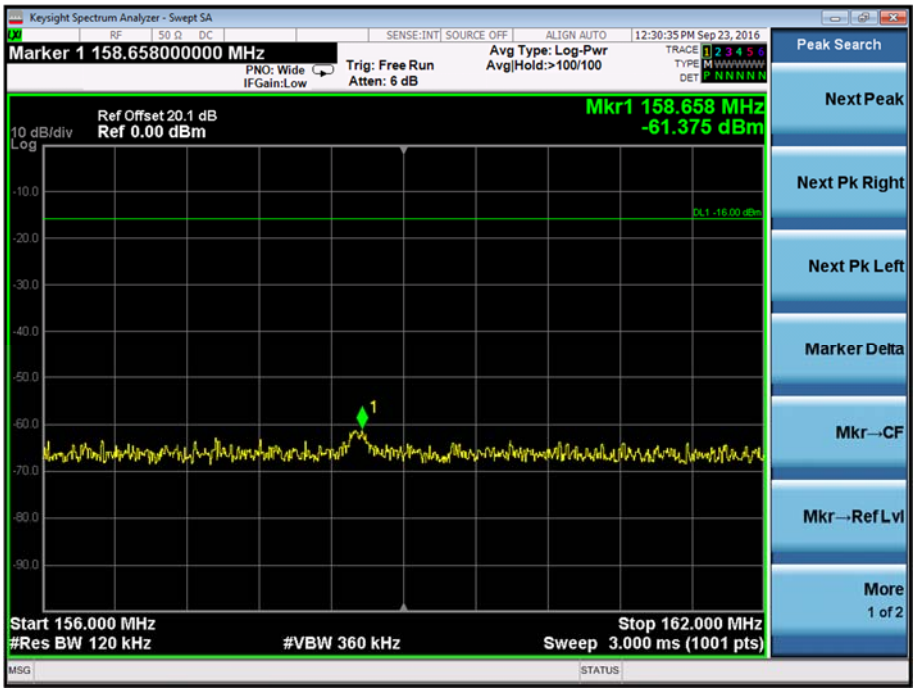
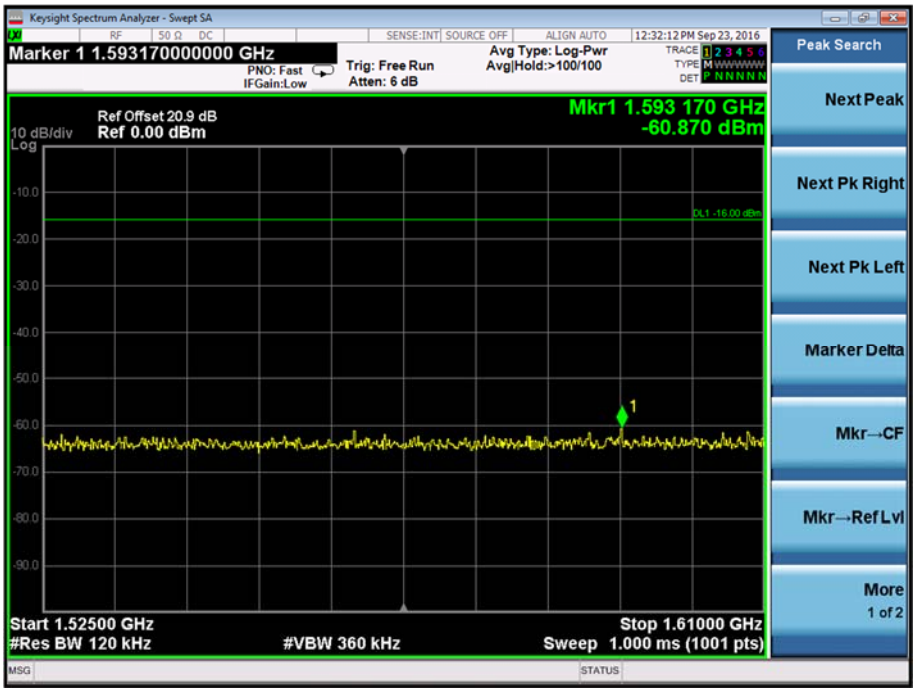
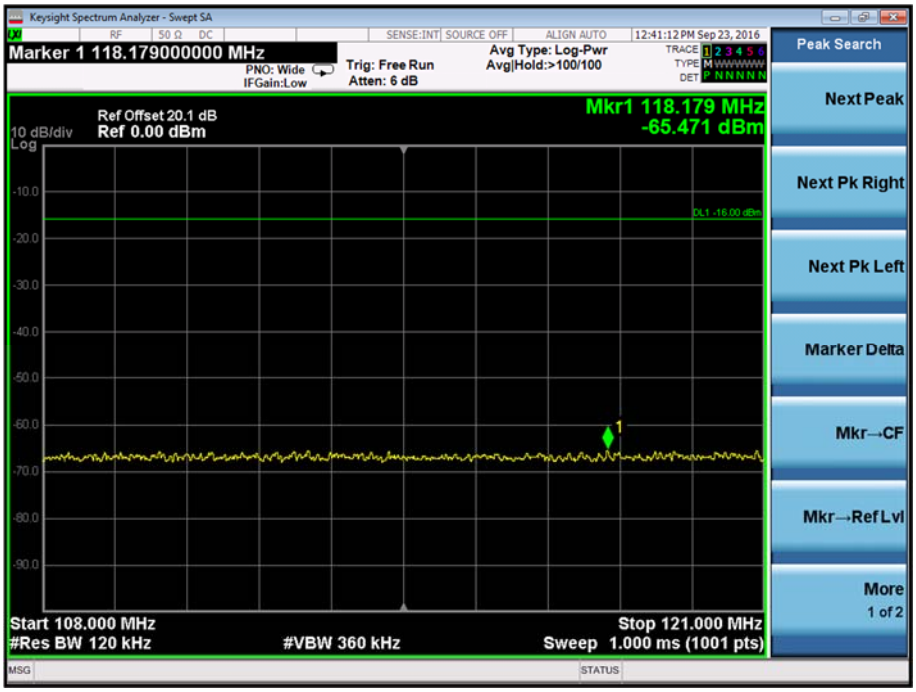


156 MHz to 162 MHz

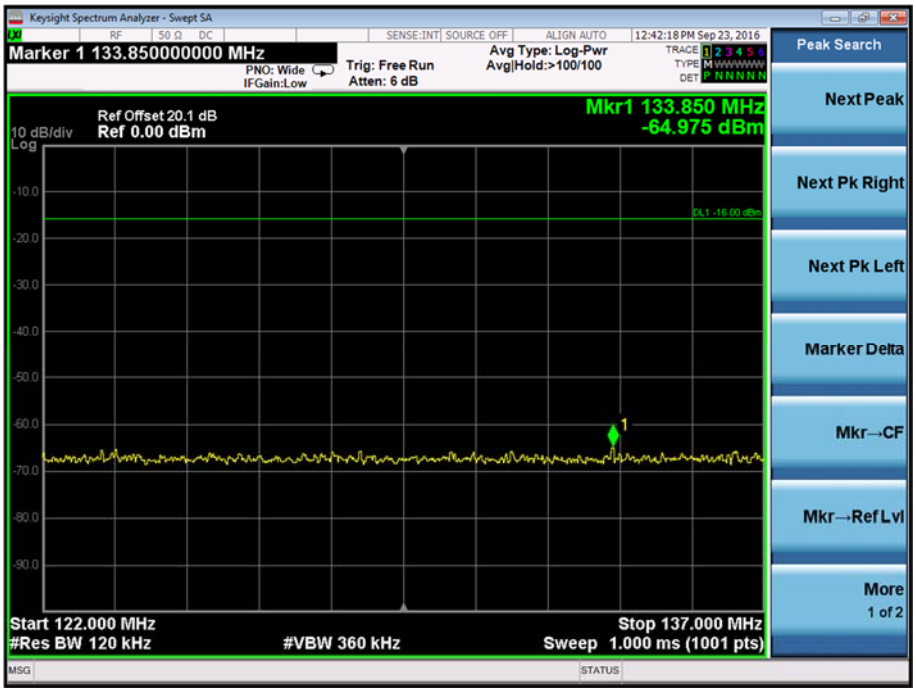


1525 MHz to 1610 MHz

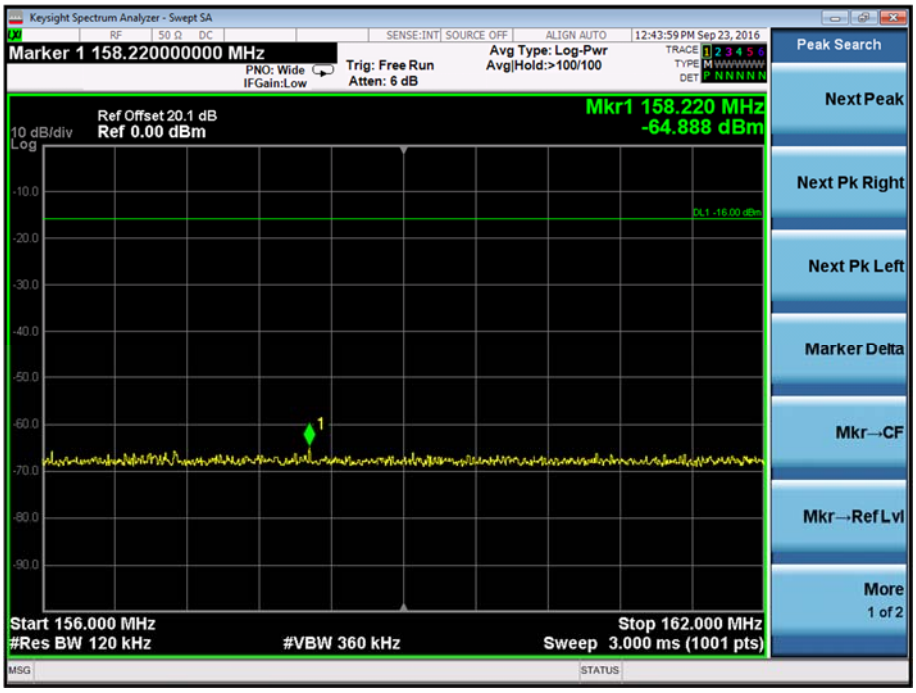
SOS-300 S/N: #1876 (75934030-TSR0003) [Iridium Port]



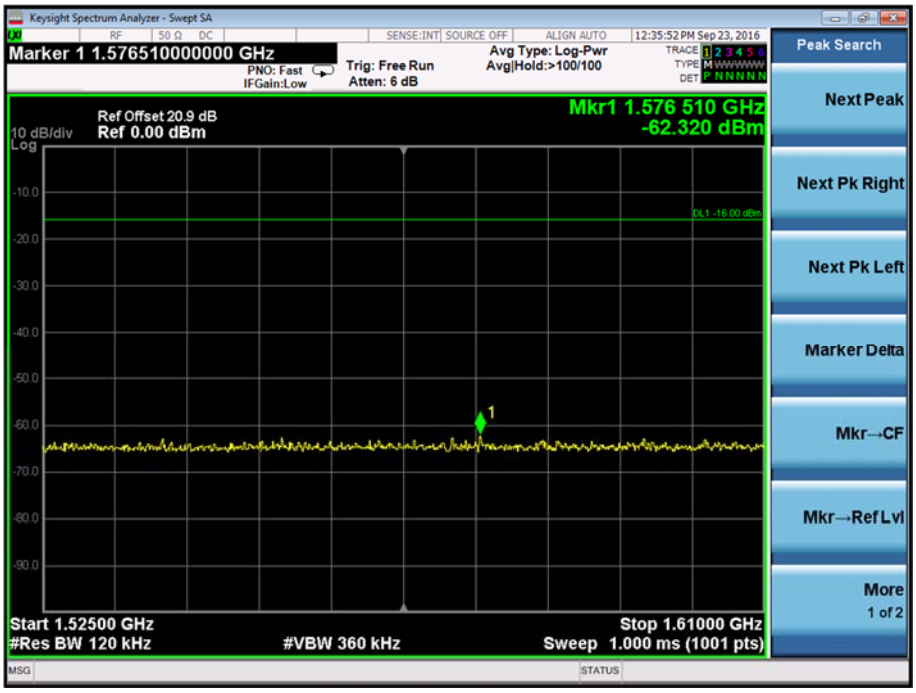
108 MHz to 121 MHz



122 MHz to 137 MHz



156 MHz to 162 MHz



1525 MHz to 1610 MHz

2.12 OPERATIONAL LIFE AND SELF-TEST

2.12.1 Specification Reference

RTCM 11010.2, Clause A.13

2.12.2 Equipment Under Test and Modification State

SOS-300 S/N: #1876 (75934030-TSR0003) – Modification State 0

2.12.3 Date of Test

01 June 2017

2.12.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.12.5 Environmental Conditions

Ambient Temperature (°C)	21.5
Relative Humidity (%)	60.5

2.12.6 Test Results

Battery Conditioning

The customer stated a pre-test discharge operating time of 3.40 hours (see Annex B), a fresh battery was discharged by operating inside the EUT for 3.83 hours, this was considered over-test.

Mode of Maximum Current Draw

The mode of maximum current draw for the 406 MHz transmitter was determined to be as follows:

- On at SOS switch
- GNSS signals not applied (maximising GNSS search time)
- Iridium secondary (rechargeable) battery flat (insufficient charge for operation)
    - The customer stated that with charge in the iridium battery available, the GNSS circuitry would be powered from that battery, however without such charge, the GNSS circuitry would be powered by the primary (non-rechargeable) battery of the 406 MHz circuitry (worst case)
- Iridium circuitry not operational (insufficient battery charge, as above)

Temperature Conditioning

The EUT was stabilised at -20 °C for ≥ 2 h

Operating Lifetime

The test was run for 29 hours in order to afford some margin; no failures were observed throughout the entire test.

Performance Testing

Test Parameters were monitored continuously throughout the test. Max/Min values are taken from the start of the test with the exception of Medium Term Stability parameters that ignore readings taken in the first 15 minutes as per C/S T.007 Clause A.2.3.

