for a period of time. The test is conducted by transmitting 50 beacon events for each EIRP, whilst ensuring that signals from individual beacon events do not overlap in time and frequency with the signals from other beacon events. The output of the GEOLUT is monitored and the information identified in Table E-1 is recorded. The procedure is repeated at EIRP values ranging from 37 dBm to 26 dBm, in one dB increments.

Performance of this test requires the following steps.

a. Use a beacon simulator as a set of controlled test beacons with a variable output EIRP.

b. Program the simulator to provide different long format beacon identification codes for each beacon event. The test scripts used for this test are provided at Annex B, Table B-1.

c. Calibrate the beacon simulator output EIRP and carrier frequency (standard deviation of frequency deviations not exceeding 0.2 Hz) to confirm the technical characteristics of the transmitted signals.

d. To avoid interference to the 406 MHz channels currently active for operational use, ensure that the simulator does not transmit in the channels used for operational beacons.

e. Set the simulator EIRP to 37 dBm in the direction of the Electro satellite.

f. Transmit the 50 beacon events provided at Table B-1 (each event consists of the same beacon message transmitted 25 times), ensuring that individual beacon transmissions do not interfere with each other. To eliminate any potential interference from LEOSAR satellite downlinks, this test shall be scheduled to ensure that test signals are not transmitted when Electro GEOLUTs are in the footprint of a Cospas-Sarsat LEOSAR satellites.

g. Collect the data produced by the GEOLUT for each beacon event as described at Annex E (note that this data will be analysed to provide the results for this test objective, as well as for objectives T-2 and T-3).

h. Repeat the process at the EIRP values listed at Table 3-1, using the associated test scripts described at Table B-1.

3.2.1.2 Data Reduction, Analysis and Results

For each set of 50 beacon events transmitted at a given EIRP as recorded at Annex E Table E-1:

a. Calculate the probability of:

(i) producing at least one valid message for each beacon event as follows:

$$\frac{\textit{number of beacon events for which GEOLUT produced at least one valid message}}{\textit{number of beacon events transmitted at the selected EIRP}}$$

(ii) producing at least one valid message within 5 minutes of beacon activation as follows:

$$\frac{\textit{number of beacon events for which GEOLUT produced a valid message within 5 min of activation}}{\textit{number of beacon events transmitted at the selected EIRP}}$$

(iii) producing at least one complete beacon message as follows:

$$\frac{\textit{number of beacon events for which GEOLUT produced a correct complete long message}}{\textit{number of beacon events transmitted at the selected EIRP}}$$

(iv) producing a confirmed complete beacon message as follows:

$$\frac{\textit{number of beacon events for which GEOLUT was able to confirm a complete long message}}{\textit{number of beacon events transmitted at the selected EIRP}}$$

b. Calculate the C/No at the GEOLUT processor corresponding to each EIRP. Note that this is a calculated theoretical value of C/No, not the value measured by the GEOLUT. (Exact formula to be provided)

c. Record the results of the calculations above in sample Table 3-1.

d. Using the data from Table 3-1, produce graphs of the results as depicted at Figure 3-1.

EIRP from simulator (dBm)	Calculated C/No at GEOLUT (dBHz)	Number of Beacon Events Used (Valid Msg Sample Set)	Number of Beacon Events for which		Probability of Valid Message	Probability of Valid Message within 5 Min
			Valid Message was Produced	Valid Message was Produced within 5 Min		
26.0						
27.0						
28.0						
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0		**50**	**50**	**50**	**1.00**	**1.00**

EIRP from simulator (dBm)	Number of Beacon Events Used (Complete Msg Sample Set)	Number of Beacon Events Used (Confirmed Complete Msg Sample Set)	Number of Beacon Events for which a Complete Message was Produced	Number of Beacon Events for which a Confirmed Complete Message was Produced	Probability of Complete / Confirmed Complete Msg
26.0					
27.0					
28.0					
29.0					
30.0					
31.0					
32.0					
33.0					
34.0					
35.0					
36.0					
37.0	**50**	**50**	**50**	**1.00**	**1.00 / 1.00**

Table 3-1: Sample Table for Analysed Results for Objective T-1

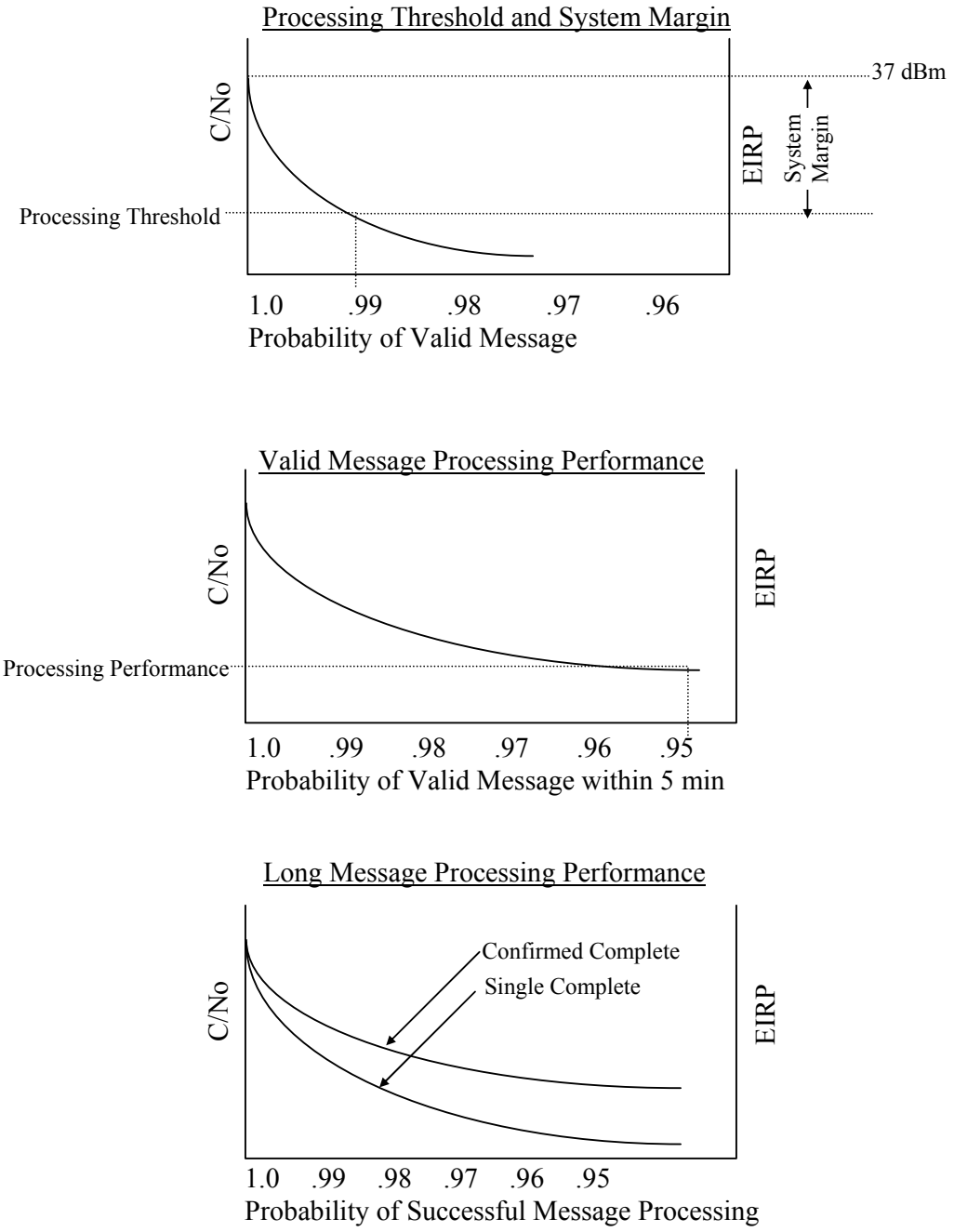


Figure 3-1: Graphs Depicting Processing Threshold, System Margin, Valid Message and Complete Long Message Processing Performance

All cases where the GEOLUT was not able to produce a valid message for a beacon event should be analysed to determine if extraordinary external factors (e.g. interference) could have caused the GEOLUT not to detect the beacon. If extraordinary external factors caused the GEOLUT to miss a beacon event, the event should be removed from the statistics and an explanation provided in the report.

3.2.2 T-2: Time to Produce Valid, Complete and Confirmed Messages

This test assesses how long it takes GEOLUTs operating with the Electro satellite to produce valid beacon messages, complete long messages, and confirmed complete long messages. This information will be used to validate message processing requirements for GEOLUTs which operate with the Electro satellite, and to determine a figure of merit for the number of bursts required to successfully process a message.

3.2.2.1 Methodology and Data Collection

For simplicity this test is conducted by analysing the data collected for test T-1 (Threshold). Note that the T-1 test scenario is specifically designed not to generate beacon bursts which overlap in time and frequency. Consequently, for operational beacon events, the times to produce valid, complete, and the time to confirm complete messages may differ from those determined during this test.

The following test methodology and data collection requirements apply:

a. Note the EIRP and 15 Hex ID for each beacon event.

b. For each beacon event note the date/time that the GEOLUT produced:

(i) the first valid message;
(ii) the first complete message; and
(iii) the first confirmation of the complete message with an independent integration process.

c. Record the data collected above in tabular format as described at Annex E. The table should have an entry for each beacon event at each EIRP.

3.2.2.2 Data Reduction, Analysis and Results

a. For each EIRP calculate the average time to:

(i) produce valid messages (ATVM), as follows:

$$ATVM = \frac{\sum \textit{time after first burst in beacon event for GEOLUT to produce valid message}}{\textit{number of beacon events for which at least one valid message produced}}$$

(ii) produce complete messages (ATCM), as follows:

$$ATCM = \frac{\sum \textit{time after first burst in beacon event for GEOLUT to produce complete message}}{\textit{number of beacon events for which at least one complete message produced}}$$

(iii)confirm a complete messages (ATCCM), as follows:

$$ATCCM = \frac{\sum \textit{time after first burst in beacon event for GEOLUT to confirm complete message}}{\textit{number of beacon events for which at least one complete message was confirmed}}$$

b. In addition, for each EIRP calculate the standard deviation for the time to produce valid, complete and confirmed complete messages.

c. For each EIRP determine the time (duration) required for the GEOLUT to provide 95% and 98% of valid, complete, and confirmed complete messages. These values are determined by normalising the time values by removing the time bias resulting from the requirement to stagger the start times of each beacon event. The normalised values are analysed to identify how long the GEOLUT required to produce the 95th and 98th percentile for valid, complete, and confirmed messages. If the 95th or 98th percentile was not achieved for any given category, this should be designated as Not Available (N/A) in the appropriate cell of the table.

d. Record the results of the above in sample Table 3-2.

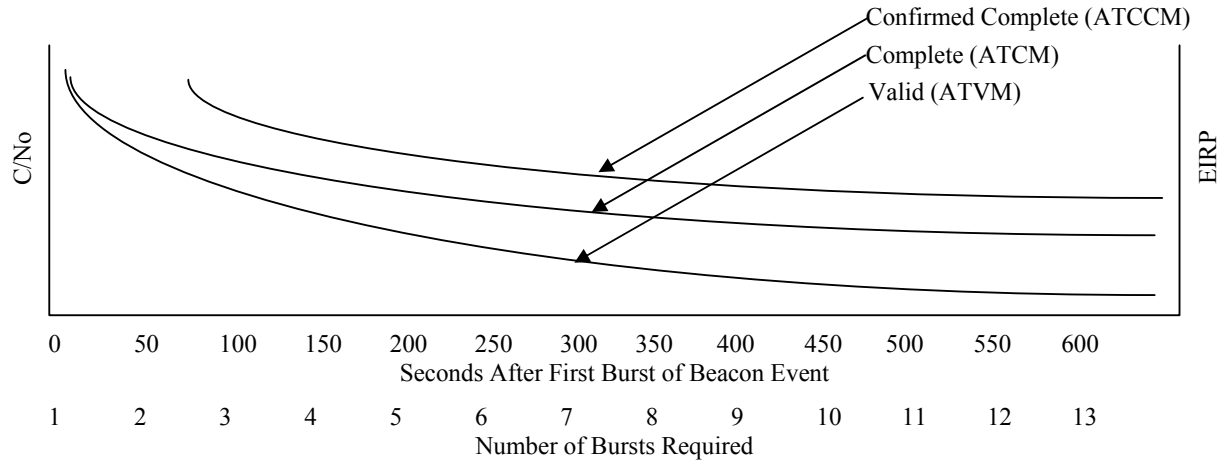
e. Using the data from Table 3-2, produce graphs of the results as depicted in Figure 3-2.

EIRP (dBm)	C/No (dBHz)	ATVM (Sec)	Standard Deviation of ATVM	ATCM (Sec)	Standard Deviation of ATCM	ATCCM (Sec)	Standard Deviation of ATCCM
26.0							
27.0							
.							
.							
.							
37.0							

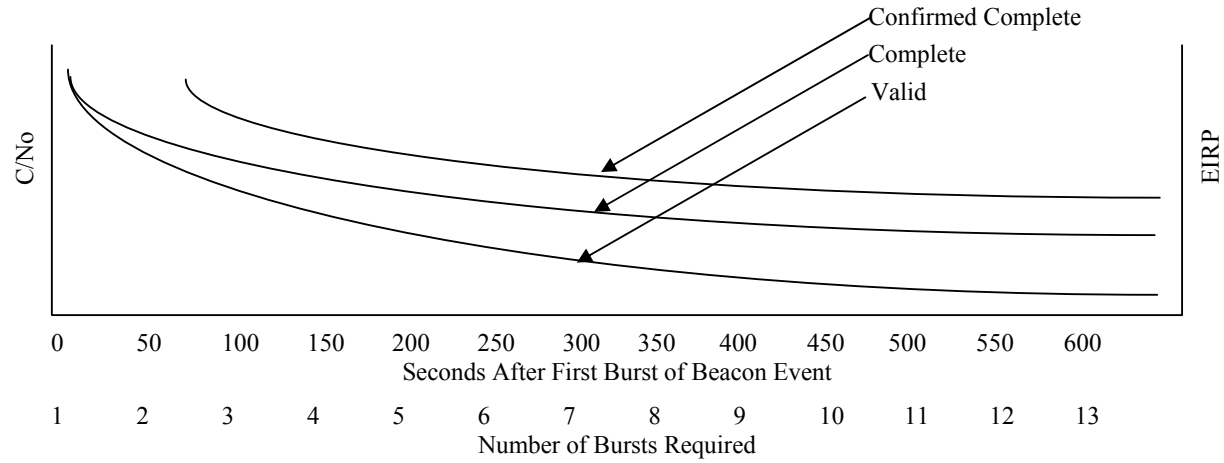
EIRP (dBm)	C/No (dBHz)	95th Percentile			98th Percentile		
		Valid Msg (Sec)	Complete Msg (Sec)	Confirmed Msg (Sec)	Valid Msg (Sec)	Complete Msg (Sec)	Confirmed Msg (Sec)
26.0							
27.0							
.							
.							
.							
37.0							

Table 3-2: Sample Table for Analysed Results for Objective T-2

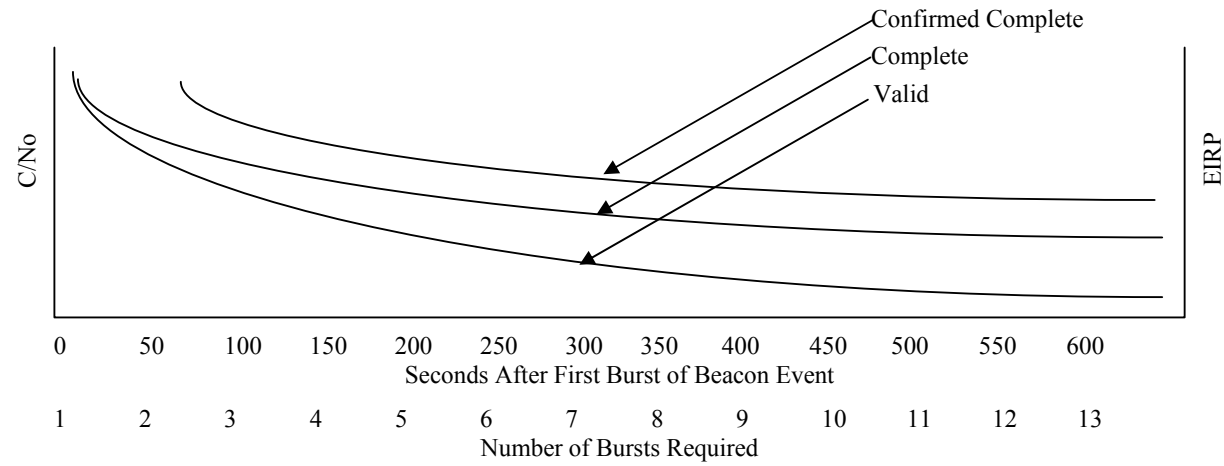
Average Time to Produce Valid, Complete and Confirmed Complete Messages



95th Percentile to Produce Valid, Complete and Confirmed Complete Messages



98th Percentile to Produce Valid, Complete and Confirmed Complete Messages



3.2.3 T-3: Carrier Frequency Measurement Accuracy

The purpose of this objective is to assess how accurately the beacon carrier frequency can be measured by the Electro GEOSAR / GEOLUT system. This is accomplished by comparing the beacon's carrier frequency for each valid message as measured by the GEOLUT with the known frequency value for the same beacon, provided by the beacon simulator operator. The current GEOLUT specification (C/S T.009) requires a frequency measurement accuracy of 2 Hz (standard deviation).