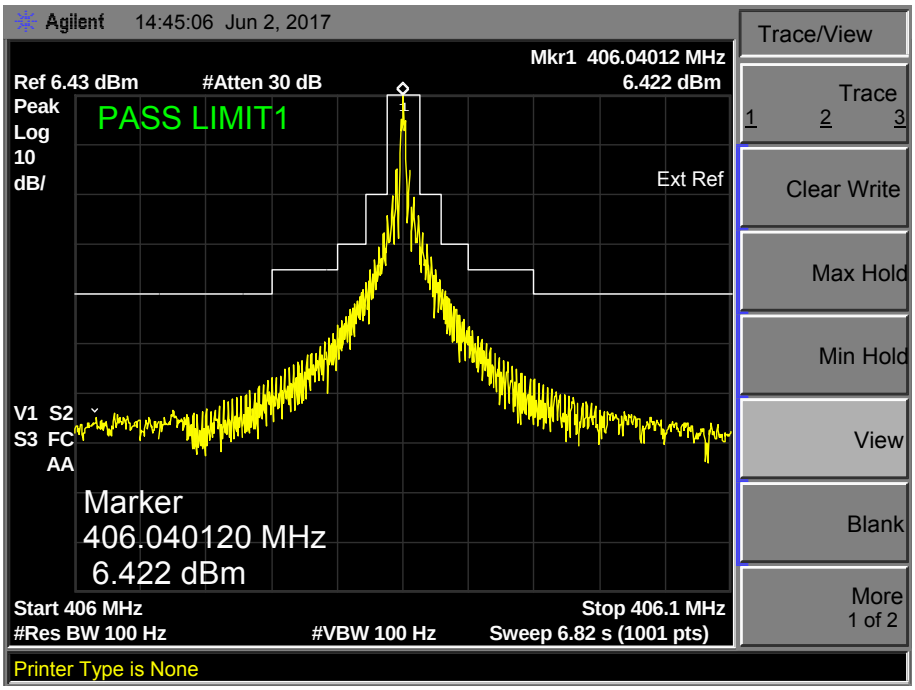
Test Parameter	Units	Result (Note 1)	Limit
Transmitter power output			
Power output	dBm	38.04 / 36.50	35 - 39
Power output rise time	ms	*	<5
Power output 1 ms before burst	dBm	*	<-10
Digital Message (bit numbers)			
Full Hex (all)	-	FFFE2F8C9F70465FC 0FF01F754769F3C0672	(Note 2)
Bit sync (1-15)	P/F	P	P
Frame sync (16-24)	P/F	P	P
Format flag (25)	(1 bit)	1	(Note 2)
Protocol flag (26)	(1 bit)	0	(Note 2)
Identification / position data (27-85)	P/F	P	P
BCH code (86-106)	P/F	P	P
Emergency code / nation. use /suppl. data (107-112)	(6 bits)	110110	(Note 2)
Additional data /BCH (if applicable) (113-144)	P/F	P	P
Position error (if applicable)	km	N/A (Default encoded)	< 5
Digital Message Generator			
Bit rate and stability	bit/s	399.94 / 399.91	396 - 404
Modulation			
Biphase-L	Y/N	Y	Y
Rise time	µs	232.3 / 178.3	50 - 250
Fall time	µs	233.6 / 180.6	50 - 250
Phase deviation: positive	rad	1.1884 / 0.9861 **	+(1.0 to 1.2)
Phase deviation: negative	rad	-1.1946 / -0.9879 **	-(1.0 to 1.2)
Symmetry measurement	-	0.0234	≤ 0.05

Test Parameter	Units	Result (Note 1)	Limit
Transmitted frequency			
Nominal value	MHz	406.0399912 / 406.0399848	C/S T.001
Short Term Stability	/100 ms	16.278E-11 / 46.314E-12	≤ $2x10^{-9}$
Medium Term Stability - Slope	/min	96.126E-12 / -83.92E-12	$(-1 \text{ to } +1)x10^{-9}$
Medium Term Stability - Residual Frequency Variation	-	42.37E-11 / 57.211E-12	≤ $3x10^{-9}$
Spurious Output			
Meets C/S T.001 mask	Y / N	Y	Y

Note 1: Where appropriate, results are displayed as Maximum / Minimum.
Note 2: The Encoded message was checked against the intended encoding and C/S T.007.

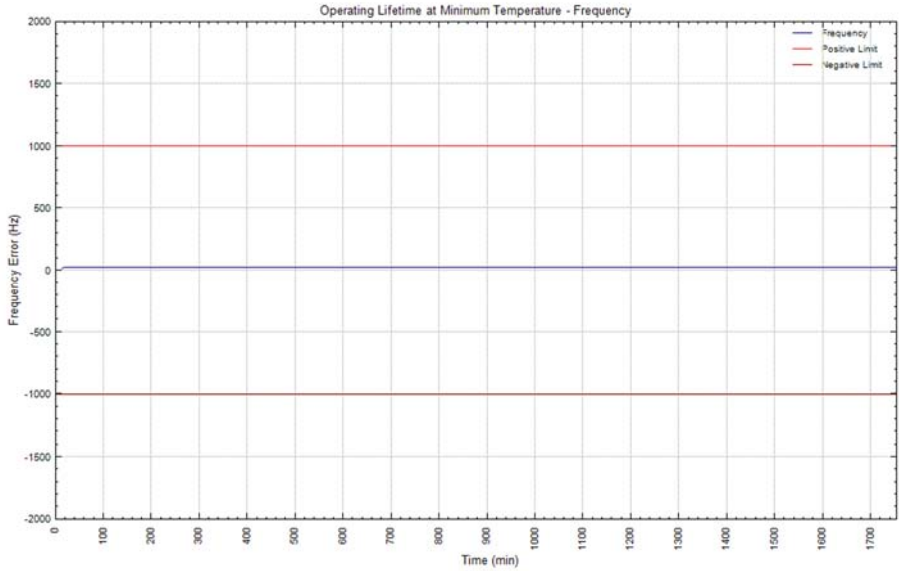
* Due to the test system configuration, it was not possible to measure these parameters; this was considered satisfactory given the compliant performance of related parameters.

** Measurements outside the limit by less than the Test Facility Accuracy Limit of C/S T.008 were accepted as satisfactory as per C/S T.007 Clause A.1.

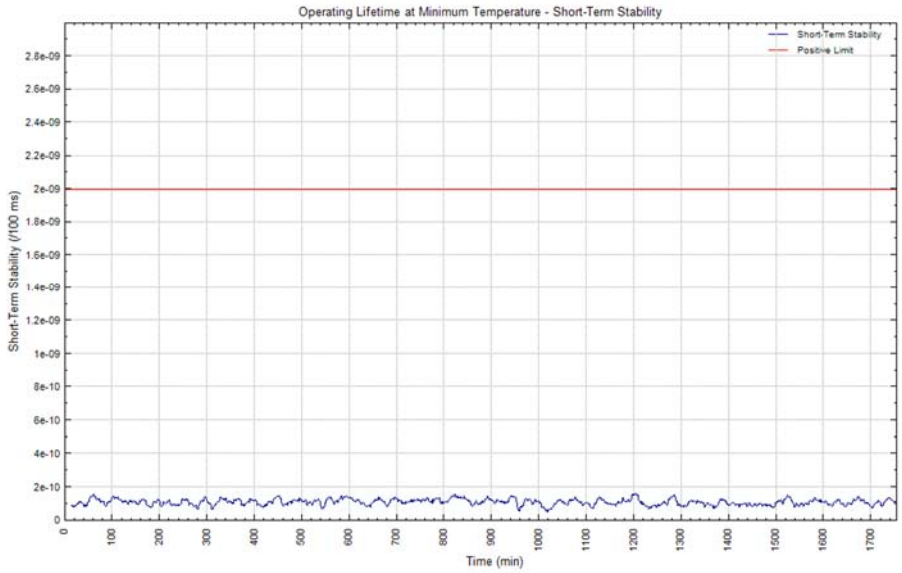


Spurious Output

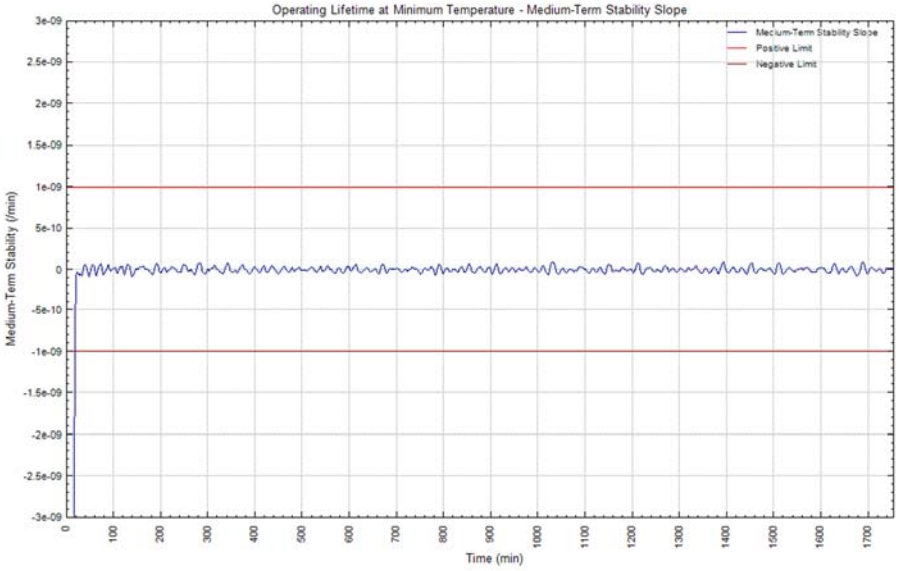
Performance Testing Plots



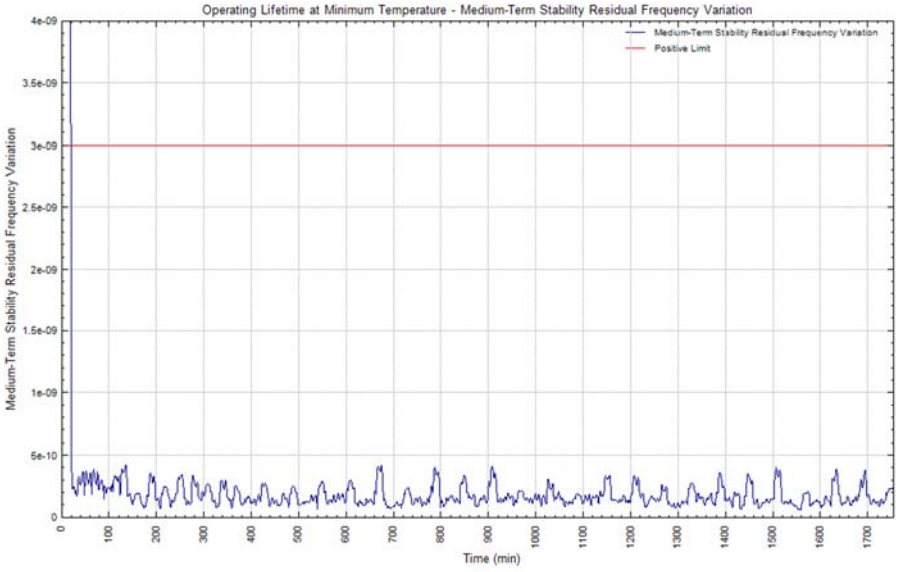
Nominal Frequency



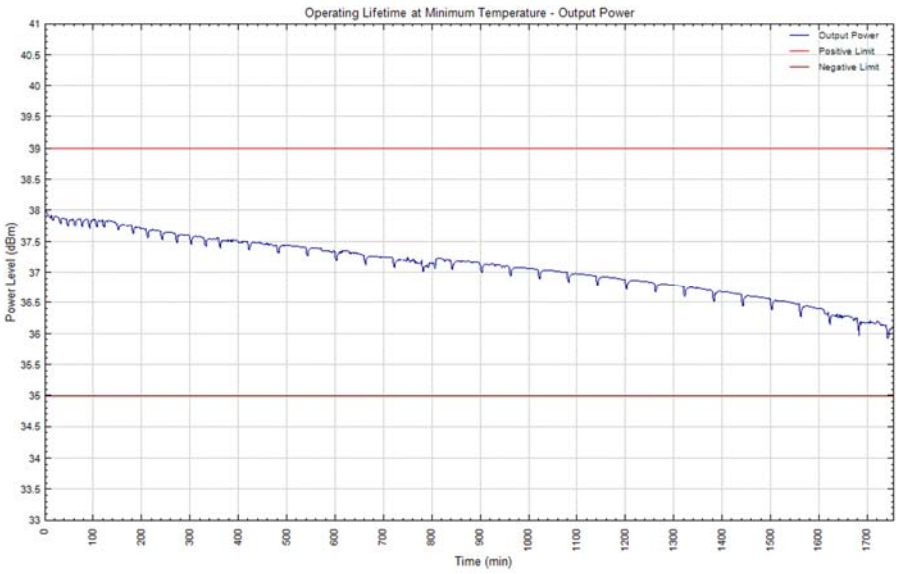
Short Term Stability



Medium Term Stability – Mean Slope



Medium Term Stability – Residual Frequency Variation



Output Power

2.13 (LIMITED) COSPAS-SARSAT TYPE APPROVAL TEST PROCEDURE

2.13.1 Specification Reference

RTCM 11010.2, Clause A.14

2.13.2 Equipment Under Test and Modification State

SOS-300 S/N: #1763 (75934030-TSR0002) – Modification State 0

2.13.3 Date of Test

10 June 2017 - 19 June 2017

2.13.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.13.5 Environmental Conditions

Ambient Temperature (°C)	17.3 – 22.1
Relative Humidity (%)	44.8 – 67.8

2.13.6 Test Results

Full Cospas-Sarsat testing was carried out prior to the RTCM 11010.2 sequence of test as requested by ACR Electronics, Inc. A limited number of Cospas-Sarsat tests were repeated in order to demonstrate continuing compliance. The summary of results of the limited test campaign which was carried out as required by the sequence of tests can be found in annex A.

EUT tested in accordance with Cospas-Sarsat T.001 Issue 3 Revision 15 October 2014 and Cospas-Sarsat T.007 Issue 4 Revision 9 October 2015 and results of the full test campaign were submitted to Cospas-Sarsat Secretariat for approval.

Cospas-Sarsat Type Approval Certificate: 280

This is intended to show compliance with the above Specification References.

2.14 SOLAR RADIATION

2.14.1 Specification Reference

RTCM 11010.2, Clause A.17

2.14.2 Test Results

Refer to TÜV SÜD PSB Pte. Ltd. Test Report: 7191160592-CHM17-CCK

2.15 OIL RESISTANCE

2.15.1 Specification Reference

RTCM 11010.2, Clause A.18

2.15.2 Equipment Under Test and Modification State

SOS-300 IMEI: 300434060816170 (75934030-TSR0046) – Modification State 0
SOS-300 IMEI: 300434060627250 (75934030-TSR0047) – Modification State 0

2.15.3 Date of Test

14 July 2017

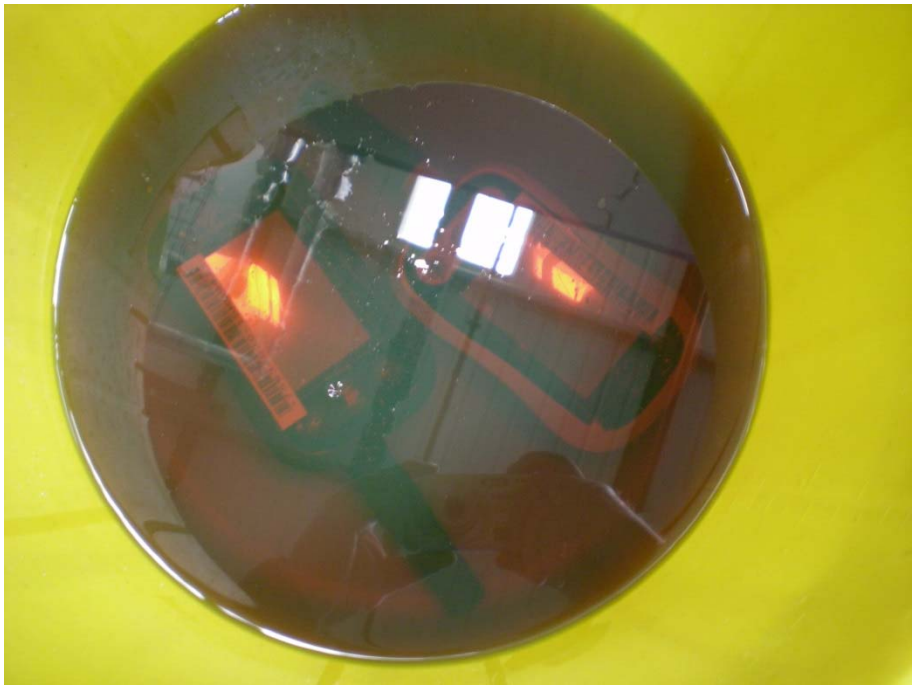
2.15.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.15.5 Environmental Conditions

Ambient Temperature (°C)	22.2 - 23.9
Relative Humidity (%)	37.4 - 41.0

2.15.6 Test Setup



Test Setup

2.15.7 Test Method

- EUT configured as complete assembly with normal labelling
  - Any storage cases (not part of EUT) removed
  - Covers or similar raised (open)
- EUT immersed at 19 °C ± 5 °C for 3 h in mineral oil as follows:
  - Aniline point: 120 °C ± 5 °C
  - Flashpoint: Minimum 240 °C
  - Viscosity: (10 – 25) cST at 99 °C
- Cleaned EUT as per manufacturer's instructions
- Inspect EUT visually for signs of any damage
- Performance Check

2.15.8 Test Results

The test method was completed satisfactorily.

Inspection

On completion of the test the EUT was subjected to an inspection. No sign of damage was found.

SOS-300 IMEI: 300434060816170 (75934030-TSR0046)

Performance Check

Test Parameter	Units	Result	Limit
Transmitted frequency (single burst)	MHz	406.040030	406.040 ± 0.001
Digital message correctness	Y/N	Y	Y

SOS-300 IMEI: 300434060627250 (75934030-TSR0047)

Performance Check

Test Parameter	Units	Result	Limit
Transmitted frequency (single burst)	MHz	406.039967	406.040 ± 0.001
Digital message correctness	Y/N	Y	Y

2.16 CORROSION

2.16.1 Specification Reference

RTCM 11010.2, Clause A.8

2.16.2 Equipment Under Test and Modification State

SOS-300 S/N: #1761 (75934030-TSR0005) – Modification State 0
SOS-300 S/N: #1765 (75934030-TSR0008) – Modification State 0

2.16.3 Date of Test

21 September 2016 to 19 October 2016

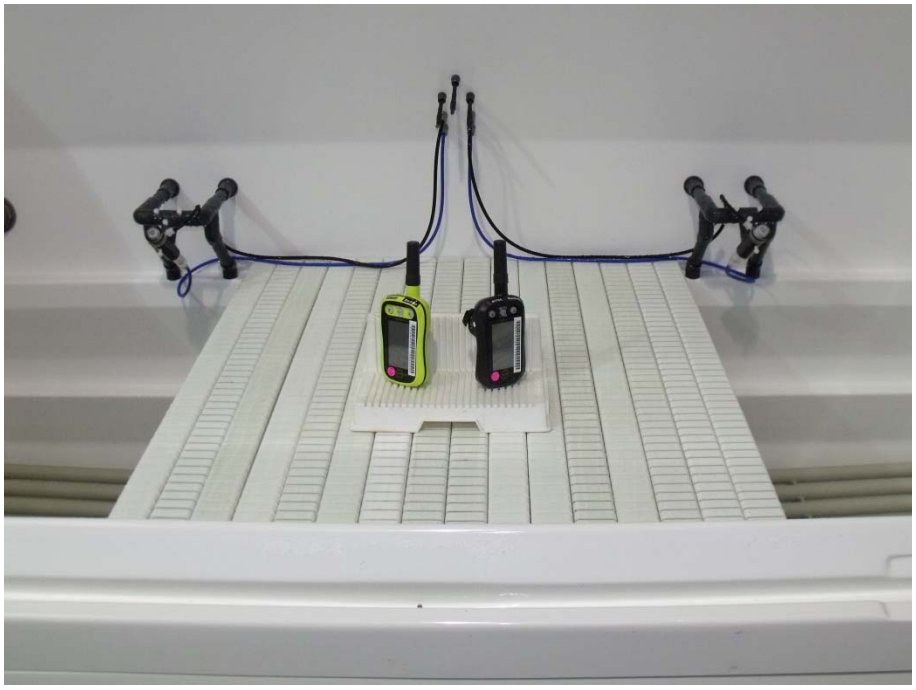
2.16.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.16.5 Environmental Conditions

Ambient Temperature (°C)	25.6
Relative Humidity (%)	32.0

2.16.6 Test Setup



Spray Test Setup

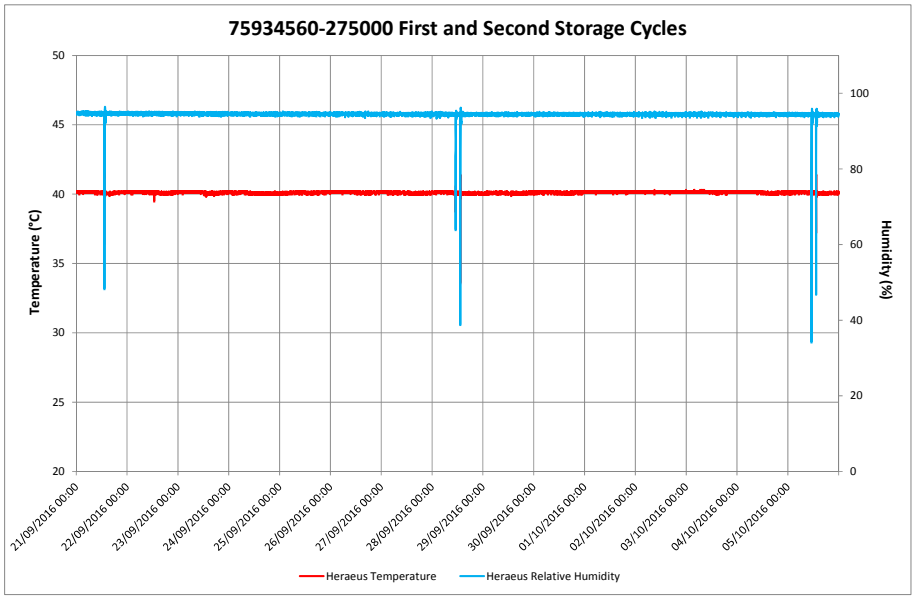
Storage Test Setup

2.16.7 Test Method

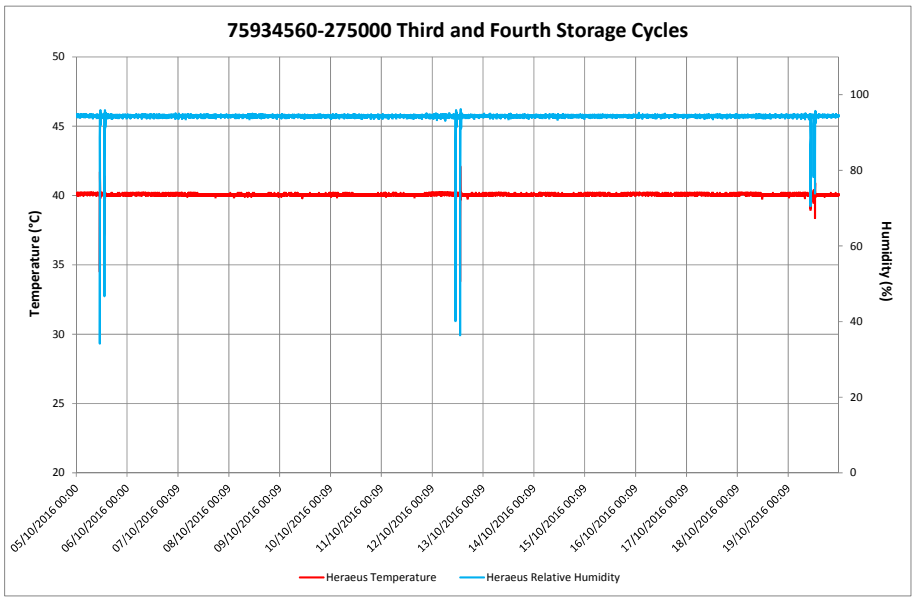
- EUT configured as complete assembly with normal labelling
  - Any storage cases (not part of EUT) removed
  - Covers or similar raised (open)
- EUT subjected to four spray/storage cycles as follows:
  - EUT placed in chamber and sprayed with a salt solution for 2 h at normal temperature
    - Salt solution (5 ± 1) parts by weight of sodium chloride (NaCl) in 95 parts by weight of distilled or demineralized water
  - At end of spraying period, EUT placed chamber maintained at 40 °C ± 2 °C, 90 % to 95 % relative humidity for 7 days
- Inspect EUT visually for signs of any damage
- Performance Check

2.16.8 Test Results

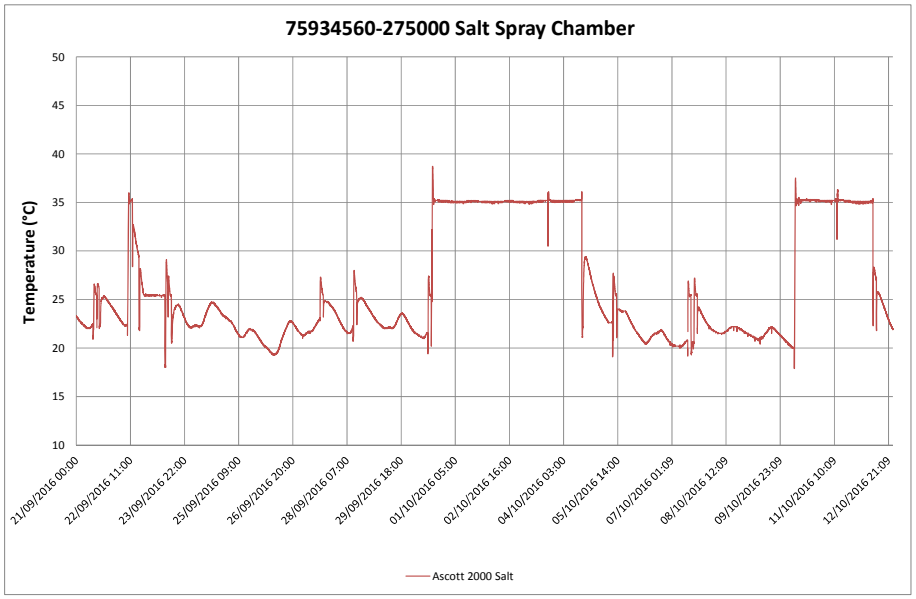
The test method was completed satisfactorily



Temperature Plot (First and Second Storage)



Temperature Plot (Third and Fourth Storage)



Salt Spray Chamber Plot

Inspection

On completion of the test the EUT was subjected to an inspection. No sign of corrosion was found.

SOS-300 S/N#1761 (75934030-TSR0005)

Performance Check

Test Parameter	Units	Result	Limit
Transmitted frequency (single burst)	MHz	406.039943	406.040 ± 0.001
Digital message correctness	Y/N	Y	Y

SOS-300 S/N #1765 (75934030-TSR0008)

Performance Check

Test Parameter	Units	Result	Limit
Transmitted frequency (single burst)	MHz	406.039882	406.040 ± 0.001
Digital message correctness	Y/N	Y	Y

2.17 COMPASS SAFE DISTANCE

2.17.1 Specification Reference

RTCM 11010.2, Clause A.19

2.17.2 Equipment Under Test and Modification State

SOS-300 IMEI: 300434060810280 (75934030-TSR0048) – Modification State 0

2.17.3 Date of Test

05 April 2017

2.17.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.17.5 Environmental Conditions

Ambient Temperature 14.5°C
Relative Humidity 36%

2.17.6 Test Method

A wooden table aligned E-W was used with a compass set in the centre, aligned to read zero. The table was marked to give a graduated scale of distance. The EUT was moved towards the compass until a standard deviation of 0.3° was obtained.

Each orientation of the EUT was tested in this manner with the measurement distance between the compass centre and the EUT being noted.

The test was repeated with readings taken when the compass gave a steering deviation of 0.9°.

The local area Magnetic Flux density (H) at the site of testing was 19.91uT.

The above testing was performed three times with the EUT as follows:

a. Unpowered.
b. Normalised.
c. Power applied.

Prior to performing the tests in accordance with part b above, the EUT was normalised by placing it into Helmholtz Coil Assembly and subjecting it to a magnetic field of 79A/m.

The test was applied in accordance with the test method requirements of IEC 61097-2.

The test was performed with the EUT in both idle (Standby) and active (Operating) modes.

2.17.7 Test Results

Standard Compass safe distance (mm)	350
Emergency Compass safe distance (mm)	250

Horizontal maximum flux density, Magnetic North (H)	H	19.8
Standard compass deviation limit (degrees)	5.4/H = A	A = 0.3
Emergency compass deviation limit (degrees)	18/H = B	B = 0.9

Orientation of the EUT	Un-powered State		Normalised		Powered Up	
	Distance From Compass Centre (mm) at A° deflection	Distance From Compass Centre (mm) at B° deflection	Distance From Compass Centre (mm) at A° deflection	Distance From Compass Centre (mm) at B° deflection	Distance From Compass Centre (mm) at A° deflection	Distance From Compass Centre (mm) at B° deflection
Front	330	190	310	185	310	185
Top	170 0.2°deflection	170 0.2°deflection	170 0.2°deflection	170 0.2°deflection	180	170 0.4°deflection
Left Hand Side	330	175	340	200	325	250
Right Hand Side	315	180	300	190	320	250
Underside	250	175	280	175	315	175
Rear	320	230	300	240	330	210

2.18 MISCELLANEOUS TESTS

2.18.1 Specification Reference

RTCM 11010.2, Clause A.20

2.18.2 Equipment Under Test and Modification State

SOS-300 IMEI: 300434061229130 (75934030-TSR0008) – Modification State 0
A1-20-1661B Rev B: Label, battery replacement date
A1-20-1843BDASH Rev B: Battery expiration label, SARLink
A1-20-1844BDASH Rev B: Activation label, SARLink SOS-300
A1-20-1845A Rev A: GPS label, SARLink SOS-300
A1-20-1847B Rev B: Label, HEXID, SARLink SOS-300
A1-20-1926T1 Rev T1: Registration label, SARLink
Y1_03_0304_B_SARLink_SOS300_User Manual Rev B: User Manual
A1-20-1928A Rev A: Label, SARLink cloth
A3-06-2976A Rev A: SARlink Pouch
A1-26-0680A Rev A: Display sleeve SARLink SOS-300
A1-20-1847B Rev B: Label, Hex ID, SARLink SOS-300

Subsequent versions of the above document(s) were supplied and where these fulfilled a further requirement a note has been made:
Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual
Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual (supplied 17/07/17).