3.2.3.1 Methodology and Data Collection

For simplicity, this test is conducted by analysing the data collected for test T-1. For each beacon event note the frequency measurement provided by the GEOLUT associated with the first valid message produced, and record this information as described at Annex E.

The measured frequency should be corrected by the GEOLUT, as possible, to account for any calibration that would normally be performed during real GEOLUT operations (e.g. if the GEOLUT includes features for assessing and correcting frequency measurements by applying calibration correction factors, these features should be activated).

3.2.3.2 Data Reduction, Analysis, and Results

Using the data recorded at Annex E the mean and standard deviation of the frequency differences for each EIRP should be calculated and recorded as indicated in sample Table 3-3 and graphed as depicted at Figure 3-3. Measurements which have large differences may be removed from the data set if the measurement error can be explained by a known phenomenon which degraded the GEOLUT's ability to produce a valid measurement.

EIRP (dBm)	Calculated C/No at GEOLUT (dBHz)	Avg Freq Measurement Error (Hz rounded to 1 decimal place)	Std Deviation of Error (Hz)
26.0			
.			
.			
37.0			

Table 3-3: Sample Table for Analysed Results for Objective T-3

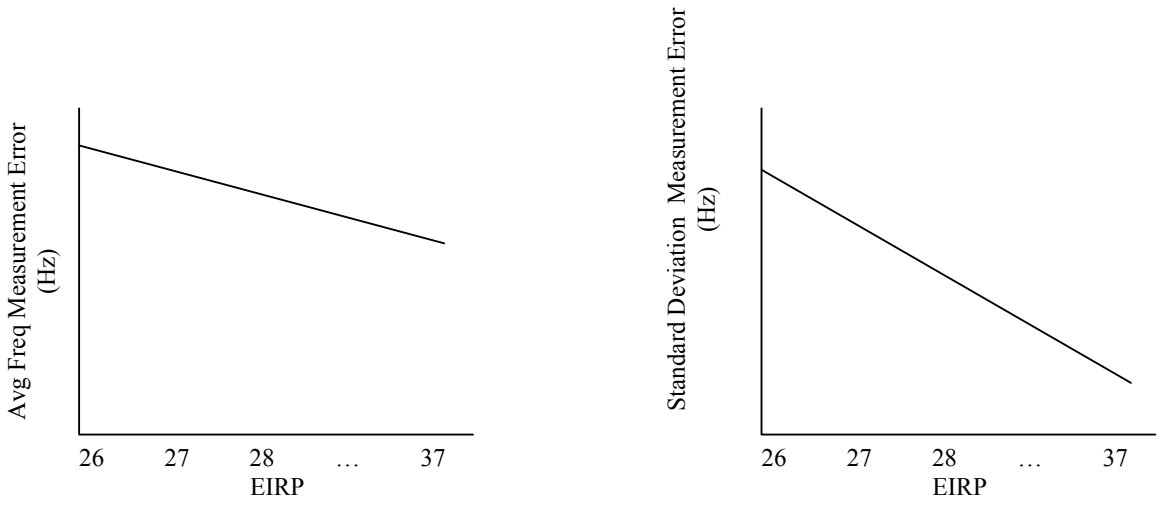


Figure 3-3: Graphs Depicting Frequency Measurement Accuracy Performance

3.2.4 T-4: ELECTRO GEOLUT Channel Capacity

The definition of capacity in Cospas-Sarsat GEOSAR systems is the number of 406 MHz distress beacons operating simultaneously in the field of view of a GEOSAR satellite, that can be successfully processed by the System to provide a valid beacon message, under nominal conditions, within 5 minutes of beacon activation 95% of the time, and the number of beacons that can be successfully processed within 10 minutes of beacon activation 98% of the time. The applicable nominal conditions are described in document C/S T.012, "Cospas-Sarsat 406 MHz Frequency Management Plan", except that the uplink EIRP will be set to 34 dBm.

3.2.4.1 Methodology and Data Collection

The Electro GEOSAR channel capacity is determined by generating traffic loads equivalent to known numbers of simultaneously active long format beacons in a Cospas-Sarsat 406 MHz channel. The time required for the GEOLUT to produce a valid beacon message, complete message and confirm a complete message for each beacon event is recorded. The number of simultaneously occurring beacon events is changed and the time required for the GEOLUT to produce valid, complete and complete confirmed messages are calculated and recorded for the new 406 MHz traffic load.

The test scripts transmitted by the beacon simulator should conform to the nominal conditions detailed in document C/S T.012, with the exception that the uplink EIRP will be 34 dBm. Specifically, the test shall replicate a number of beacon messages overlapping in time and frequency commensurate with the number of simultaneously active beacons. Further, the beacon events used in the test script shall also replicate the beacon burst repetition period defined in document C/S T.001 (406 MHz beacon specification). The test shall be scheduled to avoid any potential interference caused by Cospas-Sarsat LEOSAR satellite downlink transmissions.

The test will replicate scenarios of 15, 20, 25 and 30 simultaneously active beacons.

Performance of this test requires the following steps**.**

a. A beacon simulator test script is developed which replicates 15 simultaneously active beacons, with each beacon event having a unique ID. The time of the first burst for each beacon event should be developed using a random process that ensures that the first burst of each beacon is transmitted within 50 seconds from the start of the test. The transmit time for subsequent transmissions for each beacon event shall conform to the repetition period defined in the Cospas-Sarsat beacon specification (C/S T.001). Therefore, the test script will include instances where beacon bursts may overlap in time and frequency. The test signals will be transmitted with a carrier frequency of 406.063MHz with the uplink power set to 34 dBm. Each beacon event shall replicate a beacon being active for a 15 minute period.

b. Ensuring that the GEOLUTs will not be in the downlink footprint of a Cospas-Sarsat LEOSAR satellite, the test script is transmitted.

c. For each beacon event the time that the GEOLUT produced the first valid message, first complete message and first confirmed complete message should be recorded in the tabular format provided at Annex F.

d. Repeat test with a different test script which also replicates 15 active beacons until 10 different test scripts have been transmitted.

e. Repeat the process above for scenarios in which the beacon simulator replicates 20 , 25 and 30 simultaneously active beacons.

3.2.4.2 Data Reduction, Analysis and Results

Using the data collected at Annex F, Table 3-4 should be completed for each simulated traffic load (e.g. the 10 repetitions of the test script for 15 active beacons are consolidated to provide the data in a single row of the table).

Channel: 406.063				
# of Active Bcn Events	**% Valid Msg within 5 Min**	**% Valid Msg within10 Min**	**% Valid Msg within 15 Min**	**% Confirmed Complete Msg within 15 Min**
15				
20				
25				
30				

Table 3-4: Sample Table for Capacity Statistics

From the data in Table 3-4, the percentage of beacon events which produced valid messages within 5, 10 and 15 minutes of the start of the beacon event, and also the percentage of confirmed complete messages, should be graphed against the respective beacon channel population as indicated at Figure 3-4. As described below, the capacity of the channel is

determined by evaluating the number of active beacons corresponding to the 95th percentile of the 5 minute curve and the 98th percentile of the 10 minute curve. Since the capacity of the channel must satisfy both the 5 and 10 minute criteria, the lower of these two figures is the channel capacity.

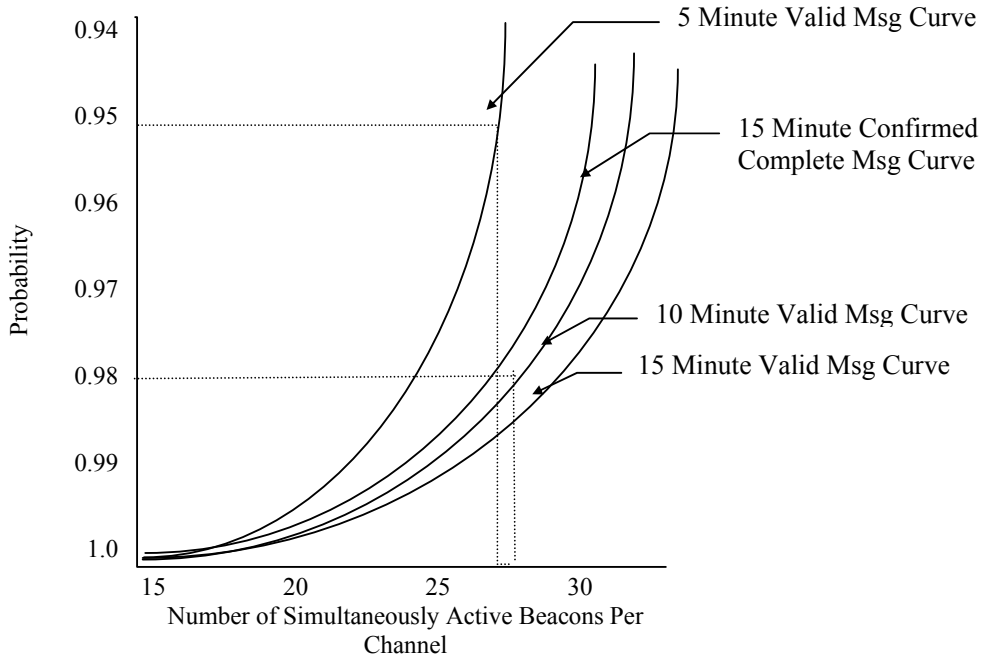


Figure 3-4: Graph Depicting Electro GEOSAR Capacity

In the fictitious example above, the 0.95 probability in 5 minutes would be the most stringent criteria, and, therefore, defines the capacity as being approximately 26.5 active beacons.

3.2.4.3 Interpretation, Conclusion and Recommendation

The results of these tests will provide an estimate of the capacity a single channel in the Electro GEOSAR system. It is recommended that these results be used to validate the GEOLUT capacity models being developed for the 406 MHz Frequency Management Plan.

3.2.5 T-5: Impact of Interference

The purpose of this objective is to determine the ability of the GEOSAR system to provide valid messages in the presence of interference and noise. In view of the specialized test equipment required to conduct this objective, not all Electro GEOLUT operators need participate, but as a minimum one operator should monitor and report the impact of interference in accordance with these procedures.

3.2.5.1 Methodology and Data Collection

This objective will use both real alerts and controlled test beacons to determine the impact of actual interferers seen in the GEOSAR field of view when interference is present. It will also examine the relationship between the characteristics of the interfering signals and any changes in the production of valid messages.

The following methodology should be used.

a. Characterize the interference by using a spectrum analyser and a data storage device to permit detailed analysis of the interfering signal at a later time than its occurrence. The following test set up could be used (see Figure 3-5):

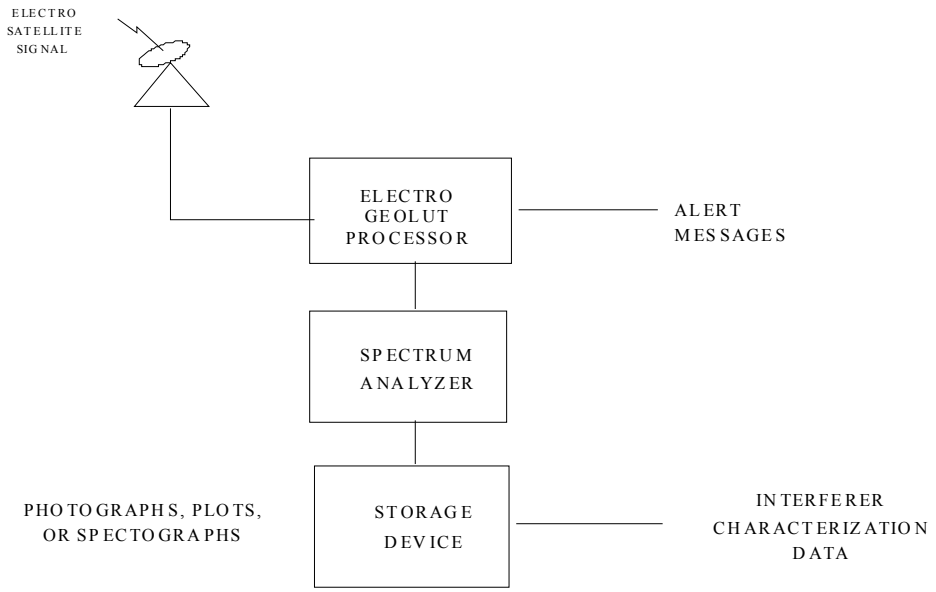


Figure 3-5: Test Set-up for Interference Evaluation

b. Monitor the GEOSAR band using the spectrum analyser. Record the output in a storage device for later detailed analysis. Photographs, data plots, or spectrographs could be used for this purpose.

c. When interference is detected the following parameters concerning the interfering signal should be collected.

i) The identification of the GEOLUT.

ii) Time of occurrence and the duration of the interfering signal.

iii) Spectral occupancy.

iv) Signal strength.

v) Time patterns (e.g. on/off versus continuous, sweeping versus constant, etc.).

vi) Nature of modulation (analogue versus digital).

vii) Location of the interferer (if known).

During periods of interference the production of valid messages by the GEOSAR processor should be evaluated. Any loss of messages, the production of invalid messages or increases in the message transfer time should be noted.

3.2.5.2 Data Reduction, Analysis and Results

When interference is detected, all GEOSAR messages during the period should be examined to determine if there is:

a. a loss of expected messages;

b. a decrease in the number of valid messages from operational and test beacons before and after the occurrence of the interference; and

c. an increase in processing anomalies.

Examine the technical parameters of the interferer and try to relate the impact on the message processing to specific characteristics of the interferer. For example, is there a relationship between the rate of reduction in valid messages to the interferer's signal power level?