2.18.3 Date of Test

14 July 2017 – 17 July 2017

2.18.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.18.5 Environmental Conditions

Ambient Temperature 25°C - 28°C
Relative Humidity 35% - 38%

2.18.6 Test Results

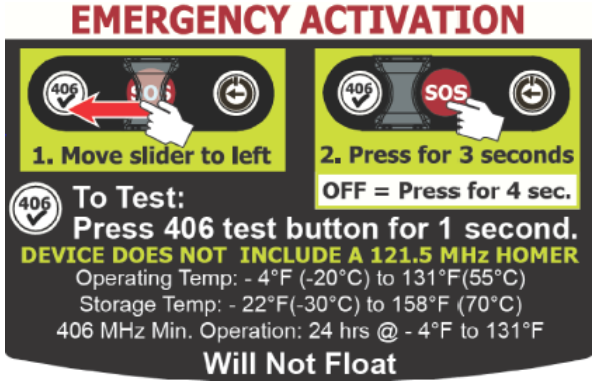
A.20 Miscellaneous		
Sub clause	Statement	Comment
A.20.1 Controls and Indicators		
	The PLB shall be inspected to ensure that all the requirements of paragraph 4.4.1 are met. All controls shall be operated by a person wearing gloves or mittens from an IMO SOLAS 13 compliant immersion suit. The inspection shall ensure that if there is a tamper proof seal it is not counted as one of the two independent actions required to activate the PLB. The means to indicate that the PLB may have been previously activated shall be checked either visually or by operation of the device in accordance with the manufacturer's instructions, a clear means of visible or audible indication shall be apparent.	The EUT was operated by a TUV SUD engineer wearing an immersion suit glove. The EUT is activated by firstly pushing the plastic slider covering the SOS button, and then the user is required to press and hold the SOS button. There is no tamper proof seal however once the EUT is activated for the first time, the device includes electronic software counters which show the user the amount of time the EUT has been activated to date (via the *406 config menu*).

4.4.1	Controls and Indicators	
4.4.1	All controls shall be clearly and durably marked. They shall be designed to prevent inadvertent activation and shall require the use of not less than two simple, independent mechanical actions for manual activation of the [the PLB]. Activation of the [the PLB] shall not require the use of two hands. The [PLB] shall be provided with a means to indicate that it has been activated. The controls should be few in number and the function of each control shall be kept simple to permit ease of operation of the [PLB]. All controls shall be so designed that they can be used by personnel wearing gloves or mittens. [The PLB] shall have, as a minimum, integral manual controls to operate the device in the following modes: OFF In the OFF mode, the [the PLB] is deactivated. ON In the ON mode, the [the PLB] is activated. TEST The various modes of the PLB shall be readily apparent by visual observation. A positive visual and/or audible indication that the PLB is activated shall be provided.	The EUT has three physical buttons: 406 test button, SOS (406 activation button) and Power. Additional options are available via the touch screen, depending on the screen activated.  The two independent actions for activation are:  It is possible to activate the EUT with one hand. The physical controls relating to the 406 MHz feature of the device are few in number (as per above). Further controls / buttons / options are available by the numerous touchscreen options. The EUT was operated by a TUV SUD engineer wearing an immersion suit glove. The three physical buttons on the EUT correspond as follows: 406 test button: TEST SOS: ON Power: OFF

A.20.2 Self-test and GNSS Self Test Function		
	The self-test mode of the PLB shall be activated. The automatic reset of the test facility and the indication of the self-test mode shall be checked by inspection. The manufacturer's declaration as to the functioning of the self-test mode shall be checked for compliance with paragraph 4.4.2. a), b) and c). If applicable the GNSS Self Test function as defined in paragraph 4.4.2 shall be checked by inspection to ensure that it is operated by a Distinct Operation, prevents Inadvertent Operation, is provided with Distinct Pass and Fail indicators. Also if applicable the manufacturer's declaration as to the functioning of the GNSS Self Test mode shall be checked for compliance with paragraph 4.4.2. c), d), e) and f).	The EUT includes a 406MHz test mode. See TUV SUD document 75934030 Report 1 for Cospas Sarsat Type Approval testing (including testing of the Self Test). Further details are provided in the Manufacturers documentation in Annex B GNSS Self Test is not supported by the EUT.
A.20.3 Battery		
	The manufacturer shall provide evidence that the primary battery used to power the PLB is not hazardous to personnel as required by paragraph 4.4.3. The manufacturer shall provide evidence that the design of the PLB includes measures to protect the batteries from reversal of polarity, shorting, self heating, cell-to-cell charging and forced discharging. The manufacturer shall declare the useful life of the battery and its expiration date and provide evidence to support these as required by paragraph 4.4.3. The battery shall be inspected to ensure that all the labelling requirements of paragraph 4.5.2.1 are met. The manufacturer shall provide evidence that the battery and the cells making up the battery are either exempt from testing or have been tested to the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, Fourth Revised Edition, PART III, Section 38.3 (ST/SG/AC.10/11/Rev.4) as amended.	The Manufacturer provided document Panasonic CR123A Spec 091015 w SDR Plot.pdf in support of this clause.

4.4.3	Battery	
4.4.3	The PLB shall have its own primary (non-rechargeable) battery and shall not depend upon any external source of power for its operation when activated. The battery shall be an integral part of the equipment. Replacement of the battery, if user-replaceable, should be possible with relative ease, and any interface connections required shall be such as to prevent reversed polarity or incorrect installation. Provision shall be made to ensure watertight integrity upon replacement of the battery. The PLB shall not be hazardous to personnel handling it, operating it, or performing manufacturer-approved servicing of it nor shall it release toxic or corrosive products outside the PLB case during or subsequent to storage at temperatures between -55 and +75 C and: a) During a full or partial discharge at any rate up to and including an external short circuit. b) During a charge or forced discharge of a cell or cells by another cell or cells within the battery. c) After a full or partial discharge. All PLBs shall include measures to protect the batteries from reversal of polarity, shorting, and the effects of self-heating, cell-to-cell charging, and forced discharging. The PLB manufacturer shall establish a useful life and an expiration date for batteries. The useful life is defined as the period of time after the date of battery manufacture that the battery will continue to meet the input power requirements of the PLB. The following losses must be included (at a temperature of +20C ±5C): a) Testing, as recommended by the manufacturer, including GNSS Self Tests if applicable, or as required by the regulatory authority, whichever is the more demanding. b) Self-discharge of the battery pack. c) Standby loads. The battery expiration date shall be the date of battery cell manufacture plus no more than 1/2 of the useful life of the battery. The battery cells shall be no older than 2 years when first fitted in the PLB.	The device has its own primary non rechargeable battery source for the 406 MHz feature The battery pack is an integral part of the EUT. The battery pack is not user replaceable (see below for related label). The Manufacturer provided document Panasonic CR123A Spec 091015 w SDR Plot.pdf with respect to battery chemistry / handling etc. The battery pack connector is keyed and as such can only be connected to the EUT in the correct orientation. See also Annex B for Manufacturer supplied battery conditioning information and Verification document. The Manufacturer advises the following in relation to the battery life: *ACR Electronics has declared that the batteries, at the time being installed in the device are not more than .25 years (3 months).* *Panasonic CR123 batteries have a declared self-discharge of 1% per year.* *ACR has established through testing, that Panasonic CR123 batteries of useful life is 7 years after being installed in the device and marks the batteries with that date as the date of expiry.* *SarLink SOS 300 performance, at declared end of battery life, was performed to Cospas Sarsat T.007 standard with passing results. Therefore, SarLink meets the intent of RTCM 11010.2 section 4.4.3.*

4.5.2.1	Battery Labelling	
4.5.2.1	The battery shall be marked indelibly and legibly with the battery type (chemical composition), voltage, expiration date (month and year) and as appropriate, precautions associated with its use, handling and disposal.	The battery is not user accessible. However, on inspection of the battery pack, the following information was noted: Battery type, Voltage, Expiration date  
A.20.4 General Construction		
	The PLB shall be inspected to ensure that it has no sharp edges or points, likely to cause injury to persons or damage to inflatables or similar survival equipment.	The EUT was inspected with a Sharp Edge tester. The result indicated that there were no sharp edges present.

A.20.5 Exterior Finish		
	The PLB shall be inspected to ensure that the exterior finish complies with the requirements of paragraph 4.5.1.	See below.
4.5.1	Exterior Finish	
4.5.1	The PLB case shall be predominantly a highly-visible yellow/orange color.	There are two models of the EUT available. One is the ACRTreuse colour (standard ACR Electronics yellow / green colour used for their range of products (EPIRBs, PLBs etc). The second is a black version.
A.20.6 Labelling		
	The labelling of the exterior of the PLB and any labelling permanently attached to the PLB shall be inspected to ensure that they comply with the requirements of paragraphs 4.5.2.2 to 4.5.2.2.4. All labelling on the exterior of the PLB shall be tested for abrasion resistance by the manufacturer who shall present evidence of the suitability of the labelling to last for at least the stated battery shelf life of the beacon, ideally this should be in the form of test results obtained using a recognized abrasion test method. Instructions for operating the PLB and any pictographs not already commonly in use shall be tested for comprehension in accordance with an appropriate internationally recognized testing procedure (i.e.: ISO, ANSI, ASTM) or a manufacturer may demonstrate the comprehensibility of the instruction or pictograph by the success of at least 4 out of a set of 5 randomly selected naive test subjects demonstrating compliance with or understanding of, as appropriate, the instructions.	See Annex B for Manufacturer Supplied Abrasion Test declaration. The following operating instructions and pictographs are provided (via adhesive labels) on the EUT: 

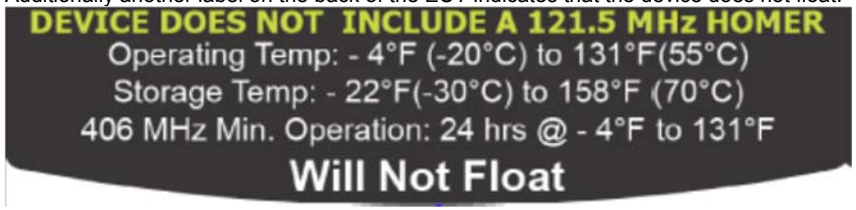
4.5.2.2	PLB Labelling	
4.5.2.2	All labelling on the exterior of the PLB shall be resistant to deterioration by prolonged exposure to sunlight, not unduly affected by seawater or oil, and abrasion resistant. All labelling essential to the safe and effective operation of the PLB shall be in high contras t to the background of the text or pictograph. Labelling and Pictograph instructions essential to the safe and effective operation of the PLB shall be sized such that they are readable by persons having 20/20 normal vision at a minimum viewing distance of 150 mm with illumination no greater than 0.3 Lux. Items a) through h) in 4.5.2.2.1 below and any other information required for the safe and effective operation of the PLB shall be visible on the PLB, or their location identified and accessible by a single simple action on the part of the operator (e.g. lifting or removing a protective cover over the control panel). Such information shall not be hidden by any permanent or semi-permanent accessory or ancillary devices normally attached to or installed on or around the body of the PLB. (A separate storage case from which the PLB can be easily removed with one hand for activation is not included in this requirement.)	Solar Radiation: Refer to TÜV SÜD PSB Pte. Ltd. Test Report: 7191160592-CHM17-CCK Corrosion: see section 2.16 of the present document. Oil Resistance: see section 2.15 of the present document. The operating instructions on the EUT provide white text on a black background (label):  Additional instructions are provided in ACRTreuse on a black background (label): The GPS antenna location label is located on the top of the device:  Both the black and ACRTreuse models have the same labelling.

4.5.2.2	All labelling essential to the safe and effective operation of the PLB shall be in high contras t to the background of the text or pictograph. Labelling and Pictograph instructions essential to the safe and effective operation of the PLB shall be sized such that they are readable by persons having 20/20 normal vision at a minimum viewing distance of 150 mm with illumination no greater than 0.3 Lux.	It was not possible to read all of the essential operating instructions when in a darkened room with illumination no greater than 0.3 Lux. The pictograph was mostly visible. The Manufacturer advises that the product is not available for general sale and as such all users will be fully trained with the operation of the device. See section 1.6 for further details relating to the FCC Waiver Docket (referencing type of equipment / end users / 121.5 MHz homing transmitter.
4.5.2.2.1	Labelling on the PLB	
4.5.2.2.1	The outside of the PLB shall be marked indelibly and legibly with the following: a) Concise, unambiguous instructions for operating and testing of the PLB that shall be understandable by untrained personnel. b) The warning, or equivalent: WARNING USE ONLY IN SITUATIONS OF GRAVE AND IMMINENT DANGER c) The warning, or equivalent: NOTICE TO THE PUBLIC DO NOT MOVE IF FOUND REPORT POSITION TO AUTHORITIES d) Space for 15 characters shall be provided on a label with text identifying this as the “Beacon Identification Code.” This is the hexadecimal representation of bits 26 through 85 of the digital message. This unique identifier number, the 15 Hex ID, shall be inserted on the label when the PLB is programmed. e) The serial number of the PLB.	The following label items / instructions were identified on the EUT (a label guide SOS-300 Photos – see Annex B) was provided to identify the label placement: a) basic operating instructions for emergency mode activation (see label pictograph above). b) The warning: WARNING: USE ONLY IN SITUATIONS OF GRAVE AND IMMINENT DANGER (see label pictograph above). c) The warning, or equivalent: NOTICE TO THE PUBLIC: IF FOUND DO NOT MOVE. REPORT POSITION TO AUTHORITIES (see label pictograph above). d) The unique identification label shown below can be found on the back of the EUT:  e) The serial number of the device: the serial number label of the EUT can be found on the back of the EUT, (see above).

4.5.2.2.1	f) Instructions to register the PLB with the appropriate authority and the contact details of the authority. g) Space for any required registration sticker. h) The battery expiration date determined in accordance with section 4.4.3.	f, g) Instructions to register the device with the appropriate authority and the contact details of the authority and (g) Space for any required registration sticker: the registration label can be found on the back of the EUT:  h) The battery expiration date determined in accordance with section 4.4.3: the battery expiration date label (field to be completed) can be found on the bottom of the EUT: 

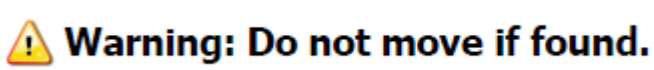
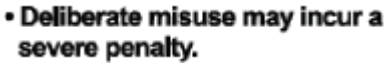
4.5.2.2.2	Attached labelling	
4.5.2.2.2	The following instructions shall be marked indelibly and legibly on the outside of the PLB or permanently attached to the PLB. If permanently attached, the placard including the instructions(s) shall be conspicuously marked adjacent to the attachment point: “DO NOT REMOVE” a) The identification of the manufacturer.	The following label items / instructions are identified on the EUT. A permanently attached pouch is supplied with the EUT; inside the pouch is a napkin made microfiber cloth containing instructions in multiple languages. Note: only the details written in English were reviewed). A note instructing not to remove the lanyard can be found on the back of the EUT.  An additional note on the pouch can also be seen:  BACK VIEW a) The Manufacturer name, ACR, can be identified on the front of the EUT. The full name ACR Electronics Inc, and the address are provided on the back of the EUT.

4.5.2.2.2	b) The PLB type number or model identification under which it was type tested. c) The temperature operating range in degrees Celsius and Fahrenheit of the PLB. d) An appropriate Dangerous Goods transportation statement together with the applicable date	b) The name SARLink can be identified on the front of the EUT. The attached napkin also refers to SARLink SOS-300: • In the U.S., call 1-800-851-3051 to report an inadvertent activation. Outside the U.S., contact your national authority. • Air Travel: This product contains small Lithium metal batteries (<2g) that comply with IATA SP 188-PI 970 Air Cargo. Always check with air carriers for concerns regarding any additional restrictions. • In order to transmit a distress alert - Ensure the SARLink SOS-300 antenna is facing upright and has an unobstructed view to the sky. • Class 2 – This device may not operate below -20°C. • Category 2 – Will Not Float. • Check travel restrictions. • Compass safe distance 3.3ft/1m. • Deliberate misuse may incur a severe penalty. • Warranty void if SARLink SOS-300 is opened. EN c) The operating and storage temperatures can be found on the back of the EUT in both degrees Celsius and Fahrenheit. d) Air travel information is provided however no applicable date could be seen: see above. Please also refer to section 1.6. The Manufacturer advises that the product is not available for general sale and as such all users will be fully trained with the operation of the device (including shipment / air travel). See section 1.6 for further details relating to the FCC Waiver Docket (referencing type of equipment / end users / 121.5 MHz homing transmitter).

4.5.2.2.2	e) If there exists a condition or operating circumstance which has been identified by the manufacturer or regulating authorities that could substantially affect the alerting or self locating performance of the PLB, then information appropriate to prevent this occurring shall appear in a conspicuous location appropriate to the prevention or remediation by the operator of said condition or operating circumstance (e.g. the necessity to orient the antenna vertically upward if orientation of the antenna is adjustable). f) The phone number(s) to be used to report inadvertent activation negating the need for the distress alert.	e) If there exists a condition or operating circumstance which has been identified by the manufacturer or regulating authorities that could substantially affect the alerting or self locating performance of the EUT, then information appropriate to prevent this occurring shall appear in a conspicuous location appropriate to the prevention or remediation by the operator of said condition or operating circumstance (e.g. the necessity to orient the antenna vertically upward if orientation of the antenna is adjustable): a GPS antenna label can be found on the top of the EUT, indicating that the area must have *clear view to sky:*  Additionally the napkin provides the following information: • **In order to transmit a distress alert - Ensure the SARLink SOS-300 antenna is facing upright and has an unobstructed view to the sky.** Additionally another label on the back of the EUT indicates that the device does not float:  f) The phone number(s) to be used to report inadvertent activation negating the need for the distress alert: None identified.: a phone number for the US is provided on the napkin (and details for other Countries): • **In the U.S., call 1-800-851-3051 to report an inadvertent activation. Outside the U.S., contact your national authority.**

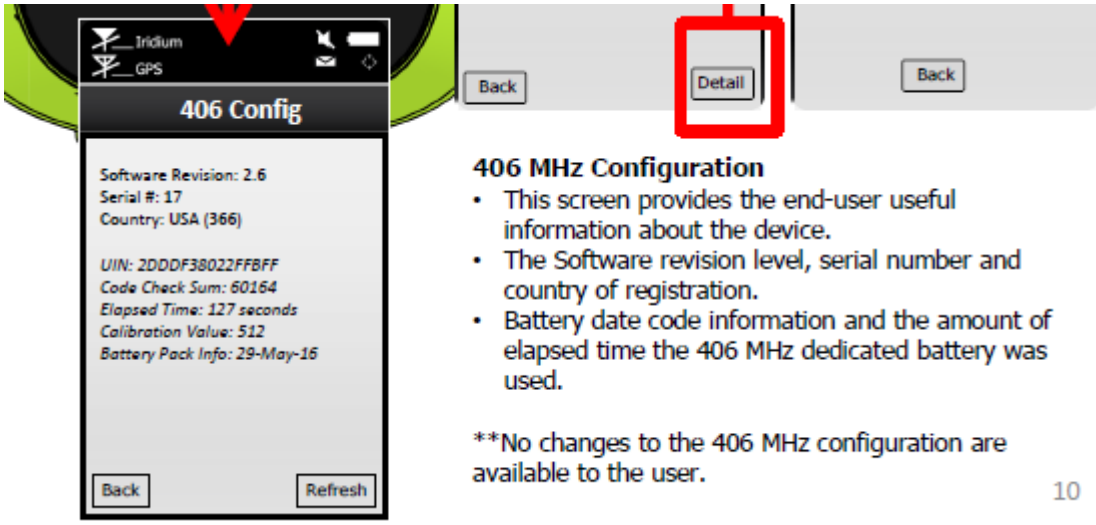
4.5.2.2.3	For Category 2 PLBs The outside of the PLB shall be marked indelibly and legibly with a warning label that states “WILL NOT FLOAT.”	A label on the back of the EUT includes the wording “Will Not Float” notice (see above).
4.5.2.2.4	Integral GNSS Receiver	
4.5.2.2.4	a) The location of the GNSS antenna shall be marked on the exterior of the PLB in a manner and location that shall be clearly viewable to the operator activating the beacon together with concise, unambiguous instructions to orient the GNSS antenna towards the sky and a warning not to obstruct the antenna. b) A positive visual and/or audible indication that the GNSS receiver has acquired a location. c) Instructions on or permanently attached to the PLB shall guide the operator towards maximizing self-locating performance. If permanently attached, the placard including the instructions(s) shall be conspicuously marked adjacent to the attachment point: “DO NOT REMOVE”	A GPS label can be found on the top of the EUT, indicating that the area must have *clear view to sky:*  There is no specific warning not to obstruct the area, however the napkin notes: • **In order to transmit a distress alert - Ensure the SARLink SOS-300 antenna is facing upright and has an unobstructed view to the sky.** No further information is provided on the EUT labelling relating to the GPS receiver, however the user manual identifies the following screen information relating to the GPS antenna:  Denotes the GPS receiver is off. The GPS receiver is always kept off to preserve battery life until time, date or position information is needed.  Denotes the GPS receiver is on with real-time satellite acquisition status represented by the number of vertical bars. One bar represents valid time and date fix, two bars represent dead reckoning, three bars represent 2-D fix, and four bars represent 3-D fix. Although the SARLink SOS-300 GPS receiver can often obtain a location fix when the antenna is partially blocked (near buildings, in a room next to a window, etc.), it is recommended that the antenna must have a clear view of the sky to minimize acquisition time and better position accuracy.

A.20.7 Documentation		
	The manufacturer shall supply a copy of the operation manual and this shall be inspected to ensure that it complies with the requirements of paragraph 4.5.3. The manufacturer shall supply a copy of the end user (consumer) packaging (or the labelling for the packaging) and this shall be inspected to ensure that it complies with the requirements of paragraph 4.5.4.	The following documents / labels were briefly reviewed with respect to clause A.20.7 (note: the inspection was provided to confirm the presence of the required information. The accuracy of the instructions was not checked): A1-20-1661B Rev B: Label, battery replacement date A1-20-1843BDASH Rev B: Battery expiration label, SARLink A1-20-1844BDASH Rev B:Activation label, SARLink SOS-300 A1-20-1845A Rev A: GPS label, SARLink SOS-300 A1-20-1847B Rev B: Label, HEXID, SARLink SOS-300 A1-20-1926T1 Rev T1: Registration label, SARLink Y3_03_0304_B_SARLink_SOS300_User Manual Rev B: User Manual A1-20-1928A Rev A: Label SARLink cloth A3-06-2976A Rev A: SARLink Pouch A1-20-1036HFORM 406 Registration and A1-20-1367A Registration Reminder Subsequent versions of the above document(s) were supplied and where these fulfilled a further requirement a note has been made: Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual (supplied 17/07/17) See details below.

4.5.3	Documentation	
4.5.3	The manufacturer shall provide an operation manual which includes the following: a) Complete instructions for operating the PLB. b) Cautions and recommendations to prevent false alerts. c) A warning paragraph with, at a minimum, the information in 4.5.2.2 and the fact that misuse of a PLB is subject to a fine.	The User Manual was briefly inspected as per clause 4.5.3 and the following was noted with respect to the applicable sub clauses (note: the inspection was provided to confirm the presence of the required information. The accuracy of the instructions was not checked): a) A brief pictograph and further detailed 'Emergency Activation' operating instructions. b) Cautions or recommendations to prevent false alerts are provided (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual). c) The following conditions of 4.5.2.2 (and the following sub clauses) where met in the User Manual (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual (supplied 17/07/17): Operating instructions Warnings (see below) Registration information Identification of the Manufacturer Device model name and name under which it was tested Operating temperature range in degrees Celsius and Fahrenheit Dangerous goods transportation information (no applicable date) Antenna optimization information (clear view to sky, not to hold the device via the antenna, positioning of the device etc) Phone number to report inadvertent activation (toll / toll free status unclear). Please refer to section 1.6. The warning: Not designed to float Location of the GPS antenna, screen information advising of GPS status (off / real time satellite acquisition, etc) The user manual also includes a warning to only use in situations of grave and imminent danger, and that deliberate misuse may incur a severe penalty (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual). There is a note in the user manual, warning the public not to move if found (as per sub para 4.5.2.2.1 c). Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual (supplied 17/07/17)  An additionally supplied napkin warns the user that :  Additionally, the napkin provides information relating to inadvertent activation.

4.5.3	d) General battery information (e.g., battery replacement instructions, battery type, safety information regarding battery use and disposal).	d) Basic battery information (for the 406 MHz feature) is provided: **406 FEATURES** Battery — Dedicated Lithium Battery for Distress Alerting Battery Replacement — 7 years Power Output — 5W Frequencies — 406.040 MHz 406 Emergency Activation — Manual Activation – Slide SOS cover left, Press SOS button Testing — Self-Test ⚠ **WARNING: Battery contains lithium** To avoid possible fire, explosion, leakage or burn hazard, do not open, recharge, disassemble or heat beacon above +70ºC (+158ºF) or incinerate. If this beacon is kept above room temperature for prolonged periods of time, the Battery Capacity will be degraded. This will need the battery to be replaced at a date earlier than stated on the beacon or the quoted operating life of the beacon (24 hours) may be reduced. The effect is more pronounced as temperature increases. In tropical regions this could reduce the battery life by a year. In hot desert regions, this could be two years. Note: Storage in lower temperatures (below ambient) does not extend battery life longer that the replacement date on the unit. 21

4.5.3	d) General battery information (e.g., battery replacement instructions, battery type, safety information regarding battery use and disposal). e) Instructions for the safe transportation or shipping of the PLB or the location where such information can be obtained on the Internet or by mail by the consumer.	Further warnings and information relating to the battery are provided (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual): **CAUTION:** Contains lithium batteries. Do not incinerate, puncture, deform, short-circuit or recharge (the 406 MHz battery may not be recharged but the Iridium battery can be recharged). **Disposal:** Remove the battery or batteries. Dispose of the used battery or batteries in accordance with local waste disposal regulations. CAUTION: Contains lithium batteries (batteries meet the UN Classification for non-dangerous goods – Class 2 non-hazmat lithium batteries). Prior to shipping beacon for service, alert your carrier about the batteries contained in this equipment to make sure they properly label your package. Call ACR's Technical Service department at +1 (954) 981-3333 for proper shipping instructions or visit the ACR website in the Support section entitled "Hazmat, MSDS Sheets, & Info". Do not incinerate, puncture, deform, or short-circuit. Do not recharge 406 MHz battery. Dispose of the used SARLink SOS-300 with the batteries removed in accordance with local waste disposal regulations. If this beacon is kept above room temperature for prolonged periods of time, the Battery Capacity will be degraded. This will need the 406 MHz battery to be replaced at a date earlier than stated on the beacon or the quoted operating life of the beacon (24 hours) may be reduced. The effect is more pronounced as temperature increases. In tropical regions this could reduce the battery life by a year. In hot desert regions, this could be two years. Note: Storage in lower temperatures (below ambient) does not extend battery life longer than the replacement date on the unit. 23 e) The following (in addition to above) information for the safe transportation or shipping of the EUT is provided (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual): **Air Travel:** Product contains small lithium metal batteries that comply with IATA SP 188-PI 970 Air Cargo. Always check with air carrier about concerns for any additional restrictions.

4.5.3	f) Information regarding the need to replace the battery after activation of the PLB and how to determine if the PLB has been activated or the battery needs to be replaced. g) Information related to the requirements of preventive maintenance.	f) There is a note indicating that the 406 MHz lithium battery should be replaced after activation. See below: ****The dedicated 406 MHz Lithium battery should be replaced after any 406 MHz Emergency Distress Activation, or on or before the 406 MHz Lithium battery expiry date.** It is also possible to see the Elapsed Time (on time) for the 406 MHz feature of the device, via the touch screen menu:  g) Instructions relating to preventative maintenance are provided in the *Beacon Maintenance* section (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual).

4.5.3	h) Minimum operating lifetime and operating and stowage temperature ranges.	h) The following specification details are provided (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual):

Product Specifications

FEATURES

Dimensions	8.12″ x 3.12″ x 1.5″ (20.62 x 7.92 x 3.81 cm)
Weight	12.52 oz (355 g)
Waterproof Rating	IP-67
Operating Temperature	-20°C to +55°C (-4°F to +131°F)
Storage Temperature	-30°C to +70°C (-22°F to +158°F)
Material	High Performance Engineered Polymer
Display	LCD Touch Screen
Display Dimensions	3 inch diagonal
GPS Receiver	U-BLOX MAX-7Q-0
Receiver Type	L1, C/A, 50-channel
Receiver Update Rate	Up to 4 Hz

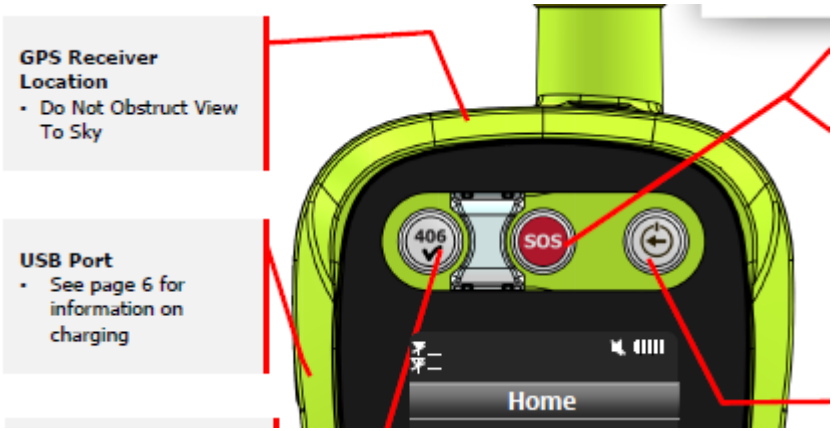
IRIDIUM FEATURES

Iridium Module	Iridium 9603
Battery Type	Rechargeable Lithium Ion
Rechargeable Cycles	500 times
Battery Voltage	3.7V
I/O Interface	Mini USB Adapter
GPS Tracking	Send and/or save waypoints
GPS Tracking Intervals	Between once per minute and once per day
SMS Texting	Canned or Custom Messages
SMS Communication	Two-Way (satellite to cell)
SOS Emergency Activation	1. Manual Activation – Slide SOS cover left, Press SOS button (406 MHz and Iridium Distress) 2. Manual Activation – Press Iridium SOS Icon – under Utilities menu (Iridium Distress Only)

406 FEATURES

Battery	Dedicated Lithium Battery for Distress Alerting
Battery Replacement	7 years
Battery Shelf Life	.25 years
Power Output	5W
Frequencies	406.040 MHz
Testing	Self-Test
406 Emergency Activation	Manual Activation – Slide SOS cover left, Press SOS button (406 MHz and Iridium Distress). 24 hours of operating lifetime.