3.2.6 T-6: Impact of Interference From LEOSAR Satellites

The purpose of this objective is to analyse and quantify the impact that Cospas-Sarsat LEOSAR satellite downlink transmissions have on the ability of Electro GEOLUTs to process beacon signals. The test transmissions used for this objective will also be used for objective T-7 (Electro GEOLUT network performance).

3.2.6.1 Methodology and Data Collection

The impact of interference from LEOSAR satellite downlink transmissions is assessed by activating beacon events at regular intervals over extended periods of time. The performance of the GEOLUT to produce valid and confirmed messages for these beacon events during periods when the GEOLUT was within, and periods when not within a LEOSAR satellite footprint, is analysed. It should be noted that harmful interference does not always occur every time GEOLUTs are in the footprint of the LEOSAR satellites, since the level of interference is dependant on many factors (e.g. side lobe characteristics of GEOLUT antenna, GEOLUT antenna shielding, etc.). Consequently, this test will not categorically confirm whether LEOSAR satellites generate harmful interference to the Electro GEOSAR System. However, the test may provide sufficient information to determine whether additional tests on the matter will be required.

Performance of this test requires the following steps.

a. The beacon simulator is programmed to transmit a new beacon event, each with an EIRP of 37 dBm every 10 minutes over a 48 hour period. Each beacon event shall have a unique ID, transmit long format messages and shall be active for 20 minutes. The burst repetition interval for each beacon event shall be implemented in a manner which ensures that at least 10 bursts from each event do not collide with bursts from other events.

b. The output of the GEOLUT should be monitored and the time required for the GEOLUT to produce the first valid, complete, and confirmed complete message for each beacon event shall be noted. Also, for each beacon event it should be noted whether the GEOLUT was in the footprint of a LEOSAR satellite during the time between beacon activation and the production of the first valid message, and the C/No measured by the GEOLUT for the first valid message of each beacon event. The results shall be recorded in the format provided at Annex G.

3.2.6.2 Data Reduction, Analysis and Results

From the data collected, the following shall be provided.

a. A histogram in 100 second intervals (as depicted at Figure 3-6), which provides the number of beacon events for which the GEOLUT was able to produce the first valid message for a beacon event. As indicated in the example, the histogram should report separately beacon events which occurred when the GEOLUT was in the footprint of a LEOSAR satellite and those which occurred for which there was no possibility of LEOSAR interference.

b. The graph shall also be annotated to depict the cumulative percentage of beacon events for which a valid message was produced.

c. A histogram similar to the one described above, depicting the number of beacon events for which the GEOLUT was able to produce confirmed complete messages, should be provided.

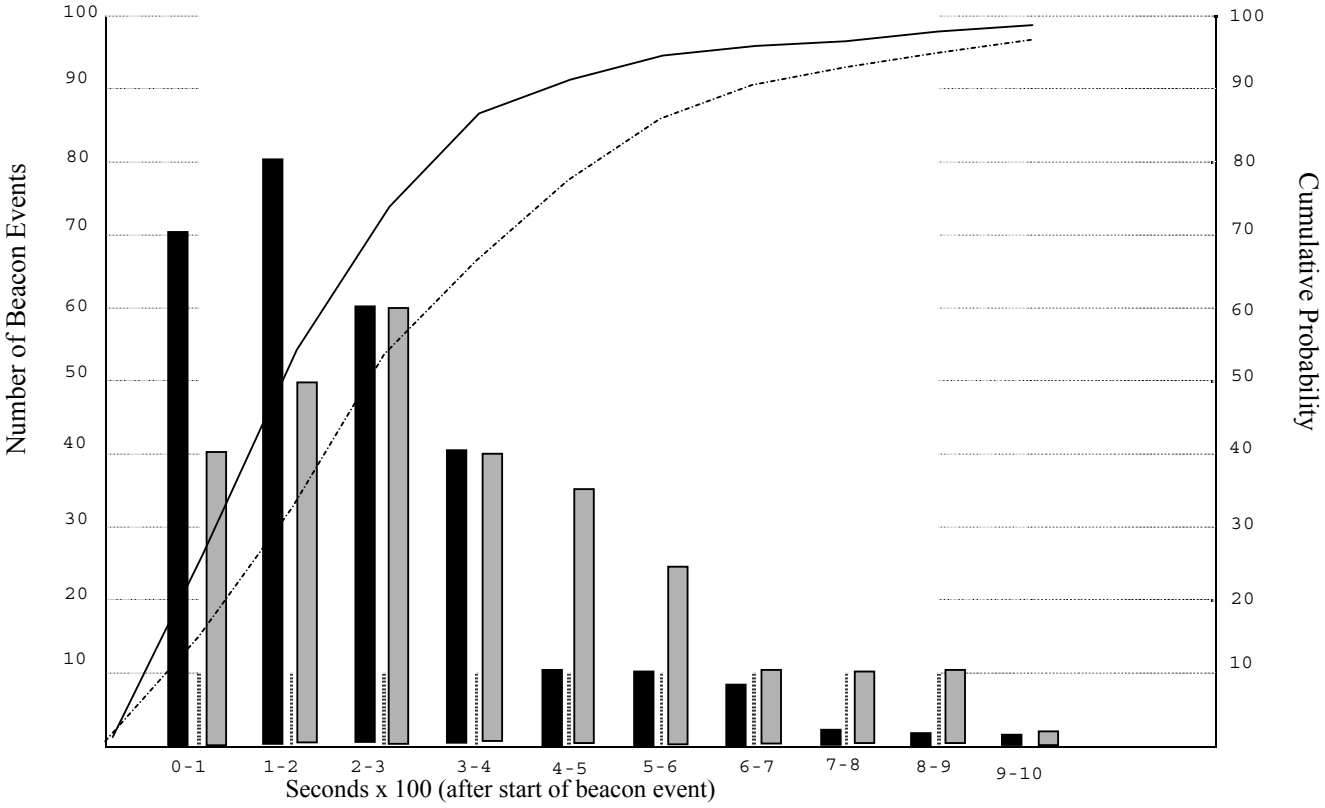
d. A graph depicting the C/No values covering the 48 hours of the test should also be provided.

e. The average and standard deviation of the time required by the GEOLUT to produce valid and confirmed complete messages should be provided separately, for:

   (i) beacon events which occurred while the GEOLUT was within the footprint of a LEOSAR downlink; and

   (ii) beacon events which occurred while the GEOLUT was not within the footprint of a LEOSAR downlink.

Figure 3-6: GEOLUT Valid Message Production Performance



Number of beacon events for which GEOLUT produced a valid message (no possibility of LEOSAR interference prior to first valid message).

Number of beacon events for which GEOLUT produced a valid message (possible LEOSAR interference prior to first valid message).

Cumulative Probability of valid message (no possibility LEOSAR interference prior to first valid message).

Cumulative Probability of valid message (possible LEOSAR interference prior to first valid message).

3.2.7 T-7: ELECTRO GEOLUT Network Performance

There is a requirement to confirm that the Electro GEOSAR system comprised of the GEOSAR satellite and the network of GEOLUTs which track it will provide reliable and timely 406 MHz alerts even if one or more of the Electro GEOLUTs were unavailable due to interference from LEOSAR downlink transmissions.

3.2.7.1 Methodology and Data Collection

The results from objective T-6 from all the participating GEOLUTs is analysed to complete the table provided below. For each beacon event the earliest time that any of the GEOLUTs produced a valid message and the earliest that any of the GEOLUTs produced a confirmed complete message is recorded. Since this test requires consolidating the results from objective T-6 from all the participating Electro GEOLUTs, objective T-7 will not be included in the performance evaluation reports provided by individual GEOLUT operators.

Beacon ID	Time to Produce Valid Msg	GEOLUT which Produced Valid Msg	Time to Produce Confirmed Complete Msg	GEOLUT which Produced Confirmed Complete Msg

Table 3-5: Sample Table of Electro GEOLUT Network Performance

3.2.7.2 Data Reduction, Analysis and Results

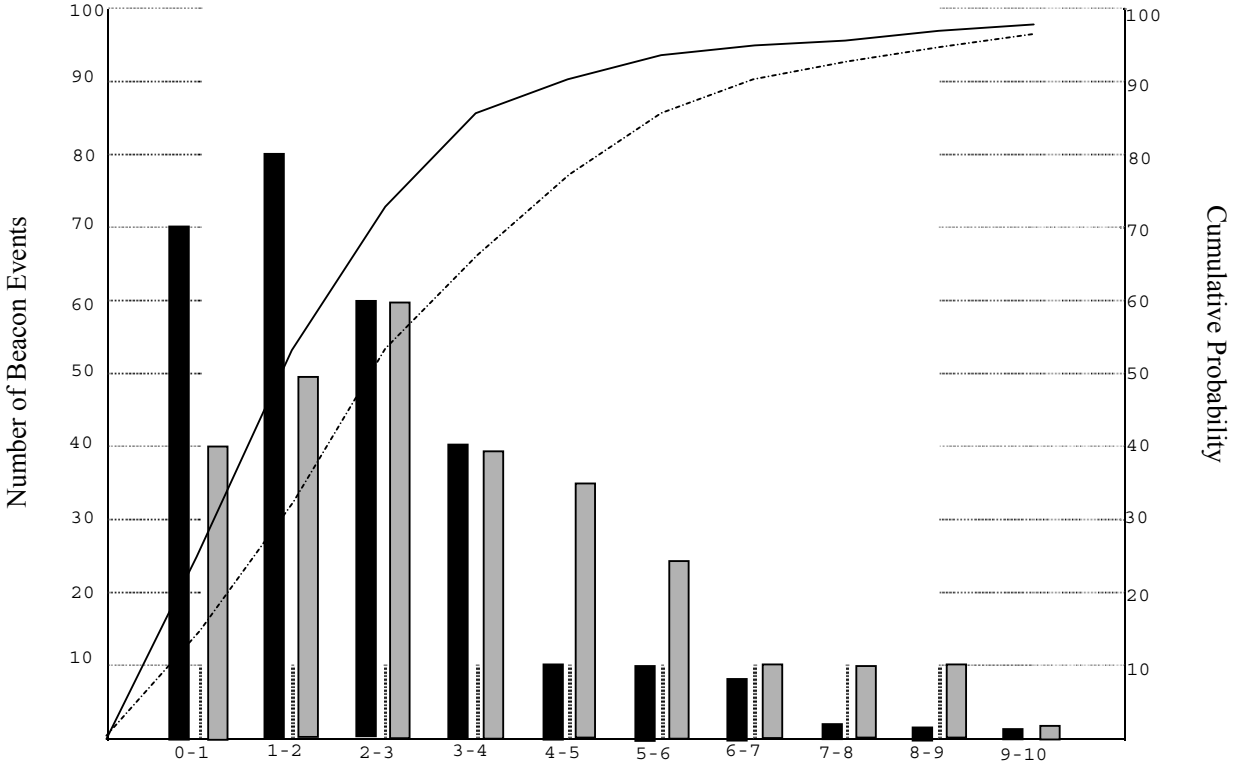
From the data collected, the following shall be provided.

a. A histogram, with 100 second intervals, depicting the number of beacon events for which valid and confirmed complete messages were produced, and the cumulative probabilities of valid and confirmed complete messages (as provided at Figure 3-7).

b. The mean time and standard deviation for the Electro GEOSAR system to produce valid and confirmed complete messages.

c. The probability that the combined network of GEOLUTs would produce a valid message within 5 minutes, and within 10 minutes.

Figure 3-7: GEOLUT Network Performance



■ Number of beacon events for which one of the Electro GEOLUTs produced the first valid message within the time interval.

▯ Number of beacon events for which one of the Electro GEOLUTs produced the first confirmed message within the time interval.

___ Cumulative Probability of the valid message being produced by at least one of the Electro GEOLUTs.

Cumulative Probability of confirmed message being produced by at least one of the Electro GEOLUTs.

3.2.8 T-8: Processing Anomalies (PA)

This test assesses GEOLUT performance in respect of its ability to suppress the number of processing anomalies produced.

3.2.8.1 Methodology and Data Collection

This test is conducted by monitoring the 406 MHz channel (406.022 MHz) used by Cospas-Sarsat reference beacons, and noting instances where the GEOLUT produced valid beacon

messages which did not correspond to any of the reference beacons in the coverage area of the Electro satellite. Since the identifications (IDs) of all reference beacons in view of the Electro satellite are known, it can be inferred that beacons detected in the 406.022 MHz channel which do not correspond to known reference beacons are processing anomalies. The following test methodology and data collection requirements apply:

a. Note the 15 hexadecimal identification of all the reference beacons in the coverage area of the Electro satellite.

b. Monitor the 406 MHz channel used by Cospas-Sarsat reference beacons for a 4 week period, and note each instance of the GEOLUT producing a processing anomaly. For each processing anomaly note the date and time that it was produced by the GEOLUT, the 15 Hex ID and the 30 Hex beacon message reported by the GEOLUT, and whether there was interference from a LEOSAR satellite at the time the PA was produced (an example of the table for collecting this data is provided at Annex H).

3.2.8.2 Data Reduction, Analysis and Results

a. Identify those valid messages that were processing anomalies (their 15 Hex ID did not correspond to the 15 Hex ID of any of the reference beacons in the coverage area of the Electro satellite).

b. For each processing anomaly, determine if the GEOLUT was in the coverage area of a LEOSAR satellite at the time the alert was produced. This information will be used to develop statistics which will provide an indication of whether LEOSAR interference impacts upon GEOLUT processing anomaly performance.

c. For each processing anomaly, attempt to determine the source (i.e. reference beacon) of the transmission. This is done by converting the GEOLUT produced message into its binary representation, and comparing it with bit-shifted versions of all the reference beacons in the Electro coverage area. If the bits of the processing anomaly message correspond to 80% or more of a reference beacon message, then it could be assumed that the processing anomaly was generated from the GEOLUT processing of transmissions from that reference beacon.

d. Record the results in the table provided at Annex H, and copied below:

15 Hex ID Produced by GEOLUT	15 Hex ID of Associated Reference Beacon	Beacon Message Produced by GEOLUT (30 Hex)	Date / Time	LUT in LEO Footprint (Y/N)

e. Calculate the PA rate as a function of beacon bursts in the coverage area of the Electro satellite. This is calculated with the following equation:

$$\left(\frac{\text{Total Number of PAs}}{\text{Number of Days Observed} * \text{Number of Reference Beacon Bursts per Day in Electro Coverage Area}} \right)$$

f. Calculate the PA rate when the GEOLUT is in the footprint of a LEOSAR satellite using the following equation.

$$\left(\frac{\text{Total Number of PAs during LEO Cov}}{\text{Total Duration of LEO Cov in Days} * \text{Number of Reference Beacon Bursts per Day in Electro Coverage Area}} \right)$$

3.2.9 T-9: ELECTRO Coverage

The coverage of the Electro GEOSAR system is evaluated using a combination of:

a. technical tests, in which a beacon is activated for a period of time, during which it crosses in or out of the Electro GEOSAR coverage area; and

b. evaluating real beacon alerts detected by the LEOSAR system, and assessing if the same alerts were detected by the Electro GEOSAR system.

3.2.9.1 Methodology and Data Collection

Testing Using Beacon Crossing Coverage Area

A beacon will be mounted on a vessel or vehicle which will be crossing the expected Electro GEOSAR coverage area. After the beacon has been activated, the beacon operator will record its location as a function of time. Electro GEOLUT operators will monitor the output of their GEOLUTs for the test period, and record the times associated with the production of all valid messages for the test beacon.