4.5.3	i) Information explaining the requirement and procedure for licensing and registering PLBs, as appropriate, and encouragement to do so promptly. j) Instructions on actions to be taken in the case of false alerts, including toll and toll – free phone numbers for contacts and including instructions that in the case of accidental activation of the PLB, the user should de-activate the PLB and notify the appropriate search and rescue authorities at the earliest possible time. k) For Category 2 PLB, a warning that states “THIS PLB WILL NOT FLOAT" and, if applicable, the information that when used around water it must be installed in a provided auxiliary flotation device, its tested depth and time rating (e.g. waterproof to x meters for x minutes/hours) and that the PLB is not designed to float and transmit a distress signal and that the PLB may not be substituted for a required EPIRB on a vessel. l) For Category 1 PLB, information that the PLB is appropriate for use in or around water and, its tested depth and time rating (e.g. waterproof to x meters for x minutes/hours) and as appropriate, either: The PLB is buoyant (but is not designed to float in an upright position and transmit a distress signal) and that the PLB may not be substituted for a required EPIRB on a vessel. Or the PLB will float without support in an upright position and transmit a distress signal and that the PLB may not be substituted for a required EPIRB on a vessel.	i) A 406 MHz *Registration* section is provided, including further contact details (beacon registration website, NOAA mail address (including fax number), (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual). j) Instructions or actions to be taken in the case of false alert are provided. One contact phone number for the United States is provided (toll / toll free status unknown). (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual). Please refer to section 1.6. There is no note, in the case of inadvertent activation, to de activate the device (via reference to another section of the user manual). (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual (supplied 17/07/17). k) The User Manual notes the following (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual)*: **⚠ Warning: Not designed to float** **⚠ Warning: Not a substitute for a required EPIRB on a vessel** There are no further references to use around water or use with personal flotation devices, however a waterproof rating is provided. *Note: the instructions on the supplied napkin state that the device is *Category 2 – Will Not Float.* l) This sub clause is only applicable to Category 1 PLBs.

4.5.3	m) Information to guide the operator towards maximizing self-locating performance including a warning not to obstruct the GNSS antenna's view of the sky and to ensure the GNSS antenna is not submersed in water.	m) A brief note indicating the GPS Receiver Location is provided:  The following details are also provided:  Denotes the GPS receiver is off. The GPS receiver is always kept off to preserve battery life until time, date or position information is needed.  Denotes the GPS receiver is on with real-time satellite acquisition status represented by the number of vertical bars. One bar represents valid time and date fix, two bars represent dead reckoning, three bars represent 2-D fix, and four bars represent 3-D fix. Although the SARLink SOS-300 GPS receiver can often obtain a location fix when the antenna is partially blocked (near buildings, in a room next to a window, etc.), it is recommended that the antenna must have a clear view of the sky to minimize acquisition time and better position accuracy. No further GPS receiver / antenna information is provided relating to maximizing performance.

4.5.3	n) If the 121.5 MHz signal is transmitted during the Self-test, information noting that the Self test shall be performed only within the first 5 minutes of any hour. o) An overview and explanation of how the Cospas-Sarsat system operates. p) Beacon registration materials and information q) For PLBs with the capability to be connected to an external GNSS receiver the manufacturer shall provide instructions for connecting and setting up the external GNSS receiver in the equipment manual. This information shall include: 1) A list of all the GNSS receivers that have been tested with the PLB to ensure correct operation of the interface; 2) Details of the electrical and/or data connections to the PLB; 3) The specification of the interface (e.g. IEC 61162-1); 4) Details of the communications protocol to be used (e.g. Baud Rate, Data Bits, Parity Bits etc); 5) A list of the NMEA messages that the PLB can handle (e.g. GGA, GLL, RMC etc) and; 6) Instructions on the key settings and parameters of the GNSS Receiver (e.g. Map Datum (WGS84/GTRF), I/O Formats, Mode of Operation etc).	n) This sub clause is not applicable as the EUT does not include a 121.5 MHz homing transmitter. See DA-15-1395A1 for FCC Waiver relating to the 121.5 MHz homing transmitter, in Annex B. o) An overview and explanation of the how the Cospas Sarsat system works is provided in the *Anatomy Of A Rescue* section of the user manual. p) The user manual does not contain any beacon registration documents, however a link to the beacon registration website is provided. The Manufacturer supplied the following documents with respect to this clause: A1-20-1036HFORM 406 Registration and A1-20-1367A Registration Reminder. q) The EUT is not capable of being connected to an external GNSS receiver.

4.5.4	Packaging Labelling	
4.5.4	End user (consumer) packaging shall include the following information in a conspicuous location, readily readable and visible to the purchaser without opening the packaging: a) The Category of the PLB: If Category 2, the additional information that the PLB will not float and is not recommended for use on or in the water and that THIS PLB IS NOT AN ELT or an EPIRB and does not meet the regulatory requirements for an ELT or an EPIRB or if applicable, the additional information that the PLB will not float and is not recommended for use on or in the water unless it is fitted with the provided auxiliary flotation device, its tested depth and time rating (e.g. waterproof to x meters for x minutes/hours) and that THIS PLB IS NOT AN ELT or an EPIRB and does not meet the regulatory requirements for an ELT or an EPIRB. This PLB is buoyant when fitted with the provided auxiliary flotation device, but will not float in an upright position. Or, if applicable, the additional information that the PLB will not float and is not recommended for use on or in the water unless it is installed into the provided auxiliary flotation device, its tested depth and time rating (e.g. waterproof to x meters for x minutes/hours) and that THIS PLB IS NOT AN ELT or an EPIRB and does not meet the regulatory requirements for an ELT or an EPIRB. This PLB will float in an upright position when installed into the provided auxiliary flotation device and transmit a distress signal once manually activated.	The following documents were briefly reviewed with respect to clause 4.5.4 (note: the inspection was provided to confirm the presence of the required information. The accuracy of the instructions was not checked): A1-26-0680A Rev A: Display Sleeve, SARLink SOS-300 The packaging states that the device: *meets all regulatory requirements of a SEND Device: 406 MHz: GPS Location Beacons incorporate all PLB functionality except THIS DEVICE DOES NOT INCLUDE A 121.5 MHz HOMER, Category 2 SEND – Will not float…* It should be noted that the regulatory testing details in the present document **does not** include any regulatory testing / test data relating to any SEND device specifications. The following items were included with respect to each sub clause: a) The device is a category 2 PLB; however the conditions of the FCC Waiver indicate that the device cannot be called a PLB (refer to section 1.6 of the present document). The packaging identifies the device as a Category 2 SEND (no reference to a Category 2 PLB). It is noted on the display sleeve packaging that the device will not float and that it is not recommended for use on or in the water (this note is with respect to a SEND device). There is no information relating to use with a floatation device or any note of waterproof rating (note: the user manual does note a waterproof rating of IP-67). (Y1_03_0332_A_SARLink_SOS300_User Manual Rev A: User Manual). It is also noted on the display sleeve packaging that the device is not an ELT, EPIRB or PLB and does not meet the regulatory requirements of an ELT, EPIRB or PLB.

4.5.4	b) The temperature operating range in degrees Celsius and Fahrenheit of the PLB. c) The expiration date of the battery. d) The Country that is coded into the 15 Hex ID e) If the Country Code or unique national characteristics cannot be readily changed in the field at nominal cost to another Country Code due to the configuration of the PLB, a warning to that effect.	b) The operating temperature range is noted in Celsius and Fahrenheit (this note is with respect to a SEND device): the conditions of the FCC waiver are such that the device should not be called a PLB (refer to section 1.6 of the present document). c) A field is available for the expiry date of the battery. d) The Manufacturer presented document A1-20-1847 indicating the field for the Country code. Fields for the HEX ID and serial number are provided. e) A note that the Country code cannot be reprogrammed in the field is provided.

A.20.8 Altitude		
	With the PLB test specimen coded using the test user protocol, activation switch in the OFF mode and under normal test conditions, place the test specimen in the altitude test chamber and reduce the chamber pressure to an altitude equivalent of 25,000 feet (7,620 meters), ± 5%. The rate of pressure change should not exceed 1.5 inches of Hg per minute (5 kPa/min). Hold the chamber at this pressure for a minimum of two hours. Increase pressure in the test chamber at a rate not to exceed 1.5 inches of Hg per minute (5 kPa/min) until the chamber pressure is equal to the ambient pressure. Carry out a self-test and verify that the self-test passes. The test specimen passes if it does not activate during the pressure changes and hold time at altitude and the self -test response is correct on completion of the test.	See section 2.9 of this report.
Annex G	Internal Navigation Device	See section 2.19 of this report.

2.19 ANNEX G INTERNAL NAVIGATION DEVICE TEST (LAND AND MARITIME SCENARIOS)

2.19.1 Specification Reference

RTCM 11010.2, Annex G

2.19.2 Equipment Under Test and Modification State

SOS-300 S/N: #1761 (75934030-TSR0005) – Modification State 0

2.19.3 Date of Test

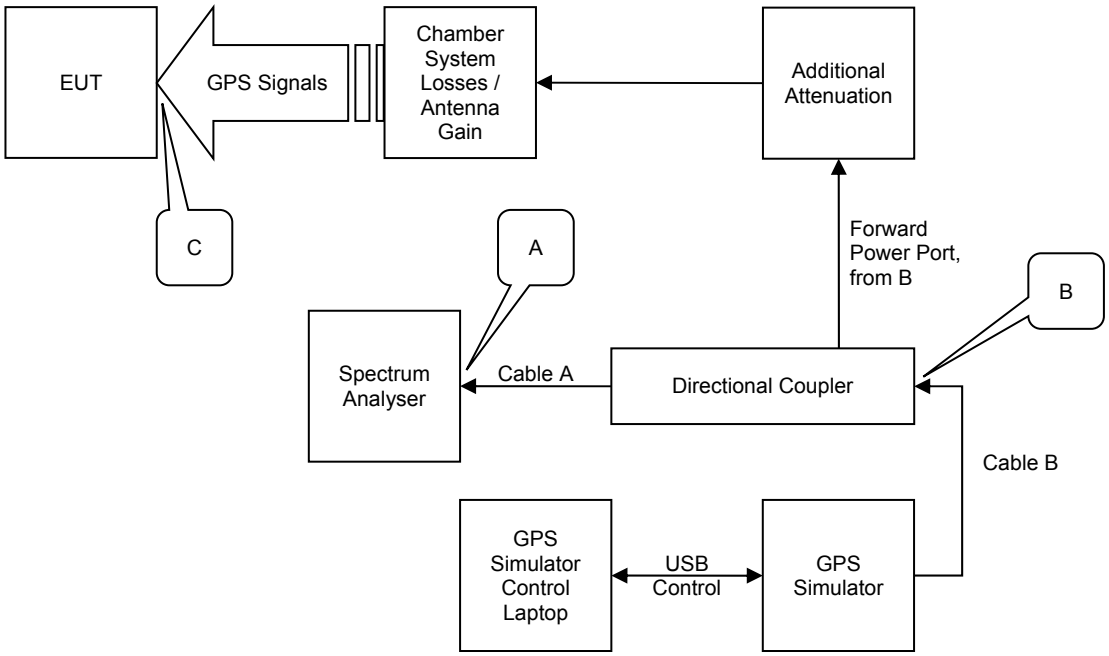
24 March 2017 and 25 March 2017

2.19.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.19.5 Test Method

Field Calibration



Field Calibration Schematic

The basic premise of the Field Calibration procedure is that Received Signal Strength (P_{RSS}) at C equals P_{RSS} at B minus the loss from B to C (calibrated), where the P_{RSS} at B equals the power measured at A plus the loss B to A.

Resultant P_{RSS} at C is recorded for each scenario at the test results section, below.

2.19.6 Environmental Conditions

Ambient Temperature 23.3 – 23.5 °C
Relative Humidity 28.5 - 36.2 %

2.19.7 Test Results

Result Summary

Pass / Fail Analysis (Table G.8):

	Pass / Fail
Land TTFF Success Rate ≥ 70%	Pass
Land Location Accuracy Pass Rate ≥ 70%	Pass
Maritime TTFF Success Rate ≥ 70%	Pass
Maritime Location Accuracy Pass Rate ≥ 70%	Pass
All four results must be a “Pass” for the EUT to pass, any one or more “Fails” indicates failure	

Land Scenarios

Scenario P_{RSS} Summary Table:

Scenario #	Number of SVs	Required RSS [dBm]	Actual RSS [dBm]
1	3	-123	-123.80
2	3	-130	-130.45
3	3	-137	-137.65
4	3	-123	-123.29
5	3	-130	-130.05
7	3	-123	-123.31
8	3	-130	-130.60
13	4	-123	-123.68
14	4	-130	-130.11
15	4	-137	-137.90
16	4	-123	-123.46
17	4	-130	-130.25
19	4	-123	-123.89
20	4	-130	-130.25
25	5	-123	-123.32
26	5	-130	-130.87
27	5	-137	-137.27
28	5	-123	-123.94
29	5	-130	-130.22
31	5	-123	-123.05
32	5	-130	-130.32
34	6	-123	-123.30
35	6	-130	-130.52
36	6	-137	-137.53
37	4	-130	-130.84
38	4	-130	-130.87
39	4	-130	-130.85
40	4	-130	-130.92
41	4	-130	N/T
42	4	-130	-130.93

Land Scenarios Test Results (G.4):

Scenario #	TTFF (min : sec)	Simulator Location	Transmitted Location	Location Error (m)
1	05:50	39° 36' N, 119° 35' W	N 39° 35' 28" W 119° 35' 32"	1037.49
2	05:51	39° 36' N, 119° 35' W	N 39° 35' 28" W 119° 35' 32"	1037.49
3	05:49	39° 36' N, 119° 35' W	N 39° 35' 28" W 119° 35' 32"	1037.49
4	06:43	39° 36' N, 119° 35' W	N 39° 35' 28" W 119° 35' 4"	987.48
5	06:47	39° 36' N, 119° 35' W	N 39° 35' 32" W 119° 35' 4"	864.26
7	Fail	39° 36' N, 119° 35' W	N/A	N/A
8	Fail	39° 36' N, 119° 35' W	N/A	N/A
13	00:51	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
14	00:49	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
15	05:48	39° 36' N, 119° 35' W	N 39° 36' 12" W 119° 35' 12"	389.06
16	00:48	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
17	01:40	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
19	00:51	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
20	06:38	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
25	00:50	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
26	01:41	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
27	05:01	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
28	00:48	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
29	01:49	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
31	03:01	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
32	03:00	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
34	00:48	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
35	01:42	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
36	04:58	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
37	00:52	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	0.00
38	11:40	23° 42.01668' S 133° 53.83336' E	S 23° 42' 0" E 133° 52' 52"	249.23
39	00:52	71° 37.56666' N 128° 52.06668' E	N 71° 37' 36" E 128° 52' 4"	61.68
40	00:49	71° 37.56666' N 128° 52.06668' E	S 23° 42' 0" E 133° 52' 52"	10590795.87
41	N/T	71° 37.56666' N 128° 52.06668' E	N/T	N/T
42	01:42	39° 36' N, 119° 35' W	N 39° 36' 0" W 119° 35' 0"	1764869.14

Land Scenarios Results Analysis (Table G.6):

Criteria	Limit / Condition	Result
No. of Successful Tests	TTFF ≤ 13 minutes	27
Total No. of Land Scenarios	30	N/A
TTFF Percentage Success Rate	(No. Successful Tests / 30) × 100	90.0
TTFF Pass / Fail Limit	≥ 70%	N/A
No of Locations with Errors	≤ 650 m	20
No of Scenarios with Locations	Enter result	24
Location Accuracy Percentage Pass Rate	(No Locations Errors ≤ 30 m / No Scenarios with Location) × 100	83.3 %
Location Accuracy Pass / Fail Limit	≥ 70%	N/A

Maritime Scenarios

General Note: The standard contains some contradictions, specifically regarding simulated positions. Testing was carried out in accordance with the Maritime Scenario Tables (G.11) because they are most accurate when compared to the official scenarios downloaded from the Spirent website. Where changes were made to the result templates, original values are stricken out.