Evaluating Coverage Area Using Real Beacon Events of Opportunity

The location and times of real beacon events detected by the LEOSAR system during the period of the Electro GEOSAR Performance testing are to be identified. Beacon events located within an area enclosed by 80° latitude and longitude should be recorded in the format provided at Annex I. The beacon ID and time of each alert in the sample set are to be compared against the GEOLUT output to determine if the event was also detected by the Electro GEOSAR system.

3.2.9.2 Data Reduction, Analysis and Results

Testing Using Beacon Crossing Coverage Area

From the data collected, the time that Electro GEOSAR coverage was lost (or began depending whether the beacon was moving in or out of coverage) is to be recorded. The movement of the beacon during the test period is to be plotted on a map, and the plot is to be annotated to depict GEO coverage / no GEO coverage. From the collected data, the estimated latitude and longitude of the last valid message detected by the GEOLUT before the beacon left coverage, should be provided.

Evaluating Coverage Area Using Real Beacon Events of Opportunity

a. All the LEOSAR alerts detected during the period of the Electro Performance evaluation that satisfy the criteria for inclusion in the sample set should be recorded in the format provided at Annex I (i.e., situated within an area enclosed by 80° latitude and longitude);

b. Each beacon event in the sample set should be checked to determine if it was also detected by the Electro GEOLUT, and the results recorded as per Annex I;

c. The beacon events are to be grouped into geographic areas of 10° latitude/longitude blocks;

d. For each block, the percentage of LEOSAR beacon events that were also detected by the GEOLUT should be calculated and presented as indicated at Table 3-6 below; and

e. The location of each beacon event should be plotted on two maps, one depicting events that were detected by both the LEOSAR and GEOLUT, and a separate map depicting beacon events detected only by the LEOSAR system.

Block Location		Number of LEOSAR Beacon Events	Number Detected by GEOLUT	% Detected by GEOLUT
Longitude	**Latitude**			
0/10w	**0/10n**			
10w/20w	**0/10n**			
20w/30w	**0/10n**			
.	**.**			
.	**.**			
.	**.**			
70e/80e	**70s/80s**			

Table 3-6: Sample Table of Coverage Statistics

3.2.10 C-1: Commissionning of the new MOSCOW GEOLUT

Part of the Electro GEOSAR performance evaluation plan includes the verification of the compliance of new Moscow GEOLUT with the performance specification (C/S T.009).

Document C/S T.010 provides the detailed testing and reporting requirements for the commissioning of the Cospas-Sarsat Moscow GEOLUT. The annexes of the documents 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.

Commissioning reports are reviewed separately by the Cospas-Sarsat Joint Committee and approved by the Cospas-Sarsat Council.

- END OF SECTION 3 -

4. REPORTING GUIDELINES

Each GEOLUT operator participating in the Electro GEOSAR Performance Evaluation Programme shall submit an individual report to the Cospas-Sarsat Secretariat. The report should follow the structure described in Annex A, using the same section paragraph numbering and annexes.

The Secretariat will retain the complete reports on file for archival purposes, and will format each report into a summarized version for presentation to the Joint Committee. Based upon the recommendations of the Joint Committee, a summary report of the performance of the Electro System will be produced for the consideration of the Cospas-Sarsat Council.

- END OF SECTION 4 -

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ANNEXES TO THE COSPAS-SARSAT ELECTRO GEOSAR PERFORMANCE EVALUATION PLAN

C/S R.016

ANNEX A

FORMAT OF ELECTRO PERFORMANCE EVALUATION REPORTS BY GEOLUT OPERATORS

A.1 INTRODUCTION

Introductory remarks provide information necessary to understand the report. The introduction should identify which test objectives were completed and have been reported in this document and any known deficiencies with the GEOLUT which could affect the results. Furthermore, the introduction shall provide:

a. the dates covered by the test programme;
b. the location of the GEOLUT; and
c. the configuration settings of the GEOLUT which could impact upon its observed performance (e.g. the bandwidth settings of the GEOLUT receiver).

A.2 SUMMARY OF RESULTS

This section will provide summary statements concerning the results of each objective. It should specifically identify any difficulties experienced with the evaluation programme and any recommendations that should be noted by the Joint Committee.

A.3 TEST T-1: PROCESSING THRESHOLD, SYSTEM MARGIN AND BEACON MESSAGE PROCESSING PERFORMANCE

A.3.1 Test Description

This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

A.3.2 Calculation of C/No

The calculations converting the EIRP of the simulator, to a C/No value at the GEOLUT processor should be provided.

A.3.3 Test Results

The GEOLUT data collected for this test should be included as an annex to the report, and referenced in this section of the report. In addition, the tables below should be produced based on the collected data and provided in this section of the national report.

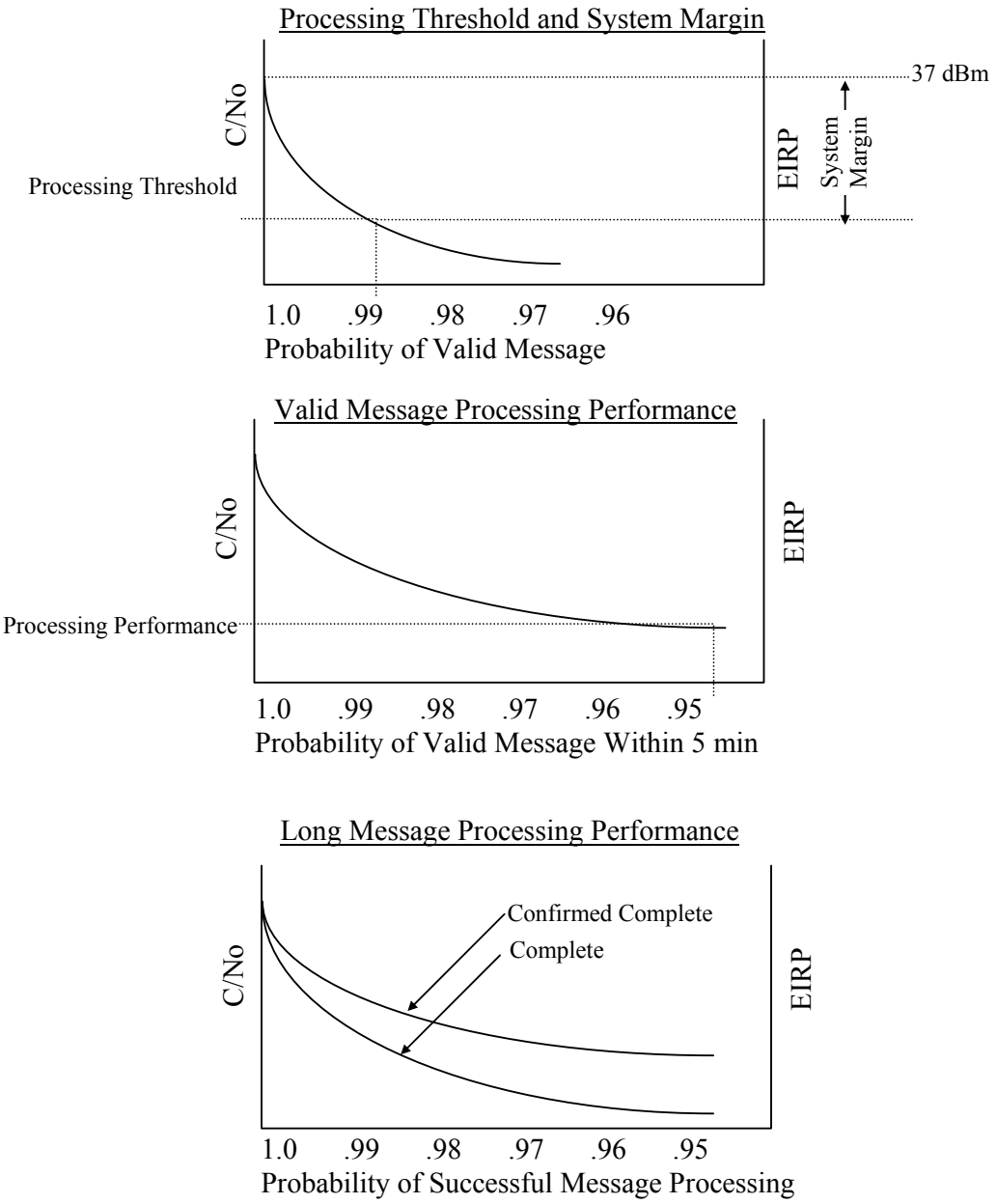
Analysed Data for Test T-1

EIRP from simulator (dBm)	Calculated C/No at GEOLUT (dBHz)	Number of Beacon Events Used (Valid Msg Sample Set)	Number of Beacon Events for which		Probability of Valid Message	Probability of Valid Message within 5 Min
			Valid Message was Produced	Valid Message was Produced within 5 Min		
26.0						
27.0						
28.0						
29.0						
30.0						
31.0						
32.0						
33.0						
34.0						
35.0						
36.0						
37.0		50	50	50	1.00	1.00

EIRP from simulator (dBm)	Number of Beacon Events Used (Complete Msg Sample Set)	Number of Beacon Events Used (Confirmed Complete Msg Sample Set)	Number of Beacon Events for which a Complete Message was Produced	Number of Beacon Events for which a Confirmed Complete Message was Produced	Probability of Complete / Confirmed Complete Msg
26.0					
27.0					
28.0					
29.0					
30.0					
31.0					
32.0					
33.0					
34.0					
35.0					
36.0					
37.0	50	50	50	1.00	1.00 / 1.00

A.3.4 Processing Threshold and Message Processing Performance

A graph of the results from the tables above should be included (a theoretical example is provided herein). The processing threshold value should be highlighted by noting the value of C/No corresponding to a 0.99 probability of obtaining a valid message as indicated below. Similarly the processing performance is determined from the graph depicting C/No versus the probability of producing a valid message within 5 minutes.



A.3.5 System Margin

The calculations converting the threshold value of C/No to the associated EIRP, and the resulting system margin should be provided.

A.3.6 Test Anomalies

This section should provide information concerning issues which occurred during the test which could affect results. If some data was excluded from the results, an explanation should be provided.

A.3.7 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

A.4 TEST T-2: TIME TO PRODUCE VALID, COMPLETE AND CONFIRMED MESSAGES

A.4.1 Test Description

This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

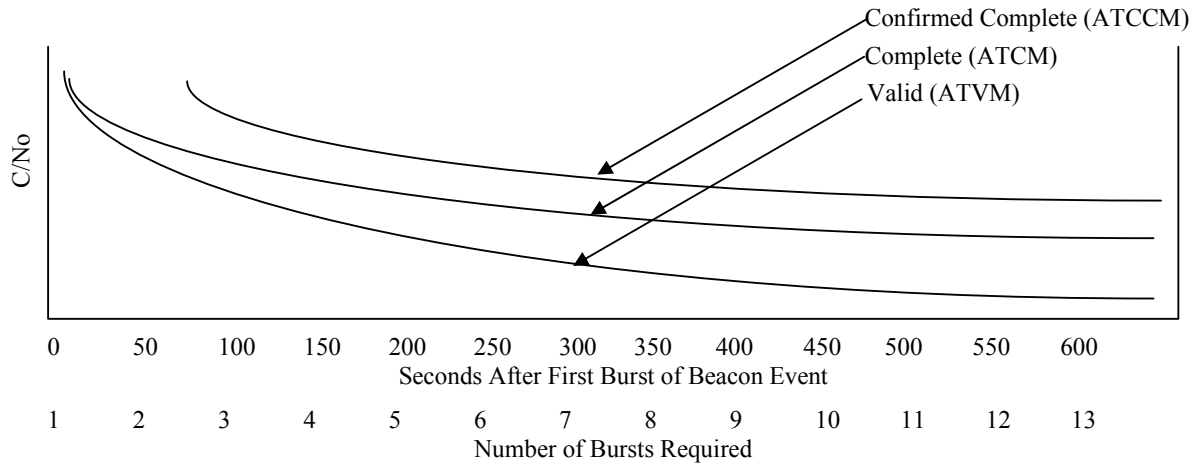
A.4.2 Test Results

The results for this test are obtained by analysing the data that was collected for the T-1 Test. A reference should be provided to indicate the annex of the report where this data is provided. From the data, the table and graphs described below should be produced and included in this section of the report. In addition to the mean time to produce valid, complete and confirmed complete messages for each EIRP, the standard deviation for each of these statistics should also be calculated and provided.

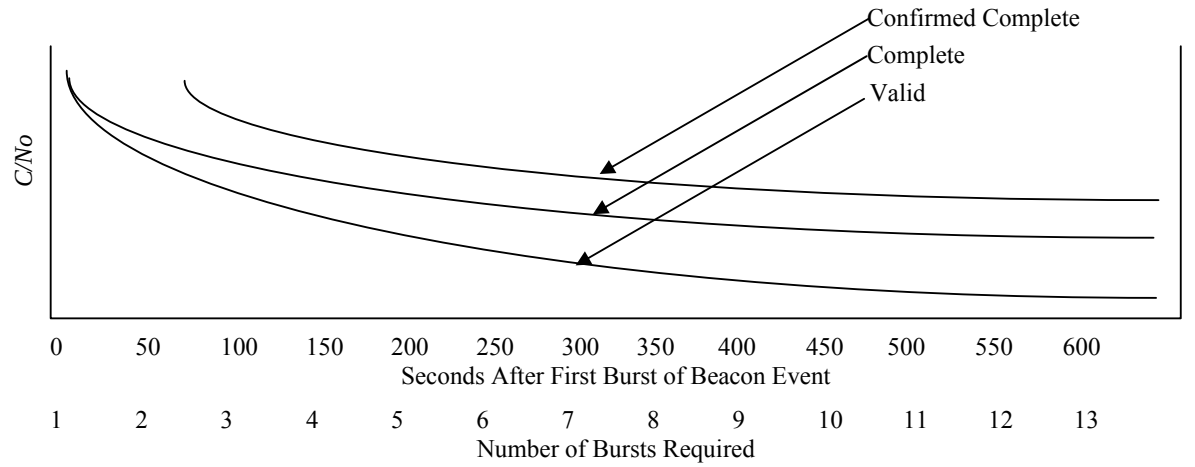
EIRP (dBm)	C/No (dBHz)	ATVM (Sec)	Standard Deviation of ATVM	ATCM (Sec)	Standard Deviation of ATCM	ATCCM (Sec)	Standard Deviation of ATCCM
26.0							
27.0							
.							
.							
37.0							

EIRP (dBm)	C/No (dBHz)	95th Percentile			98th Percentile		
		Valid Msg (Sec)	Complete Msg (Sec)	Confirmed Msg (Sec)	Valid Msg (Sec)	Complete Msg (Sec)	Confirmed Msg (Sec)
26.0							
27.0							
.							
.							
37.0							

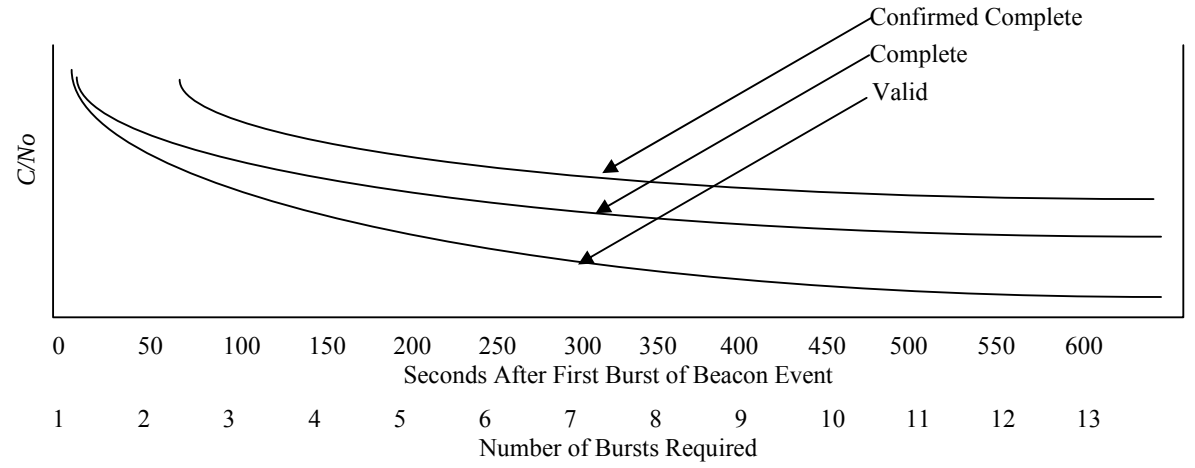
Average Time to Produce Valid, Complete and Confirmed Complete Messages



95th Percentile to Produce Valid, Complete and Confirmed Complete Messages



98th Percentile to Produce Valid, Complete and Confirmed Complete Messages



This section should provide information concerning issues which occurred during the test which could affect results. If some data was excluded from the results, an explanation should be provided.