Scenario P_{RSS} Summary Table:

Scenario #	Number of SVs	Required RSS [dBm]	Actual RSS [dBm]
1	7	-130	-130.80
2	7	-130	-130.75
6	7	-130	-130.61
7	7	-130	-130.60
8	7	-130	-130.56
9	7	-130	-130.72
12	6	-130	-130.21
13	6	-130	-130.57
14	6	-130	-130.63
16	6	-130	-130.75
17	6	-130	-130.65
18	6	-130	-130.60
20	7	-130	-130.23
22	7	-130	-130.88
24	7	-130	-130.40
26	7	-130	-130.24
28	7	-130	-130.37
30	7	-130	-130.84
32	7	-130	-130.69
33	7	-135	-135.25
34	7	-135	-135.63
35	7	-135	-135.76
36	7	-135	-135.70
37	7	-130	-130.70
38	7	-130	-130.75
39	7	-130	-130.14

Maritime Scenarios Test Results G.5):

Scenario #	TTFF (min : sec)	Simulator Location	Transmitted Location	Location Error (m)
1	00:51	0° 0’ N, 0° 0’ E	N 0° 0' 0" W 0° 0' 0"	0.00
2	00:50	0° 0’ N, 0° 0’ E	S 0° 0' 0" E 0° 0' 0"	0.00
6	00:50	0° 0’ N, 0° 0’ E	N 80° 0' 0" W 0° 0' 0"	0.00
7	00:51	0° 0’ N, 0° 0’ E	S 0° 0' 0" E 0° 0' 0"	0.00
8	00:52	0° 0’ N, 0° 0’ E	N 0° 0' 0" W 0° 0' 0"	0.00
9	00:49	0° 0’ N, 0° 0’ E	N 0° 0' 0" W 0° 0' 0"	0.00
12	00:50	80° 0’ N, 0° 0’ E	N 80° 0' 0" W 0° 0' 0"	0.00
13	00:51	80° 0’ N, 0° 0’ E	N 80° 0' 0" E 0° 0' 0"	0.00
14	01:41	80° 0’ N, 0° 0’ E	N 80° 0' 0" E 0° 0' 0"	0.00
16	00:50	80° 0’ N, 0° 0’ E	N 80° 0' 0" W 0° 0' 0"	0.00
17	00:41	80° 0’ N, 0° 0’ E	N 80° 0' 0" E 0° 0' 0"	0.00
18	00:51	80° 0’ N, 0° 0’ E	N 80° 0' 0" W 0° 0' 0"	0.00
20	00:50	0° 0’ N, 0° 0’ E	N 0° 0' 0" W 0° 0' 0"	0.00
22	01:40	0° 0’ N, 0° 0’ E	S 0° 0' 0" W 0° 0' 0"	0.00
24	00:50	0° 0’ N, 0° 0’ E	S 0° 0' 0" E 0° 0' 0"	0.00
26	00:51	0° 0’ N, 0° 0’ E	N 0° 0' 0" W 0° 0' 0"	0.00
28	00:50	0° 0’ N, 0° 0’ E	S 0° 0' 0" W 0° 0' 0"	0.00
30	01:42	0° 0’ N, 0° 0’ E	S 0° 0' 0" E 0° 0' 0"	0.00
32	01:40	0° 0’ N, 0° 0’ E	S 0° 0' 0" W 0° 0' 0"	0.00
33	00:50	0° 0’ N, 0° 0’ E	S 0° 0' 0" E 0° 0' 0"	0.00
34	01:42	0° 0’ N, 0° 0’ E	N 0° 0' 0" E 0° 0' 0"	0.00
35	01:44	0° 0’ N, 0° 0’ E	N 0° 0' 0" E 0° 0' 0"	0.00
36	01:40	0° 0’ N, 0° 0’ E	S 0° 0' 0" E 0° 0' 0"	0.00
37	00:48	44° 0’ S, 175° 0’ E	S 44° 3' 0" E 174° 9' 0"	0.00
38	00:49	47° 0’ N, 8° 0’ E	N 47° 21' 0" W 8° 27' 0"	0.00
39	00:52	0° 0’ N, 0° 0’ E	S 0° 0' 0" W 0° 0' 0"	0.00

Maritime Scenarios Results Analysis (G.7):

Criteria	Limit / Condition	Result
No. of Successful Tests	TTFF ≤ 13 minutes	26
Total No. of Maritime Scenarios	26	N/A
TTFF Percentage Success Rate	(No. Successful Tests / 26) × 100	100
TTFF Pass / Fail Limit	≥ 70%	N/A
No of Locations with Errors	≤ 650 m	26
No of Scenarios with Locations	Enter result	26
Location Accuracy Percentage Pass Rate	(No Locations Errors ≤ 30 m / No Scenarios with Location) × 100	100
Location Accuracy Pass / Fail Limit	≥ 70%	N/A

SECTION 3

TEST EQUIPMENT

3.1 TEST EQUIPMENT

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 Beacons - Initial Aliveness Test					
Power Meter	Hewlett Packard	436A	47	12	14-Jul-2016
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Beacon RF Unit	TUV SUD Product Service	N/A	97	-	TU
RF Shielded Enclosure	Rittal	AE1380	162	-	TU
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	13-Apr-2017
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	14-Aug-2016
Hygromer	Rotronic	I-1000	2829	12	4-Nov-2016
Termination (50ohm, 6W)	Micronde	R404613	3074	12	6-Apr-2017
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	10-Jun-2017
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3162	12	24-Nov-2016
Bandpass filter	Trilithic	5BE406/35-1-AA	3206	12	14-Sep-2016
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2017
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	15-Sep-2017
Rubidium Frequency Standard	Symmetricom	8040C	3490	12	22-Apr-2017
Time Interval Analyser	Yokogawa	TA720	4550	12	7-Mar-2017
Oscilloscope	Yokogawa	DL750	4552	12	6-Apr-2017
Bandpass Filter (1MHz)	KR Electronics	3219-SMA	4601	12	10-Jul-2016
2 metre N-Type Cable	Florida Labs	NMS-235SP-78.8-NMS	4622	12	12-Aug-2016

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.2 Climatic – Dry Heat					
Power Meter	Hewlett Packard	436A	47	12	14-Jul-2016
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	18-Feb-2017
Signal Generator	Hewlett Packard	8644A	96	12	27-Apr-2017
RF Shielded Enclosure	Rittal	AE1380	162	-	TU
3dB/10W Attenuator	Texscan	HFP-50N	475	12	4-Apr-2017
Signal Generator	Hewlett Packard	8663A	765	12	9-Nov-2016
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	14-Aug-2016
Climatic Chamber	Climatec	Climatec 1	2124	12	25-Nov-2016
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	29-Jan-2017
Climatic Chamber	Climatec	CLIMATEC 3	2846	12	1-Jul-2017
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3098	12	29-Mar-2017
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	10-Jun-2017
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	12	17-Sep-2016
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	12-Nov-2016
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2016
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2017
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	15-Sep-2017
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	9-Dec-2016
Rubidium Frequency Standard	Symmetricom	8040C	3490	12	22-Apr-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
Bandpass Filter (1MHz)	KR Electronics	3219-SMA	4602	12	12-Jul-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	8-Oct-2016

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 Climatic – Damp Heat					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	18-Feb-2017
RF Shielded Enclosure	Rittal	AE1380	162	-	TU
Termination (50ohm)	Diamond Antenna	DL-30N	391	12	16-Feb-2017
Climatic Chamber	Climatec	Climatec 1	2124	12	11-Nov-2017
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Beacon Tester	WS Technologies	BT100S	3263	-	TU
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	15-Sep-2017
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	9-Dec-2016
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
Section 2.4 Climatic - Low Temperature (Functional)					
Power Meter	Hewlett Packard	436A	47	12	14-Jul-2017
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	18-Feb-2017
Signal Generator	Hewlett Packard	8644A	96	12	27-Apr-2017
3dB/10W Attenuator	Texscan	HFP-50N	475	12	4-Apr-2017
Climatic Chamber	Climatec	Climatec 1	2124	12	11-Nov-2017
Temperature Chamber	Instron	906	2128	12	17-Oct-2016
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	10-Jun-2017
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	12	17-Sep-2016
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	12-Nov-2016
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2016
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2017
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	7-Sep-2016
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	9-Dec-2016
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	19-Aug-2016
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
Bandpass Filter (1MHz)	KR Electronics	3219-SMA	4602	12	12-Jul-2017

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 Vibration					
Vibration Table	MTS	840	2287	6	11-Sep-2016
Isotron Accelerometer	Endevco	256-10	3393	12	7-Jul-2017
Charge Amplifier	Endevco	133	3478	12	12-Apr-2017
Accelerometer	PCB Piezotronic	352C03	4329	0	27-Dec-2016
Antenna (Double Ridge Guide,1GHz-18GHz)	EMCO	3115	35	12	27-Nov-2016
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	18-Feb-2017
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	-	2-Dec-2017
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
LDS 984	Ling	984LS/DPAK130	2513	6	16-Sep-2016
Vibration System	Ling Dynamic Systems	LDS V964	2515	6	3-Jul-2017
Antenna (DRG Horn)	ETS-Lindgren	3115	3125	12	25-Jul-2017
Charge Amplifier	Endevco	133	3188	12	29-Nov-2017
Beacon Tester	WS Technologies	BT100S	3263	-	TU
ESA-E Series Spectrum Analyser	Agilent Technologies	E4402B	3348	12	7-Sep-2016
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	6-May-2017
Isotron Accelerometer	Endevco	256-10	3376	6	16-Dec-2016
Accelerometer	Endevco	256-10	3433	6	15-Aug-2017
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	19-Aug-2016
Vibration Controller (8 Ch)	m + p International	VibPilot 8	3777	12	24-Jun-2017
Vibration Controller (8 Ch)	m + p International	VibPilot 8	3778	12	9-Sep-2017
Vibration Controller (8 Ch)	m + p International	VibPilot 8	3780	12	8-Sep-2017
Isotron Accelerometer	Endevco	256-10	3789	6	13-Jan-2017
Isotron Accelerometer	Endevco	256-10	3803	6	12-Jan-2017
Accelerometer	Meggitt Endevco	256-10	4274	6	17-Dec-2016
Accelerometer	PCB Piezotronic	352C03	4330	6	4-Jul-2017
Accelerometer	PCB Piezotronic	352C03	4336	6	17-Jul-2017
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	2-Mar-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
Beacon Tester	WS Technologies	BT100S	4790	24	22-Sep-2018

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 Bump					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	-	2-Dec-2017
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
Charge Amp	Endevco	133	2500	12	26-Nov-2016
Antenna (DRG Horn)	ETS-Lindgren	3115	3125	12	25-Jul-2017
Vibration System	Ling Dynamic Systems	875	3170	6	23-Nov-2016
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	6-May-2017
Vibration Controller	m + p International	Vibpilot 8	3771	12	14-Jun-2017
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	2-Mar-2017
Isotron Accelerometer	PCB Piezotronic	M353B18	4563	12	11-Jan-2017
Thermal Isotron Accelerometer	PCB Piezotronic	M353B18	4568	6	1-Jul-2017
Isotron Accelerometer	PCB Piezotronic	M353B18	4582	12	14-Jul-2017
Isotron Accelerometer	PCB Piezotronic	M353B18	4591	12	11-Jan-2017
Beacon Tester	WS Technologies	BT100S	4790	24	22-Sep-2018
Section 2.7 - Drop / Topple					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	-	2-Dec-2017
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
Montford F43	Montford	4FT CUBED	2126	12	25-Nov-2017
Lansmont	Lansmont	PDT 56E	2291	-	TU
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3354	12	6-May-2017
Tape Measure	Stanley	Powerlock 33-443	4305	-	TU
Beacon Tester	WS Technologies	BT100S	4790	24	22-Sep-2018
Montford F43	Montford	4FT CUBED	2126	12	25-Nov-2017
Lansmont	Lansmont	PDT 56E	2291	-	TU
Hardwood Block	Unknown	ELM	2650	-	TU
5m Tape Measure	Stanley	Fatmax 5m	4024	-	TU
10 meter Tape Measure	Stanley	Fatmax 10m/33'	4072	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.8 Climatic - Thermal Shock					
Montford F43	Montford	4FT CUBED	2126	12	25-Nov-2017
Thermometer	Digitron	T208	2340	12	7-Nov-2017
Thermocouple Data Logger	Pico Technology Ltd	USB TC-08	3912	12	13-Dec-2017
Bench Scales	Kern-Sohn	CKE16K0.05	4647	12	14-Mar-2018
Climatic Chamber	Aralab	Aralab 1, 1000 ECP75	4718	12	OP MON
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	24-Jun-2017
Section 2.9 Climatic - Altitude					
Weiss Technik (T)	Weiss Technik	WEISS ALT	2133	12	10-Jan-2018
Section 2.10 Climatic - Immersion					
Montford F43	Montford	4FT CUBED	2126	12	25-Nov-2017
Thermometer	Digitron	T208	2340	12	7-Nov-2017
940 litre Tank	Unknown	940 litre	3574	-	TU
5m Tape Measure	Stanley	Fatmax 5m	4024	-	TU
Stop Watch	Radio Spares	Model 694 (974)	4026	0	19-Sep-2017
Bench Scales	Kern-Sohn	CKE16K0.05	4647	12	14-Mar-2018
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	24-Jun-2017
Section 2.11 Beacons - Spurious Emissions					
Climatic Chamber	Heraeus Votsch	VMT 04/30	40	-	O/P Mon
Digital Temperature Indicator + T/C	Fluke	51	412	12	2-Mar-2017
Hygromer	Rotronic	I-1000	2829	12	4-Nov-2016
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3160	12	10-Jun-2017
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	15-Sep-2017
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	2-Mar-2017
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	8-Oct-2016