A.4.4 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

A.5 TEST T-3: CARRIER FREQUENCY MEASUREMENT ACCURACY

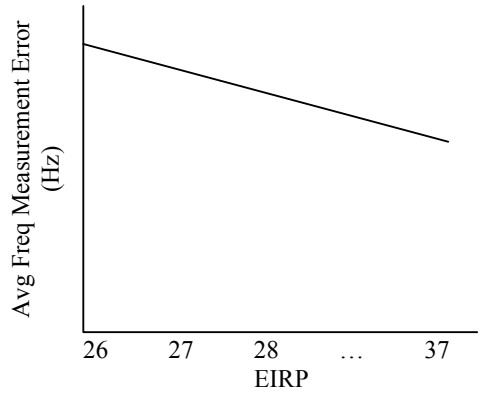
A.5.1 Test Description

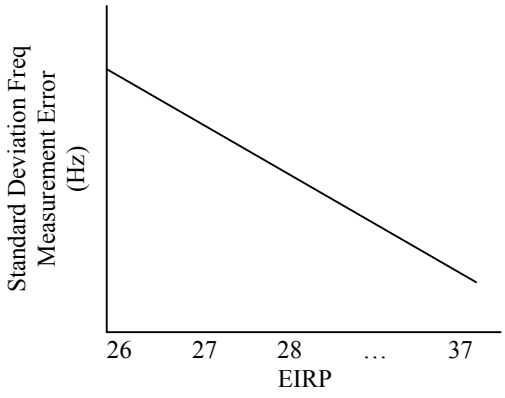
This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

A.5.2 Test Results

The results for this test are obtained by analysing the data that was collected for the T-1 Test, to obtain the average frequency measurement error and standard deviation of this error, for each EIRP. A reference should be provided to indicate the annex of the report where this data is provided. The results of these calculations should be presented in tabular and graphical formats as indicated below.

EIRP (dBm)	Calculated C/No at GEOLUT (dBHz)	Avg Freq Measurement Error (Hz rounded to 1 decimal place)	Std Deviation of Error (Hz)
26.0			
.			
.			
37.0			





A.5.3 Test Anomalies

This section should provide information concerning issues which occurred during the test which could affect results. If some data was excluded from the results, an explanation should be provided.

A.5.4 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

A.6 TEST T-4: ELECTRO GEOLUT CHANNEL CAPACITY

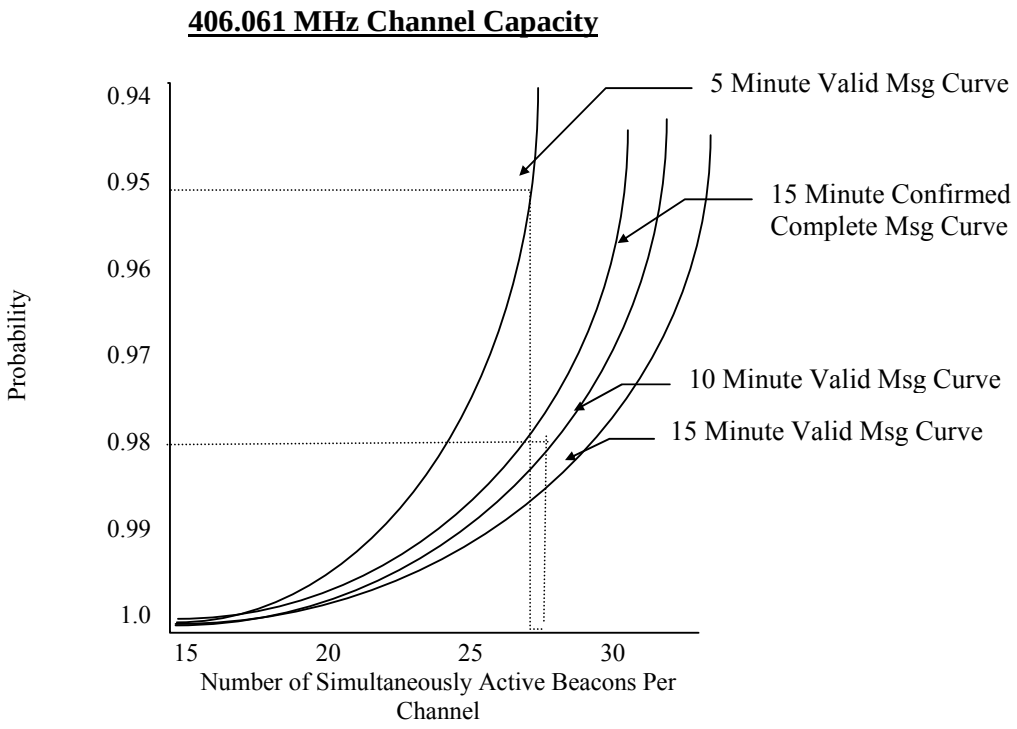
A.6.1 Test Description

This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

A.6.2 Test Results

The GEOLUT data collected for this test should be included as an annex to the report, and should be referenced in this section of the report. From the data collected, the table and graph depicted below should be provided, and the capacity calculated and reported in this section of the report.

Channel: 406.063				
# of Active Bcn Events	% Valid Msg within 5 Min	% Valid Msg within10 Min	% Valid Msg within 15 Min	% Confirmed Complete Msg within 15 Min
15				
20				
25				
30				



A.6.3 Test Anomalies

This section should provide information concerning issues which occurred during the test which could affect results. If some data was excluded from the results, an explanation should be provided.

A.6.4 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

A.7 TEST T-5: IMPACT OF INTERFERENCE

This objective is not accomplished through a controlled test, but rather by monitoring the performance of the GEOLUT throughout the period of the entire Electro performance evaluation programme, during which time it is anticipated that there will be periods of interference. In view of the unstructured nature of this process it is not possible to predict what information will be collected, the detailed analysis which will be required, nor define the structure for reporting the results in advance.

In view of the above, for administrations which participated in this test objective, a description of the configuration used to detect and measure interference should be provided. In addition, the data collected for this objective should be provided as an annex to the report. Finally any data reduction and/or analysis conducted should be described and the results reported.

A.8 TEST T-6: IMPACT OF INTERFERENCE FROM LEOSAR SATELLITES

A.8.1 Test Description

This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

A.8.2 Test Results

The GEOLUT data collected for this test should be included as an annex to the report, and should be referenced in this section of the report. The following should be provided:

a. histograms / graphs, as provided in the example below, which depict the performance of the GEOLUT to produce valid messages during periods when the GEOLUT was in the footprint of a LEOSAR satellite prior to the production of a valid message for a beacon event and when it was not;

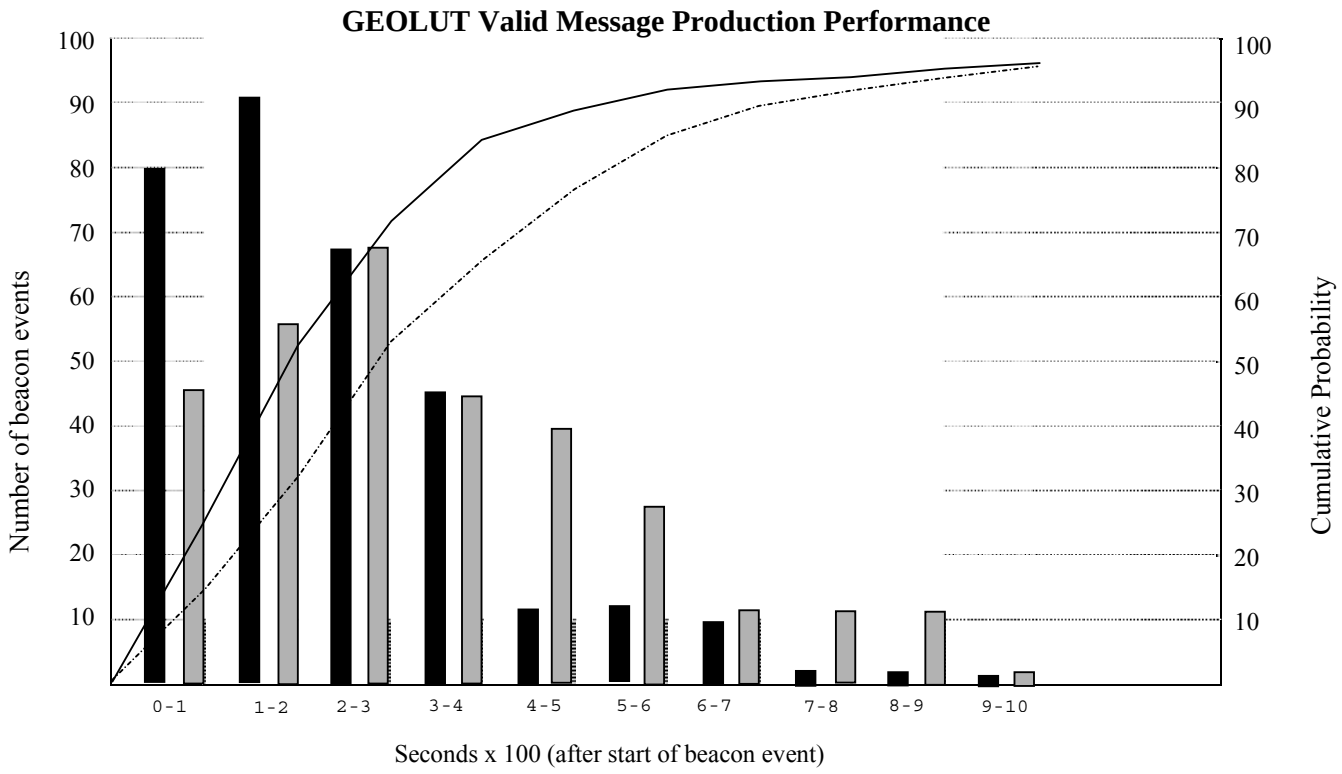
b. the mean and standard deviation for the time to produce valid messages, for both sample sets;

c. histograms / graphs, also in the format provided below, which depict the performance to produce confirmed complete messages during periods when the GEOLUT was in the footprint of a LEOSAR satellite prior to the first valid message, and when it was not;

d. the mean and standard deviation for the time to produce confirmed complete messages; and

e. a graph depicting the C/No, as measured by the GEOLUT to produce the first valid message for each beacon event, plotted against the time since the start of the test (i.e., the horizontal axis of the graph will cover the 48 hour test period).

With respect to the calculation for the mean and standard deviation, if the GEOLUT did not produce a valid or confirmed complete message, the beacon event should not be included in the respective sample set, and a note should be provided in the report indicating how many such events occurred. For example, the note might indicate that valid messages were not produced for 3 beacon events, and confirmed complete messages were not produced for 7 events.



Number of beacon events for which GEOLUT produced a valid message (no possibility of LEOSAR interference prior to first valid message).

Number of beacon events for which GEOLUT produced a valid message (possible LEOSAR interference prior to first valid message).

—— Cumulative Probability of valid message (no possibility of LEOSAR interference prior to first valid message).

·-·-·- Cumulative Probability of valid message (possible LEOSAR interference prior to first valid message).

A.8.3 Test Anomalies

This section should provide information concerning issues which occurred during the test that could affect the results. If some data was excluded from the results, an explanation should be provided. Specifically, the number of beacon events for which the GEOLUT was not able to produce a valid or a confirmed complete message should be provided.

A.8.4 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

A.9 TEST T-7: ELECTRO GEOLUT NETWORK PERFORMANCE

Since this test requires consolidating the results of objective T-6 from all the participating Electro GEOLUTs, objective T-7 will not be included in the performance evaluation reports provided by the individual GEOLUT operators. Instead the Joint Committee will produce a report for this objective by consolidating the results provided by the participating GEOLUT operators for objective T-6.

A.9.1 Test Results

The Joint Committee should analyse the data collected for objective T-6 (impact of LEOSAR interference), and complete the actions described below.

a. An entry should be made in the format of the table described at Annex G which captures the earliest time that any of the Electro GEOLUTs produced a valid message for each beacon event, and the earliest time that any of the GEOLUTs produced a confirmed complete message for each beacon event.

b. From the table produced by the Joint Committee, a graph (as described at Figure 3.7) should be provided, which depicts the performance of the Electro GEOLUT network in respect of producing valid and confirmed complete messages.

c. From the consolidated data:

   (i) mean and standard deviation for time required for the network of Electro GEOLUTs to produce valid and confirmed messages for each beacon event should be calculated and reported;

   (ii) the probability that the network of Electro GEOLUTs would produce valid messages within 5 and 10 minutes should be calculated and reported; and

   (iii) the probability that the GEOLUT network produced confirmed complete messages should be calculated and reported.

A.10 TEST T-8: PROCESSING ANOMALIES

A.10.1 Test Description

This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

A.10.2 Test Results

An entry should be made in the table provided at Annex H (a copy of the format of the table is provided below) for each instance when the GEOLUT produced a valid message which satisfied both conditions stated below:

a. the bias frequency calculated by the GEOLUT confirmed the transmission occurred in the channel reserved for reference beacons (406.0205 - 406.0235 MHz); and

b. the 15 Hex ID of the valid message produced by the GEOLUT did not match any of the 15 Hex IDs of reference beacons operating in the Electro coverage area.

15 Hex ID Produced by GEOLUT	15 Hex ID of Associated Reference Beacon	Beacon Message Produced by GEOLUT (30 Hex)	Date / Time	LUT in LEO Footprint (Y/N)

Table for Recording 406 MHz Processing Anomalies (extracted from Annex H)

A.10.3 Processing Anomaly Rate (PA)

The PA rate and the PA rate when the GEOLUT was in the footprint of a LEOSAR satellite should be calculated and reported.

A.10.4 Test Anomalies

This section should provide information concerning issues which occurred during the test which could affect results. If some data was excluded from the results, an explanation should be provided.

A.10.5 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

A.11 Test T-9: ELECTRO COVERAGE

A.11.1 Test Description

This section should include a statement confirming that the tests were conducted and analysed in accordance with C/S R.016, or describe any modifications to the test procedures that were required.

A.11.2 Test Results

Beacon Crossing Coverage Area

a. A narrative description of the test should provided, indicating the route taken, the beacon identification, and the times associated with the activation and deactivation of the beacon.

b. The GEOLUT performance in respect of producing valid messages, as a function of time and elevation angle (as indicated below) should be provided.

c. The results provided in the table should be graphically depicted on a map.

Beacon 15 Hex ID:_____ **Activation Date / Time:_____** **De-activation Date / Time:_____**			
Date / Time	**Location (Lat/Long)**	**Beacon to Satellite Elevation Angle**	**Detected by GEOLUT (Yes/No)**

Evaluating Coverage Using Real Beacon Events

a. All beacon events detected by the LEOSAR system in the area enclosed by 80° N/S and 80° E/W, shall be recorded as per Annex I, and an indication of whether the beacon event was also detected by the Electro GEOLUT.

b. Using the data captured at Annex I, beacon events are to be grouped into geographic locations of 10° latitude/longitude blocks, and the associated statistics calculated as indicated below.

Block Location		**Number of LEOSAR Beacon Events**	**Number Detected by GEOLUT**	**% Detected by GEOLUT**
Longitude	**Latitude**			
0/10w	**0/10n**			
10w/20w	**0/10n**			
20w/30w	**0/10n**			
.	**.**			
.	**.**			
.	**.**			
70e/80e	**70s/80s**			

c. Two maps of the data collected as per Annex I should be produced. One map depicting each beacon event that was detected by the LEOSAR and also by the Electro GEOLUT, and the second map depicting each beacon event that was only detected by the LEOSAR system.

A.11.3 Test Anomalies

This section should provide information concerning issues which occurred during the test which could affect results. If some data was excluded from the results, an explanation should be provided.

A.11.4 Recommendations

Any proposed recommendations resulting from this test should be detailed in this section.

List of Annexes (electronic copies of annexes to be provided to Secretariat separately)

Annex A GEOLUT Data Collected for Objectives T-1, T-2, and T-3;
Annex B GEOLUT Data Collected for Objective T-4;
Annex C GEOLUT Data Collected for Objective T-6;
Annex D GEOLUT Data Collected for Objective T-8; and
Annex E GEOLUT Data Collected for Objective T-9

- END OF ANNEX A -

ANNEX B

TEST SCRIPTS FOR OBJECTIVES T-1, T-2 AND T-3

Introduction

This annex provides a description of the test signals that will be transmitted by the French simulator for objectives T-1, T-2 and T-3. In order to transmit the required number of beacon events at each EIRP, each script will be comprised of 50 beacon events. A different script will be used for each EIRP value. The test script for uplink signals with EIRPs of 28 dBm is provided below. The scripts for the other EIRPs will be identical to this example except that the beacon event IDs transmitted will be coded with the appropriate EIRP value. Copies of the test scripts for EIRP values from 26 to 37 dBm are available from the Cospas-Sarsat Secretariat on request.

Each row in the table represents a single beacon event. Each beacon event is comprised of 25 beacon bursts with a fixed burst repetition interval of 50 sec. The start time for each beacon event is indicated in the table.

The 15 Hex ID of each beacon event conforms to the following convention:

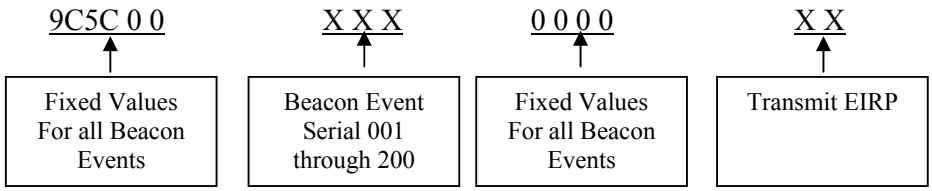


Table B-1: Test Script for Tests T-1, T-2 and T-3

EIRP 28 dBm To = year/Month/Time (GMT hour:minute:second) e.g. 2011/08/06:43:22			
15 Hex ID of BCN Event	30 Hex Msg of BCN Event	Time of First Burst in BCN Event	Tx Freq (Hz)
9C5C00004000028	CE2E0000200001452F4C00100002C1	To	406062500
9C5C00008000028	CE2E0000400001447A8F40100002C1	To+1	406062600
9C5C00012000028	CE2E0000900001426C6AC0100002C1	To+2	406062700
9C5C00016000028	CE2E0000B0000142A0D400100002C1	To+3	406062800
9C5C00020000028	CE2E0001000001438604C0100002C1	To+4	406062900
9C5C00024000028	CE2E0001200001434ABA00100002C1	To+5	406063000
9C5C00028000028	CE2E0001400001421F7940100002C1	To+6	406063500
9C5C00032000028	CE2E0001900001440 99CC0100002C1	To+7	406063400
9C5C00036000028	CE2E0001B0000144C52200100002C1	To+8	406063300
9C5C00040000028	CE2E0002000001409E6600100002C1	To+9	406063200
9C5C00044000028	CE2E00022000014052D8C0100002C1	To+10	406063100
9C5C00048000028	CE2E00024000014107 1B80100002C1	To+11	406063000
9C5C00052000028	CE2E00029000014711FE00100002C1	To+12	406062500

9C5C00056000028	CE2E0002B0000147DD40C0100002C1	To+13	406062600
9C5C00060000028	CE2E000300000146FB9000100002C1	To+14	406062700
9C5C00064000028	CE2E000320000146372EC0100002C1	To+15	406062800
9C5C00068000028	CE2E00034000014762ED80100002C1	To+16	406062900
9C5C00072000028	CE2E0003900001417408001000002C1	To+17	406063000
9C5C00076000028	CE2E0003B0000141B8B6C0100002C1	To+18	406063500
9C5C00080000028	CE2E000400000146AEA380100002C1	To+19	406063400
9C5C00084000028	CE2E000420000146621D40100002C1	To+20	406063300
9C5C00088000028	CE2E00044000014737DE00100002C1	To+21	406063200
9C5C00092000028	CE2E000490000141213B80100002C1	To+22	406063100
9C5C00096000028	CE2E0004B0000141ED8540100002C1	To+23	406063000
9C5C00100000028	CE2E0008000001437950401000002C1	To+24	406062500
9C5C00104000028	CE2E000820000143B5EE80100002C1	To+25	406062600
9C5C00108000028	CE2E000840000142E02DC0100002C1	To+26	406062700
9C5C00112000028	CE2E000890000144F6C840100002C1	To+27	406062800
9C5C00116000028	CE2E0008B00001443A7680100002C1	To+28	406062900
9C5C00120000028	CE2E0009000001451CA640100002C1	To+29	406063000
9C5C00124000028	CE2E000920000145D01880100002C1	To+30	406063500
9C5C00128000028	CE2E00094000014485DBC0100002C1	To+31	406063400
9C5C00132000028	CE2E000990000142933E40100002C1	To+32	406063300
9C5C00136000028	CE2E0009B00001425F8080100002C1	To+33	406063200
9C5C00140000028	CE2E000A0000014604C480100002C1	To+34	406063100
9C5C00144000028	CE2E000A20000146C87A40100002C1	To+35	406063000
9C5C00148000028	CE2E000A400001479DB900100002C1	To+36	406062500
9C5C00152000028	CE2E000A900001418B5C80100002C1	To+37	406062600
9C5C00156000028	CE2E000AB000014147E240100002C1	To+38	406062700
9C5C00160000028	CE2E000B0000014061328010000 2C1	To+39	406062800
9C5C00164000028	CE2E000B20000140AD8C40100002C1	To+40	406062900
9C5C00168000028	CE2E000B40000141F84F00100002C1	To+41	406063000
9C5C00172000028	CE2E000B90000147EEAA80100002C1	To+42	406063500
9C5C00176000028	CE2E000BB000014722144010000 2C1	To+43	406063400
9C5C00180000028	CE2E000C0000014034010010000 2C1	To+44	406063300
9C5C00184000028	CE2E000C20000140F8BFC0100002C1	To+45	406063200
9C5C00188000028	CE2E000C40000141AD7C80100002C1	To+46	406063100
9C5C00192000028	CE2E000C90000147BB9900100002C1	To+47	406063000
9C5C00196000028	CE2E000CB00001477727C0100002C1	To+48	406063500
9C5C00200000028	CE2E00100000014160CF00100002C1	To+49	406063400

- END OF ANNEX B -

ANNEX C

TEST SCRIPTS FOR OBJECTIVE T-4
(Channel Capacity)

Introduction

This annex provides a description of the test signals that will be transmitted by the French simulator for objective T-4. Each script includes 15, 20, 25 or 30 different beacons that transmit 18 beacon bursts with a fixed burst repetition interval of 50 seconds. Each beacon event is comprised of 18 beacon bursts, which may overlap in time. The start of time of the first beacon burst for each beacon event is provided in the table.

To obtain sufficient statistics 10 different scripts for each beacon population will be transmitted. The beginning of one script simulating 15 simultaneously active beacons is provided below.

The 15 Hex ID of each beacon event conforms to the following convention:

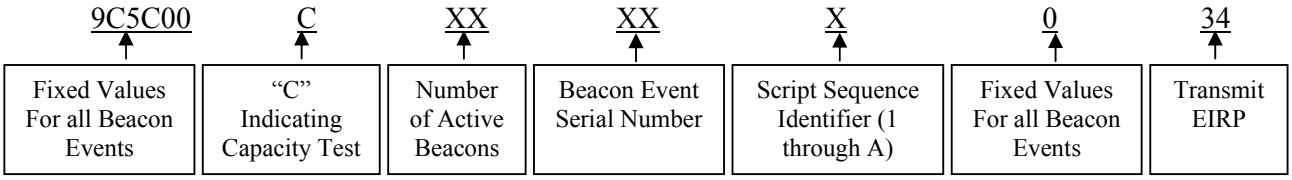


Table C-1: Test script for Test T-4

15 Hex ID of Bcn Event	30 Hex Msg of Bcn Event	Time of First Burst in Bcn Event	Tx Freq (Hz)
9C5C00C15011034	CE2E0060A80881A5224C00100002C1	To	406063000
9C5C00C15151034	CE2E0060A8A881A475A100100002C1	To + 4,14 s	406063000
9C5C00C15041034	CE2E0060A82081A577B740100002C1	To + 7,62 s	406063000
9C5C00C15101034	CE2E0060A88081A4205A40100002C1	To + 8,28 s	406063000
9C5C00C15061034	CE2E0060A83081A555D3C0100002C1	To + 8,72 s	406063000
9C5C00C15071034	CE2E0060A83881A544E180100002C1	To + 10,85 s	406063000
9C5C00C15031034	CE2E0060A81881A5002880100002C1	To + 11,92 s	406063000
9C5C00C15081034	CE2E0060A84081A5BAEC40100002C1	To + 12,05 s	406063000
9C5C00C15111034	CE2E0060A88881A4316800100002C1	To + 16,38 s	406063000
9C5C00C15021034	CE2E0060A81081A5111AC0100002C1	To + 18,22 s	406063000
9C5C00C15091034	CE2E0060A84881A5ABDE00100002C1	To + 20,02 s	406063000
9C5C00C15051034	CE2E0060A82881A5668500100002C1	To + 24,51 s	406063000
9C5C00C15131034	CE2E0060A89881A4130C80100002C1	To + 33,13 s	406063000
9C5C00C15141034	CE2E0060A8A081A4649340100002C1	To + 42,73 s	406063000
9C5C00C15121034	CE2E0060A89081A4023EC0100002C1	To + 45,31 s	406063000

- END OF ANNEX C -

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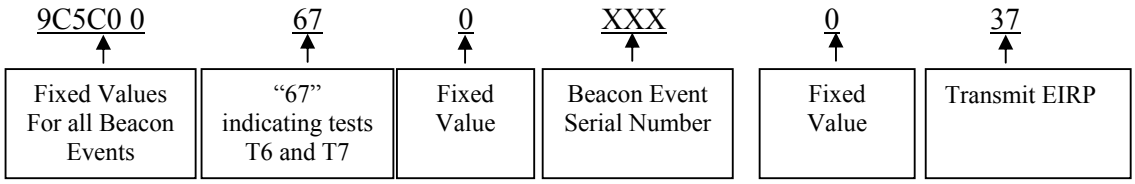
ANNEX D

TEST SCRIPTS FOR OBJECTIVES T-6 AND T-7

Introduction

This annex provides a description and schedule of the test signals that will be transmitted by the French simulator for objectives T-6 and T-7. Each row in the table represents a single beacon event used in the test script. Each beacon event will replicate a typical 406 MHz distress beacon active for a period of 20 minutes (24 bursts).

The 15 Hex ID of each beacon event conforms to the following convention:



Ed.note: Insert the following table

Table D-1: Test Script for Tests T-6 and T-7

15 Hex ID of BCN event	30 Hex Msg of BCN Event	Time of First burst in BCN Event To + X sec (hh:mm:ss:ccc)	Tx Freq (Hz)
9C5C00670001037	CE2E0033800081BB80A1C0100002C1	00:00:02:530	406.061
9C5C00670002037	CE2E0033800101BFC3CF40100002C1	00:10:07:190	406.061
9C5C00670003037	CE2E0033800181BC02EAC0100002C1	00:20:23:320	406.061
9C5C00670004037	CE2E0033800201BEF36A80100002C1	00:30:13:300	406.061
9C5C00670005037	CE2E0033800281BD324F00100002C1	00:40:30:210	406.061
9C5C00670006037	CE2E0033800301B9712180100002C1	00:50:04:550	406.061
9C5C00670007037	CE2E0033800381BAB00400100002C1	01:00:48:570	406.061
9C5C00670008037	CE2E0033800401BC922100100002C1	01:10:20:430	406.061
9C5C00670009037	CE2E0033800481BF530480100002C1	01:20:48:060	406.061
9C5C00670010037	CE2E0033800801B850B600100002C1	01:30:30:300	406.061
9C5C00670011037	CE2E0033800881BB919380100002C1	01:40:35:010	406.061
9C5C00670012037	CE2E0033800901BFD2FD00100002C1	01:50:26:130	406.061
9C5C00670013037	CE2E0033800981BC13D880100002C1	02:00:06:220	406.061
9C5C00670014037	CE2E0033800A01BEE258C0100002C1	02:10:11:150	406.061
9C5C00670015037	CE2E0033800A81BD237D40100002C1	02:20:34:460	406.061
9C5C00670016037	CE2E0033800B01B96013C0100002C1	02:30:26:020	406.061
9C5C00670017037	CE2E0033800B81BAA13640100002C1	02:40:17:080	406.061
9C5C00670018037	CE2E0033800C01BC831340100002C1	02:50:19:180	406.061
9C5C00670019037	CE2E0033800C81BF4236C0100002C1	03:00:11:240	406.061
9C5C00670020037	CE2E0033801001B863E0C0100002C1	03:10:36:540	406.061

9C5C00670021037	CE2E0033801081BBA2C540100002C1	03:20:30:070	406.061
9C5C00670022037	CE2E0033801101BFE1ABC0100002C1	03:30:07:400	406.061
9C5C00670023037	CE2E0033801181BC208E40100002C1	03:40:27:140	406.061
9C5C00670024037	CE2E0033801201BED10E00100002C1	03:50:20:560	406.061
9C5C00670025037	CE2E0033801281BD102B80100002C1	04:00:03:080	406.061
9C5C00670026037	CE2E0033801301B9534500100002C1	04:10:12:220	406.061
9C5C00670027037	CE2E0033801381BA926080100002C1	04:20:11:130	406.061
9C5C00670028037	CE2E0033801401BCB04580100002C1	04:30:44:330	406.061
9C5C00670029037	CE2E0033801481BF716000100002C1	04:40:38:160	406.061
9C5C00670030037	CE2E0033801801B872D280100002C1	04:50:53:260	406.061
9C5C00670031037	CE2E0033801881BBB3F700100002C1	05:00:44:590	406.061
9C5C00670032037	CE2E0033801901BFF09980100002C1	05:10:57:180	406.061
9C5C00670033037	CE2E0033801981BC31BC00100002C1	05:20:52:260	406.061
9C5C00670034037	CE2E0033801A01BEC03C40100002C1	05:30:09:120	406.061
9C5C00670035037	CE2E0033801A81BD0119C0100002C1	05:40:51:320	406.061
9C5C00670036037	CE2E0033801B01B9427740100002C1	05:50:25:530	406.061
9C5C00670037037	CE2E0033801B81BA8352C0100002C1	06:00:04:310	406.061
9C5C00670038037	CE2E0033801C01BCA177C0100002C1	06:10:30:330	406.061
9C5C00670039037	CE2E0033801C81BF605240100002C1	06:20:53:220	406.061
9C5C00670040037	CE2E0033802001B8054D40100002C1	06:30:49:100	406.061
9C5C00670041037	CE2E0033802081BBC468C0100002C1	06:40:28:090	406.061
9C5C00670042037	CE2E0033802101BF870640100002C1	06:50:42:080	406.061
9C5C00670043037	CE2E0033802181BC4623C0100002C1	07:00:25:190	406.061
9C5C00670044037	CE2E0033802201BEB7A380100002C1	07:10:57:170	406.061
9C5C00670045037	CE2E0033802281BD768600100002C1	07:20:38:590	406.061
9C5C00670046037	CE2E0033802301B935E880100002C1	07:30:07:500	406.061
9C5C00670047037	CE2E0033802381BAF4CD00100002C1	07:40:08:510	406.061
9C5C00670048037	CE2E0033802401BCD6E800100002C1	07:50:20:440	406.061
9C5C00670049037	CE2E0033802481BF17CD80100002C1	08:00:13:310	406.061
9C5C00670050037	CE2E0033802801B8147F00100002C1	08:10:09:110	406.061
9C5C00670051037	CE2E0033802881BBD55A80100002C1	08:20:52:560	406.061
9C5C00670052037	CE2E0033802901BF963400100002C1	08:30:36:410	406.061
9C5C00670053037	CE2E0033802981BC571180100002C1	08:40:08:360	406.061
9C5C00670054037	CE2E0033802A01BEA691C0100002C1	08:50:13:480	406.061
9C5C00670055037	CE2E0033802A81BD67B440100002C1	09:00:17:330	406.061
9C5C00670056037	CE2E0033802B01B924DAC0100002C1	09:10:52:130	406.061
9C5C00670057037	CE2E0033802B81BAE5FF40100002C1	09:20:49:210	406.061
9C5C00670058037	CE2E0033802C01BCC7DA40100002C1	09:30:44:040	406.061
9C5C00670059037	CE2E0033802C81BF06FFC0100002C1	09:40:29:370	406.061
9C5C00670060037	CE2E0033803001B82729C0100002C1	09:50:41:370	406.061
9C5C00670061037	CE2E0033803081BBE60C40100002C1	10:00:03:420	406.061
9C5C00670062037	CE2E0033803101BFA562C0100002C1	10:10:49:360	406.061
9C5C00670063037	CE2E0033803181BC644740100002C1	10:20:19:380	406.061
9C5C00670064037	CE2E0033803201BE95C700100002C1	10:30:01:510	406.061
9C5C00670065037	CE2E0033803281BD54E280100002C1	10:40:55:310	406.061
9C5C00670066037	CE2E0033803301B9178C00100002C1	10:50:49:060	406.061
9C5C00670067037	CE2E0033803381BAD6A980100002C1	11:00:38:480	406.061
9C5C00670068037	CE2E0033803401BCF48C80100002C1	11:10:51:020	406.061
9C5C00670069037	CE2E0033803481BF35A900100002C1	11:20:12:160	406.061
9C5C00670070037	CE2E0033803801B8361B80100002C1	11:30:40:580	406.061
9C5C00670071037	CE2E0033803881BBF73E00100002C1	11:40:09:420	406.061

9C5C00670072037	CE2E0033803901BFB45080100002C1	11:50:46:510	406.061
9C5C00670073037	CE2E0033803981BC757500100002C1	12:00:56:180	406.061
9C5C00670074037	CE2E0033803A01BE84F540100002C1	12:10:04:110	406.061
9C5C00670075037	CE2E0033803A81BD45D0C0100002C1	12:20:24:370	406.061
9C5C00670076037	CE2E0033803B01B906BE40100002C1	12:30:12:180	406.061
9C5C00670077037	CE2E0033803B81BAC79BC0100002C1	12:40:26:320	406.061
9C5C00670078037	CE2E0033803C01BCE5BEC0100002C1	12:50:24:090	406.061
9C5C00670079037	CE2E0033803C81BF249B40100002C1	13:00:14:180	406.061
9C5C00670080037	CE2E0033804001B8C81640100002C1	13:10:39:140	406.061
9C5C00670081037	CE2E0033804081BB0933C0100002C1	13:20:35:560	406.061
9C5C00670082037	CE2E0033804101BF4A5D40100002C1	13:30:37:390	406.061
9C5C00670083037	CE2E0033804181BC8B78C0100002C1	13:40:19:230	406.061
9C5C00670084037	CE2E0033804201BE7AF880100002C1	13:50:32:090	406.061
9C5C00670085037	CE2E0033804281BDBBDD00100002C1	14:00:21:190	406.061
9C5C00670086037	CE2E0033804301B9F8B380100002C1	14:10:45:500	406.061
9C5C00670087037	CE2E0033804381BA399600100002C1	14:20:19:200	406.061
9C5C00670088037	CE2E0033804401BC1BB300100002C1	14:30:00:530	406.061
9C5C00670089037	CE2E0033804481BFDA9680100002C1	14:40:43:570	406.061
9C5C00670090037	CE2E0033804801B8D92400100002C1	14:50:21:170	406.061
9C5C00670091037	CE2E0033804881BB180180100002C1	15:00:01:570	406.061
9C5C00670092037	CE2E0033804901BF5B6F00100002C1	15:10:28:340	406.061
9C5C00670093037	CE2E0033804981BC9A4A80100002C1	15:20:56:300	406.061
9C5C00670094037	CE2E0033804A01BE6BCAC0100002C1	15:30:43:080	406.061
9C5C00670095037	CE2E0033804A81BDAAEF40100002C1	15:40:06:280	406.061
9C5C00670096037	CE2E0033804B01B9E981C0100002C1	15:50:04:260	406.061
9C5C00670097037	CE2E0033804B81BA28A440100002C1	16:00:55:410	406.061
9C5C00670098037	CE2E0033804C01BC0A8140100002C1	16:10:58:140	406.061
9C5C00670099037	CE2E0033804C81BFCBA4C0100002C1	16:20:56:100	406.061
9C5C00670100037	CE2E0033808001B952A040100002C1	16:30:43:480	406.061
9C5C00670101037	CE2E0033808081BA9385C0100002C1	16:40:15:270	406.061
9C5C00670102037	CE2E0033808101BED0EB40100002C1	16:50:48:270	406.061
9C5C00670103037	CE2E0033808181BD11CEC0100002C1	17:00:56:360	406.061
9C5C00670104037	CE2E0033808201BFE04E80100002C1	17:10:15:100	406.061
9C5C00670105037	CE2E0033808281BC216B00100002C1	17:20:12:400	406.061
9C5C00670106037	CE2E0033808301B8620580100002C1	17:30:14:560	406.061
9C5C00670107037	CE2E0033808381BBA32000100002C1	17:40:00:210	406.061
9C5C00670108037	CE2E0033808401BD810500100002C1	17:50:10:130	406.061
9C5C00670109037	CE2E0033808481BE402080100002C1	18:00:13:280	406.061
9C5C00670110037	CE2E0033808801B9439200100002C1	18:10:06:300	406.061
9C5C00670111037	CE2E0033808881BA82B780100002C1	18:20:30:200	406.061
9C5C00670112037	CE2E0033808901BEC1D900100002C1	18:30:17:010	406.061
9C5C00670113037	CE2E0033808981BD00FC80100002C1	18:40:43:050	406.061
9C5C00670114037	CE2E0033808A01BFF17CC0100002C1	18:50:13:040	406.061
9C5C00670115037	CE2E0033808A81BC305940100002C1	19:00:20:420	406.061
9C5C00670116037	CE2E0033808B01B87337C0100002C1	19:10:11:160	406.061
9C5C00670117037	CE2E0033808B81BBB21240100002C1	19:20:09:140	406.061
9C5C00670118037	CE2E0033808C01BD903740100002C1	19:30:36:090	406.061
9C5C00670119037	CE2E0033808C81BE5112C0100002C1	19:40:30:190	406.061
9C5C00670120037	CE2E0033809001B970C4C0100002C1	19:50:25:300	406.061
9C5C00670121037	CE2E0033809081BAB1E140100002C1	20:00:26:110	406.061
9C5C00670122037	CE2E0033809101BEF28FC0100002C1	20:10:20:280	406.061

9C5C00670123037	CE2E0033809181BD33AA40100002C1	20:20:52:440	406.061
9C5C00670124037	CE2E0033809201BFC22A00100002C1	20:30:41:290	406.061
9C5C00670125037	CE2E0033809281BC030F80100002C1	20:40:35:130	406.061
9C5C00670126037	CE2E0033809301B8406100100002C1	20:50:17:280	406.061
9C5C00670127037	CE2E0033809381BB814480100002C1	21:00:20:470	406.061
9C5C00670128037	CE2E0033809401BDA36180100002C1	21:10:35:370	406.061
9C5C00670129037	CE2E0033809481BE624400100002C1	21:20:50:470	406.061
9C5C00670130037	CE2E0033809801B961F680100002C1	21:30:41:060	406.061
9C5C00670131037	CE2E0033809881BAA0D300100002C1	21:40:09:430	406.061
9C5C00670132037	CE2E0033809901BEE3BD80100002C1	21:50:25:200	406.061
9C5C00670133037	CE2E0033809981BD229800100002C1	22:00:52:090	406.061
9C5C00670134037	CE2E0033809A01BFD31840100002C1	22:10:23:310	406.061
9C5C00670135037	CE2E0033809A81BC123DC0100002C1	22:20:49:550	406.061
9C5C00670136037	CE2E0033809B01B8515340100002C1	22:30:37:460	406.061
9C5C00670137037	CE2E0033809B81BB9076C0100002C1	22:40:34:380	406.061
9C5C00670138037	CE2E0033809C01BDB253C0100002C1	22:50:09:570	406.061
9C5C00670139037	CE2E0033809C81BE737640100002C1	23:00:57:080	406.061
9C5C00670140037	CE2E003380A001B9166940100002C1	23:10:06:120	406.061
9C5C00670141037	CE2E003380A081BAD74CC0100002C1	23:20:54:250	406.061
9C5C00670142037	CE2E003380A101BE942240100002C1	23:30:31:290	406.061
9C5C00670143037	CE2E003380A181BD5507C0100002C1	23:40:49:200	406.061
9C5C00670144037	CE2E003380A201BFA48780100002C1	23:50:24:480	406.061
9C5C00670145037	CE2E003380A281BC65A200100002C1	24:00:12:540	406.061
9C5C00670146037	CE2E003380A301B826CC80100002C1	24:10:38:020	406.061
9C5C00670147037	CE2E003380A381BBE7E900100002C1	24:20:56:050	406.061
9C5C00670148037	CE2E003380A401BDC5CC00100002C1	24:30:36:190	406.061
9C5C00670149037	CE2E003380A481BE04E980100002C1	24:40:48:340	406.061
9C5C00670150037	CE2E003380A801B9075B00100002C1	24:50:52:250	406.061
9C5C00670151037	CE2E003380A881BAC67E80100002C1	25:00:01:290	406.061
9C5C00670152037	CE2E003380A901BE851000100002C1	25:10:07:500	406.061
9C5C00670153037	CE2E003380A981BD443580100002C1	25:20:50:330	406.061
9C5C00670154037	CE2E003380AA01BFB5B5C0100002C1	25:30:12:160	406.061
9C5C00670155037	CE2E003380AA81BC749040100002C1	25:40:24:440	406.061
9C5C00670156037	CE2E003380AB01B837FEC0100002C1	25:50:11:400	406.061
9C5C00670157037	CE2E003380AB81BBF6DB40100002C1	26:00:35:380	406.061
9C5C00670158037	CE2E003380AC01BDD4FE40100002C1	26:10:27:180	406.061
9C5C00670159037	CE2E003380AC81BE15DBC0100002C1	26:20:32:080	406.061
9C5C00670160037	CE2E003380B001B9340DC0100002C1	26:30:22:140	406.061
9C5C00670161037	CE2E003380B081BAF52840100002C1	26:40:51:520	406.061
9C5C00670162037	CE2E003380B101BEB646C0100002C1	26:50:19:240	406.061
9C5C00670163037	CE2E003380B181BD776340100002C1	27:00:58:470	406.061
9C5C00670164037	CE2E003380B201BF86E300100002C1	27:10:38:010	406.061
9C5C00670165037	CE2E003380B281BC47C680100002C1	27:20:54:430	406.061
9C5C00670166037	CE2E003380B301B804A800100002C1	27:30:12:560	406.061
9C5C00670167037	CE2E003380B381BBC58D80100002C1	27:40:36:460	406.061
9C5C00670168037	CE2E003380B401BDE7A880100002C1	27:50:25:350	406.061
9C5C00670169037	CE2E003380B481BE268D00100002C1	28:00:33:500	406.061
9C5C00670170037	CE2E003380B801B9253F80100002C1	28:10:57:010	406.061
9C5C00670171037	CE2E003380B881BAE41A00100002C1	28:20:13:520	406.061
9C5C00670172037	CE2E003380B901BEA77480100002C1	28:30:28:430	406.061
9C5C00670173037	CE2E003380B981BD665100100002C1	28:40:40:190	406.061

9C5C00670174037	CE2E003380BA01BF97D140100002C1	28:50:14:550	406.061
9C5C00670175037	CE2E003380BA81BC56F4C0100002C1	29:00:20:000	406.061
9C5C00670176037	CE2E003380BB01B8159A40100002C1	29:10:21:330	406.061
9C5C00670177037	CE2E003380BB81BBD4BFC0100002C1	29:20:53:350	406.061
9C5C00670178037	CE2E003380BC01BDF69AC0100002C1	29:30:52:260	406.061
9C5C00670179037	CE2E003380BC81BE37BF40100002C1	29:40:25:000	406.061
9C5C00670180037	CE2E003380C001B9DB3240100002C1	29:50:06:460	406.061
9C5C00670181037	CE2E003380C081BA1A17C0100002C1	30:00:45:470	406.061
9C5C00670182037	CE2E003380C101BE597940100002C1	30:10:58:290	406.061
9C5C00670183037	CE2E003380C181BD985CC0100002C1	30:20:21:060	406.061
9C5C00670184037	CE2E003380C201BF69DC80100002C1	30:30:16:540	406.061
9C5C00670185037	CE2E003380C281BCA8F900100002C1	30:40:06:480	406.061
9C5C00670186037	CE2E003380C301B8EB9780100002C1	30:50:47:370	406.061
9C5C00670187037	CE2E003380C381BB2AB200100002C1	31:00:13:000	406.061
9C5C00670188037	CE2E003380C401BD089700100002C1	31:10:06:410	406.061
9C5C00670189037	CE2E003380C481BEC9B280100002C1	31:20:44:480	406.061
9C5C00670190037	CE2E003380C801B9CA0000100002C1	31:30:25:350	406.061
9C5C00670191037	CE2E003380C881BA0B2580100002C1	31:40:27:210	406.061
9C5C00670192037	CE2E003380C901BE484B00100002C1	31:50:25:240	406.061
9C5C00670193037	CE2E003380C981BD896E80100002C1	32:00:28:160	406.061
9C5C00670194037	CE2E003380CA01BF78EEC0100002C1	32:10:28:090	406.061
9C5C00670195037	CE2E003380CA81BCB9CB40100002C1	32:20:17:580	406.061
9C5C00670196037	CE2E003380CB01B8FAA5C0100002C1	32:30:18:260	406.061
9C5C00670197037	CE2E003380CB81BB3B8040100002C1	32:40:29:460	406.061
9C5C00670198037	CE2E003380CC01BD19A540100002C1	32:50:15:430	406.061
9C5C00670199037	CE2E003380CC81BED880C0100002C1	33:00:23:310	406.061
9C5C00670200037	CE2E0033810001BA67CC40100002C1	33:10:31:440	406.061
9C5C00670201037	CE2E0033810081B9A6E9C0100002C1	33:20:56:090	406.061
9C5C00670202037	CE2E0033810101BDE58740100002C1	33:30:03:110	406.061
9C5C00670203037	CE2E0033810181BE24A2C0100002C1	33:40:02:430	406.061
9C5C00670204037	CE2E0033810201BCD52280100002C1	33:50:00:260	406.061
9C5C00670205037	CE2E0033810281BF140700100002C1	34:00:57:190	406.061
9C5C00670206037	CE2E0033810301BB576980100002C1	34:10:03:520	406.061
9C5C00670207037	CE2E0033810381B8964C00100002C1	34:20:26:160	406.061
9C5C00670208037	CE2E0033810401BEB46900100002C1	34:30:49:280	406.061
9C5C00670209037	CE2E0033810481BD754C80100002C1	34:40:51:340	406.061
9C5C00670210037	CE2E0033810801BA76FE00100002C1	34:50:09:210	406.061
9C5C00670211037	CE2E0033810881B9B7DB80100002C1	35:00:21:090	406.061
9C5C00670212037	CE2E0033810901BDF4B500100002C1	35:10:13:230	406.061
9C5C00670213037	CE2E0033810981BE359080100002C1	35:20:47:370	406.061
9C5C00670214037	CE2E0033810A01BCC410C0100002C1	35:30:31:310	406.061
9C5C00670215037	CE2E0033810A81BF053540100002C1	35:40:10:380	406.061
9C5C00670216037	CE2E0033810B01BB465BC0100002C1	35:50:20:000	406.061
9C5C00670217037	CE2E0033810B81B8877E40100002C1	36:00:36:580	406.061
9C5C00670218037	CE2E0033810C01BEA55B40100002C1	36:10:04:400	406.061
9C5C00670219037	CE2E0033810C81BD647EC0100002C1	36:20:10:470	406.061
9C5C00670220037	CE2E0033811001BA45A8C0100002C1	36:30:47:200	406.061
9C5C00670221037	CE2E0033811081B9848D40100002C1	36:40:04:590	406.061
9C5C00670222037	CE2E0033811101BDC7E3C0100002C1	36:50:37:320	406.061
9C5C00670223037	CE2E0033811181BE06C640100002C1	37:00:07:280	406.061
9C5C00670224037	CE2E0033811201BCF74600100002C1	37:10:01:270	406.061

9C5C00670225037	CE2E0033811281BF366380100002C1	37:20:22:320	406.061
9C5C00670226037	CE2E0033811301BB750D00100002C1	37:30:58:340	406.061
9C5C00670227037	CE2E0033811381B8B42880100002C1	37:40:16:060	406.061
9C5C00670228037	CE2E0033811401BE960D80100002C1	37:50:34:300	406.061
9C5C00670229037	CE2E0033811481BD572800100002C1	38:00:58:090	406.061
9C5C00670230037	CE2E0033811801BA549A80100002C1	38:10:46:060	406.061
9C5C00670231037	CE2E0033811881B995BF00100002C1	38:20:29:470	406.061
9C5C00670232037	CE2E0033811901BDD6D180100002C1	38:30:59:390	406.061
9C5C00670233037	CE2E0033811981BE17F400100002C1	38:40:44:430	406.061
9C5C00670234037	CE2E0033811A01BCE67440100002C1	38:50:06:450	406.061
9C5C00670235037	CE2E0033811A81BF2751C0100002C1	39:00:54:040	406.061
9C5C00670236037	CE2E0033811B01BB643F40100002C1	39:10:43:170	406.061
9C5C00670237037	CE2E0033811B81B8A51AC0100002C1	39:20:26:490	406.061
9C5C00670238037	CE2E0033811C01BE873FC0100002C1	39:30:03:410	406.061
9C5C00670239037	CE2E0033811C81BD461A40100002C1	39:40:44:180	406.061
9C5C00670240037	CE2E0033812001BA230540100002C1	39:50:41:030	406.061
9C5C00670241037	CE2E0033812081B9E220C0100002C1	40:00:26:340	406.061
9C5C00670242037	CE2E0033812101BDA14E40100002C1	40:10:55:080	406.061
9C5C00670243037	CE2E0033812181BE606BC0100002C1	40:20:30:310	406.061
9C5C00670244037	CE2E0033812201BC91EB80100002C1	40:30:45:100	406.061
9C5C00670245037	CE2E0033812281BF50CE00100002C1	40:40:53:030	406.061
9C5C00670246037	CE2E0033812301BB13A080100002C1	40:50:23:540	406.061
9C5C00670247037	CE2E0033812381B8D28500100002C1	41:00:26:510	406.061
9C5C00670248037	CE2E0033812401BEF0A000100002C1	41:10:02:390	406.061
9C5C00670249037	CE2E0033812481BD318580100002C1	41:20:01:170	406.061
9C5C00670250037	CE2E0033812801BA323700100002C1	41:30:21:520	406.061
9C5C00670251037	CE2E0033812881B9F31280100002C1	41:40:22:360	406.061
9C5C00670252037	CE2E0033812901BDB07C00100002C1	41:50:50:410	406.061
9C5C00670253037	CE2E0033812981BE715980100002C1	42:00:55:440	406.061
9C5C00670254037	CE2E0033812A01BC80D9C0100002C1	42:10:44:360	406.061
9C5C00670255037	CE2E0033812A81BF41FC40100002C1	42:20:47:470	406.061
9C5C00670256037	CE2E0033812B01BB0292C0100002C1	42:30:40:590	406.061
9C5C00670257037	CE2E0033812B81B8C3B740100002C1	42:40:32:300	406.061
9C5C00670258037	CE2E0033812C01BEE19240100002C1	42:50:56:080	406.061
9C5C00670259037	CE2E0033812C81BD20B7C0100002C1	43:00:20:150	406.061
9C5C00670260037	CE2E0033813001BA0161C0100002C1	43:10:53:190	406.061
9C5C00670261037	CE2E0033813081B9C04440100002C1	43:20:59:570	406.061
9C5C00670262037	CE2E0033813101BD832AC0100002C1	43:30:15:380	406.061
9C5C00670263037	CE2E0033813181BE420F40100002C1	43:40:27:250	406.061
9C5C00670264037	CE2E0033813201BCB38F00100002C1	43:50:09:590	406.061
9C5C00670265037	CE2E0033813281BF72AA80100002C1	44:00:14:540	406.061
9C5C00670266037	CE2E0033813301BB31C400100002C1	44:10:01:150	406.061
9C5C00670267037	CE2E0033813381B8F0E180100002C1	44:20:31:330	406.061
9C5C00670268037	CE2E0033813401BED2C480100002C1	44:30:50:270	406.061
9C5C00670269037	CE2E0033813481BD13E100100002C1	44:40:02:300	406.061
9C5C00670270037	CE2E0033813801BA105380100002C1	44:50:31:550	406.061
9C5C00670271037	CE2E0033813881B9D17600100002C1	45:00:08:320	406.061
9C5C00670272037	CE2E0033813901BD921880100002C1	45:10:05:590	406.061
9C5C00670273037	CE2E0033813981BE533D00100002C1	45:20:14:320	406.061
9C5C00670274037	CE2E0033813A01BCA2BD40100002C1	45:30:55:250	406.061
9C5C00670275037	CE2E0033813A81BF6398C0100002C1	45:40:55:170	406.061

9C5C00670276037	CE2E0033813B01BB20F640100002C1	45:50:46:210	406.061
9C5C00670277037	CE2E0033813B81B8E1D3C0100002C1	46:00:17:190	406.061
9C5C00670278037	CE2E0033813C01BEC3F6C0100002C1	46:10:42:170	406.061
9C5C00670279037	CE2E0033813C81BD02D340100002C1	46:20:20:430	406.061
9C5C00670280037	CE2E0033814001BAEE5E40100002C1	46:30:18:380	406.061
9C5C00670281037	CE2E0033814081B92F7BC0100002C1	46:40:14:150	406.061
9C5C00670282037	CE2E0033814101BD6C1540100002C1	46:50:11:520	406.061
9C5C00670283037	CE2E0033814181BEAD30C0100002C1	47:00:09:140	406.061
9C5C00670284037	CE2E0033814201BC5CB080100002C1	47:10:08:030	406.061
9C5C00670285037	CE2E0033814281BF9D9500100002C1	47:20:50:500	406.061
9C5C00670286037	CE2E0033814301BBDEFB80100002C1	47:30:43:290	406.061
9C5C00670287037	CE2E0033814381B81FDE00100002C1	47:40:58:510	406.061
9C5C00670288037	CE2E0033814401BE3DFB00100002C1	47:50:10:500	406.061
9C5C00670289037	CE2E0033814481BDFCDE80100002C1	48:00:10:140	406.061

- END OF ANNEX D -

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ANNEX E

DATA TO BE COLLECTED FOR OBJECTIVES T-1, T-2 AND T-3

Introduction

This annex provides a description of the data to be recorded for each beacon event transmitted by the simulator for objectives T-1, T-2, and T-3. This information provides the foundation for the analysis and conclusions provided in the body of the report.

The table below combines information obtained from the simulator operator, with data collected from the GEOLUT under test. Each row in the table represents a single beacon event.

A separate table should be provided for each run of the simulator (i.e. there should be 4 tables for each EIRP value since each EIRP scenario is repeated 4 times).

These tables should be included as an annex in the Electro Performance Evaluation Report provided by each participating Electro GEOLUT operator.

Table E-1: Results for Tests T-1, T-2 and T-3

EIRP (dBm)_____ Date/Time of First Burst in Test Script Run 1_____									
15 Hex ID Tx by Simulator	**Time of First Burst in Bcn Event**	**Time GEOLUT provided First Valid Msg**	**First Valid Msg C/No Measured by GEOLUT (dBHz)**	**Time GEOLUT provided First Complete Msg**	**First Complete Msg C/No Measured by GEOLUT (dBHz)**	**Time GEOLUT Provided Confirmed Msg**	**Confirmed Complete Msg C/No Measured by GEOLUT (dBHz)**	**Freq Transmitted (Hz)**	**Calibrated Freq Measured by GEOLUT for first Valid Message (Hz)**

The time required for the GEOLUT to produce a valid message for each beacon event can be calculated by taking the difference between columns 3 and 2. The time to produce complete and confirmed complete message is the difference between columns 5 and 2, and 7 and 2.

- END OF ANNEX E –

ANNEX F

DATA TO BE COLLECTED FOR OBJECTIVE T-4

Introduction

This annex provides a description of the data which should be recorded for each beacon event transmitted by the simulator for objective T-4. This information provides the foundation for the analysis and conclusions provided in the body of the report.

The table below combines information obtained from the simulator operator, with data collected by the GEOLUT under test. Each row in the table represents a single beacon event.

A separate table should be provided for each run of a test script (i.e. there should be 10 tables for each simulated traffic load).

These tables should be included as an annex in the Electro Performance Evaluation Report provided by each participating Electro GEOLUT operator.

Simulated Traffic Load (Number of simultaneously occurring beacon events)_____

Script Number ___ Date/Time of First Burst in Test Script Run 1_____

15 Hex ID Tx by Simulator	Time of First Burst in Bcn Event	**Time GEOLUT provided First Valid Msg**	**First Valid Msg C/No Measured by GEOLUT (dBHz)**	**Time GEOLUT provided first Complete Msg**	**First Complete Msg C/No Measured by GEOLUT (dBHz)**	**Time GEOLUT Confirmed Complete Msg**	**Confirmed Complete Msg C/No Measured by GEOLUT (dBHz)**	**Frequency**

- END OF ANNEX F -

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ANNEX G

DATA TO BE COLLECTED FOR OBJECTIVES T-6 AND T-7

Introduction

This annex provides a description of the data which should be recorded for each beacon event transmitted by the simulator for objectives T-6 and T-7. This information provides the foundation for the analysis and conclusions provided in the body of the report.

The table below combines information obtained from the simulator operator, with data collected by the GEOLUT under test. Each row in the table represents a single beacon event.

This table should be included as an annex in the Electro Performance Evaluation Report provided by each participating Electro GEOLUT operator.

15 Hex ID Tx by Simulator	Time of First Burst in Bcn Event	Time GEOLUT Provided First Valid Msg	First Valid Msg C/No measured by GEOLUT (dBHz)	Time GEOLUT Provided First Complete Message	First Complete Msg C/No measured by GEOLUT (dBHz)	Time GEOLUT Provided First Confirmed Complete Msg	Confirmed Complete Msg C/No measured by GEOLUT (dBHz)	LEOSAR Interference (Y/N)

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ANNEX H

DATA TO BE COLLECTED FOR OBJECTIVE T-8

Introduction

This annex provides a description of the data which should be recorded for each processing anomaly noted in the 406 MHz channel reserved for reference beacons.

This table should be included as an annex in the Electro Performance Evaluation Report provided by each participating Electro GEOLUT operator.

15 Hex ID Produced by GEOLUT	15 Hex ID of Associated Reference Beacon	Beacon Message Produced by GEOLUT (30 Hex)	C/No of Message as Measured by GEOLUT (dBHz)	Date / Time	LUT in LEO Footprint (Y/N)

_____ = Total duration that the GEOLUT was in the footprint of a LEOSAR satellite during the 4 week period of observation.

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ANNEX I

DATA TO BE COLLECTED FOR OBJECTIVE T-9

Introduction

This annex provides a description of the data which should be recorded for test T-9 (Electro coverage), for the test using beacon events of opportunity.

This table should be included as an annex in the Electro Performance Evaluation Report provided by each participating Electro GEOLUT operator.

15 Hex ID	Location Determined by LEOSAR System	LEOSAR Detection Time	Detected by GEOLUT (Yes / No)

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ANNEX J

ELECTRO GEOSAR Performance Evaluation Programme Schedule

Milestone	2011																							
	March				April				May				June				July				August			
Russia, France, Turkey and India coordinate and develop detailed plans regarding the usage of French beacon simulator during GEOSAR Electro Performance Evaluation Test campaign in accordance with C/S R.016 (15.03-11.04)																								
Russia, France and Turkey perform preliminary tests with to validate the feasibility of using beacon simulator with SC "Electro-L" SAR instrument (11.04 -15.04)																								
Analysing preliminary tests' results and making corresponding updates/corrections (11.04 -06.05)																								
GEOSAR Electro Performance Evaluation Main Test Campaign (04.07-12.07)																								
Russia and Turkey develop reports as per C/S R.016 requirements on the test conducted for internal review and subsequent submission to the Cospas-Sarsat Secretariat (08.07-05.08)																								

Note. Information on the outcome of the test campaign will be presented to CSC-47 in October 2011.

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