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.12 Beacons – Operating Lifetime					
Power Meter	Hewlett Packard	436A	47	12	14-Jul-2016
3dB/10W Attenuator	Texscan	HFP-50N	475	12	4-Apr-2017
Signal Generator	Hewlett Packard	8663A	765	12	9-Nov-2016
Distress Beacon RF Unit	TUV SUD Product Service	-	2445	-	TU
Termination (50ohm, 15W)	Diamond Antenna	DL-30N	3098	12	29-Mar-2017
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	10-Jun-2017
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	12	17-Sep-2016
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	12-Nov-2016
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2016
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2017
Cable (2m, N Type)	Rhophase	NPS-1601-2000-NPS	3355	12	9-Dec-2016
Rubidium Frequency Standard	Symmetricom	8040C	3490	12	22-Apr-2017
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	16-Feb-2017
Bandpass Filter (1MHz)	KR Electronics	3219-SMA	4602	12	12-Jul-2017

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.13 Beacons - Constant Temperature Tests					
Power Meter	Hewlett Packard	436A	83	12	23-Sep-2017
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	27-Feb-2018
Beacon RF Unit	TUV SUD Product Service	N/A	97	-	TU
Termination (50ohm)	Meca	405-1	362	12	14-Feb-2018
Signal Generator (100kHz to 2.6GHz)	Hewlett Packard	8663A	1063	12	17-Apr-2018
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
Stop Clock	R.S Components	RS328 061	2674	12	4-Jul-2017
Hygromer	Rotronic	I-1000	2829	12	24-Nov-2017
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3159	12	OP MON
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3162	12	14-Dec-2017
Bandpass Filter	Trilithic	5BE406/35-1-AA	3207	12	19-Sep-2017
Time Interval Analyser	Yokogawa	TA720 704510	3253	12	15-Nov-2017
ScopeCorder	Yokogawa	DL750 701210	3254	12	10-Nov-2017
Power Sensor	Agilent Technologies	8482A	3290	12	18-Jan-2018
Cable (1m, N type)	Rhophase	NPS-1601-1000-NPS	3350	12	9-May-2018
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	2-Mar-2018
Section 2.13 Beacons - Navigation System					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Copper GRP	TUV SUD Product Service	27cm Diameter	3538	-	TU
Digital thermo Hygrometer	Radio Spares	1260	4300	12	23-Aug-2017
Section 2.13 Beacons - Satellite Qualitative Test					
Beacon Tester	WS Technologies	BT 100S	87	-	TU
Copper GRP	TUV SUD Product Service	27cm Diameter	3538	-	TU
Digital thermo Hygrometer	Radio Spares	1260	4300	12	23-Aug-2017
Section 2.15 - Oil Resistance					
Temperature Logger	Digitron	2098T	2479	12	26-Oct-2017
Thermocouple	TC Limited	Type-T	4739	12	24-Jul-2017
Beacon Tester	WS Technologies	BT100S	4790	24	22-Sep-2018

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.16 Climatic - Corrosion					
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
Chamber	Heraeus	HC 4033	2174	12	6-Jul-2017
Balance	Geniweigher	GM-11K	2334	12	21-Mar-2017
pH Meter	Jenway	3310	2335	-	TU
Data Logging Thermometer	Digitron	2098T	2348	12	22-Oct-2016
Measuring cylinder	Unknown	50mL	3136	-	TU
Beacon Tester	WS Technologies	BT100S	3263	-	TU
Receptacle (100mm dia Nominal)	Embee	100mm	3321	-	TU
Bench Scales	Kern-Sohn	CKE16K0.05	4647	12	21-Mar-2017
Hydrometer	Brannen	1.00-1.05 g/ml	4672	12	30-Oct-2016
Salt Spray Test Chamber	Ascott	S2000IS	4725	12	30-Mar-2017
Type T PFA Insulated Thermocouple	TC Limited	Type-T	4739	12	24-Jun-2017
Section 2.17 EMC - Compass Safe Distance					
Sussex Helmholtz Coil	Various	88771	327	-	TU
Amplifier (1MHz-1GHz)	Amp Research	10W1000	331	-	TU
Magnetometer	Bartington	MAG01	671	36	24-Feb-2018
Marine Binacle Compass with Repeater Display	Cassens & Plath	Compass: Type 11	3834	-	TU
Section 2.18 – Miscellaneous Tests					
Sharp Edge Tester	TES TEC GmbH	SET-50	2792	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.19 Beacons - GNSS - RTCM Scenarios					
Antenna (Double Ridge Guide)	EMCO	3115	34	12	2-Dec-2017
Attenuator (10dB, 10W)	Texscan	HFP-50N	468	12	28-Jun-2018
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	26-Aug-2017
Attenuator (10dB, 10W)	Trilithic	HFP-50N	1377	12	25-Oct-2017
Hygrometer	Rotronic	I-1000	2882	12	24-Nov-2017
GPS/SBAS Simulator	Spirent	STR4500	3056	0	30-Sep-2017
Attenuator (20dB, 10W)	Aeroflex / Weinschel	23-20-34	3158	12	11-Jul-2018
Beacon Tester	WS Technologies	BT100S	3263	-	TU
0.92 to 2.2 GHz Coupler	Narda	3042B	4472	12	8-Dec-2017
2 metre N-Type Cable	Florida Labs	NMS-235SP-78.8-NMS	4622	12	12-Oct-2017

There was no applicable test equipment for section(s): 2.14

Note: some tests took place over one or more days and consequently it may appear that some of the test equipment could have been outside of the valid calibration period at the time of testing. However, we confirm that all equipment held a valid and in-date calibration when used, and we hold this information on record.

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

SECTION 4

PHOTOGRAPHS

4.1 PHOTOGRAPHS OF EQUIPMENT UNDER TEST (EUT)

Front View


DEVICE DOES NOT
INCLUDE A
121.5 MHz HOMER
Primary
#1762
EMERGENCY ACTIVATION
CENTIMETRES

Back View

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

ANNEX A

LIMITED C/S TESTING (SUMMARY OF RESULTS)

TEST RESULTS TABLE

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-20°C)	(+21°C)	(+55°C)	
1. Power Output							**Result: Pass**
Model: SOS-300, S/N: #1763**, TUV Ref: TSR0002 and Modification State 0**							
Transmitter power output	(maximum)	35 - 39	dBm	N/T	37.72	N/T	
	(minimum)			N/T	37.68	N/T	
Power output rise time	(maximum)	< 5	ms	N/T	0.13	N/T	
	(minimum)			N/T	0.10	N/T	
Power output 1ms before burst	(maximum)	< -10	dBm	N/T	-37.10	N/T	
	(minimum)			N/T	-38.35	N/T	
2. Digital Message Coding							**Result: Pass**
Model: SOS-300, S/N: #1763**, TUV Ref: TSR0002 and Modification State 0**							
Bit Sync	1 - 15	15 bits “1”	P / F	N/T	P	N/T	
Frame sync	16 - 24	“000101111”	P / F	N/T	P	N/T	
Format flag	25	1 bit	bit value	N/T	1	N/T	
Protocol flag	26	1 bit	bit value	N/T	0	N/T	
Identification / position data	27 - 85	59 bits	P / F	N/T	P	N/T	
BCH code	86 -106	21 bits	P / F	N/T	P	N/T	
Emerg. Code/nat. use/supplem. Data	107 - 112	6 bits	bit value	N/T	110110	N/T	
Additional data / BCH (if applicable)	112 - 144	32 bits	P / F	N/T	P	N/T	
Position Error (if applicable)		< 5	km	N/T	N/A	N/T	

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
3. Digital Message Generator						**Result: Pass**
Model: SOS-300, S/N: #1763**, TUV Ref: TSR0002 and Modification State 0**						
Repetition rate, T_R:						
Average T_R	$48.5 \le T_{Ravg} \le 51.5$	seconds	N/T	49.795	N/T	
Minimum T_R	$47.5 \le T_{Rmin} \le 48.0$	seconds	N/T	47.736	N/T	
Maximum T_R	$52.0 \le T_{Rmax} \le 52.5$	seconds	N/T	52.338	N/T	
Standard deviation	0.5 - 2.0	seconds	N/T	1.41	N/T	
Bit rate						
Minimum fb	≥ 396	bits/sec	N/T	399.92	N/T	
Maximum fb	≤ 404	bits/sec	N/T	399.93	N/T	
Total transmission time						
Short message (maximum)	435.6 - 444.4	ms	N/T	N/T	N/T	
Short message (minimum)			N/T	N/T	N/T	
Long message (maximum)	514.8 - 525.2	ms	N/T	520.12	N/T	
Long message (minimum)			N/T	520.08	N/T	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	N/T	160.10	N/T	
Maximum T1	≤ 161.6	ms	N/T	160.15	N/T	
First burst delay	≥ 47.5	seconds	N/T	N/T	N/T	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin	Tamb	Tmax	
				(-20°C)	(+21°C)	(+55°C)	
4. Modulation							**Result: Pass**
Model: SOS-300, S/N: #1763**, TUV Ref: TSR0002 and Modification State 0**							
Biphase-L		P / F	P / F	N/T	P	N/T	
Rise time	(maximum)	50 - 250	µs	N/T	200.3	N/T	
	(minimum)	50 - 250	µs	N/T	180.3	N/T	
Fall time	(maximum)	50 - 250	µs	N/T	196.7	N/T	
	(minimum)	50 - 250	µs	N/T	180.6	N/T	
Phase deviation: positive	(maximum)	+(1.0 to 1.2)	radians	N/T	1.1458	N/T	
	(minimum)	+(1.0 to 1.2)	radians	N/T	1.0513	N/T	
Phase deviation: negative	(maximum)	-(1.0 to 1.2)	radians	N/T	-1.1474	N/T	
	(minimum)	-(1.0 to 1.2)	radians	N/T	-1.0528	N/T	
Symmetry measurement		≤ 0.05		N/T	0.0202	N/T	
5. 406 MHz Transmitted Frequency							**Result: Pass**
Model: SOS-300, S/N: #1763**, TUV Ref: TSR0002 and Modification State 0**							
Nominal Value	(maximum)	C/S T.001	MHz	N/T	406.0399454	N/T	
	(minimum)			N/T	406.0399454	N/T	
Short-term stability	(maximum)	≤ $2x10^{-9}$	/100ms	N/T	77.192E-12	N/T	
	(minimum)			N/T	63.069E-12	N/T	
Medium-term stability – Slope	(maximum)	(-1 to +1)$x10^{-9}$	/minutes	N/T	36.179E-12	N/T	
	(minimum)			N/T	19.388E-12	N/T	
Medium-term stability – Residual frequency variation	(maximum)	≤ $3x10^{-9}$		N/T	20.027E-11	N/T	
	(minimum)			N/T	18.176E-11	N/T	
6. Spurious Emissions into 50ohms							**Result: Pass**
Model: SOS-300, S/N: #15, TUV Ref: TSR0058 and Modification State 0							
In band (406.0 – 406.1 MHz)		C/S T.001 mask	P / F	N/T	P	N/T	See Section 2.11

Parameters to be Measured	Range of Specification	Units	Test Results				Comments
9. Thermal Shock							**Result: Pass**
Model: SOS-300, S/N: #1763, TUV Ref: TSR0002 and Modification State 0							
Soak Temperature	30°C difference	°C	+10				
Measurement Temperature		°C	-20				
Transmitted Frequency			Max		Min		
Nominal value	C/S T.001	MHz	406.0399860		406.0399841		
Short-term stability	≤ $2x10^{-9}$	/100ms	13.895E-11		71.053E-12		
Medium-term stability – Slope	(-2 to +2)$x10^{-9}$	/min	35.492E-11		-85.203E-12		
Medium-term stability – Residual frequency variation	≤ $3x10^{-9}$		97.712E-11		48.850E-11		
Transmitter power output	35 - 39	dBm	38.05		37.42		
Digital message	correct	P/F	P				
14. Satellite Qualitative Tests							**Result: Pass**
Model: SOS-300, S/N: IMEI: 300434060816170, TUV Ref: TSR0046 and Modification State 0							
Test Configuration	As per C/S T.007		Configuration				
			5	6	7	8	
15 Hex ID Decoded by LUT	correct	P / F	N/T	N/T	N/T	P	
Doppler Location results with error ≤ 5km	≥ 80	%	N/T	N/T	N/T	100	

ANNEX B

MANUFACTURER SUPPLIED INFORMATION

Clause 4.3.1.3.3 Internal navigation device performance – IEC 61108 1 Waiver

May 25, 2017

Subject: SOS-300, marketed as SARLink SOS-300 Waiver Information

To Whom It May Concern:

ACR Electronics, Inc. hereby declares that GNSS circuitry used in SOS-300 is also used in previously tested and certified RLB-42, reference TUV test report 75928177 Report 05 per IEC 61108-1.

Based on the above information, ACR Electronics, Inc. requests that the IEC 61108-1 Internal Navigation Device Performance test be waived.

Please feel free to contact me if additional information is required.

Signed on behalf of ACR Electronics, Inc.

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Battery Conditioning Information

Parameter	Unit	Value	Limit
Operating current at -20 °C	mA	32.6	
Rated life	h	24	
Required battery capacity	mAh	782.4	
Nominal battery capacity	mAh	1400	
Overhead	mAh	617.6	
Self-test Current	mA	102.68	
Self-test duration	s	10	
Self-tests per annum	-	12	
Self-test consumption per annum	mAh	3.42	
GNSS Self-test Current	mA	0	
GNSS Self-test duration	s	0	
GNSS Self-tests per annum	-	0	
GNSS Self-test consumption per annum	mAh	0.00	
Battery Self discharge	%	1	
Battery Self discharge per annum	mAh	14.00	
Standby current	A	4.32E-08	
Standby drain per annum	mAh	0.38	
Total drain per annum	mAh	17.80	
Useful Life	years	34.70	
Expiry Date	years	7	
Useful Life to Expiry Date ratio	-	4.96	≥ 2
Loss over Expiry Date	mAh	124.61	
Operating current (at Ambient)	mA	36.60	
Extension factor, F (at Ambient)	h	3.40	

Declarations

ACR SOS-300:
Verification of Compliance to Section 4.4.2 of
RTCM 11010.2 (PLB Standard)

This document provides evidence that ACR Electronics has verified that the SOS-300 complies with Section 4.4.2 a), b), c), d), e) and f) of the RTCM Standard 11010.2 for 406 MHz Satellite Personal Locator Beacons (PLBs) dated June 9, 2014.

In particular, the following items have been verified at the minimum, ambient, and maximum operating temperatures on production units awaiting final approval for shipment.

4.4.2 a) The PLB battery experiences full-load current drain during the Self-test:

The current was measured during the self-test and compared to the current during a live transmission; the currents were found to be identical.

4.4.2 b) Each self-test pass/fail indicator correctly identifies a fail condition when a failure in the monitored function has been induced:

Each Self-Test failure condition was tested to ensure that a failure in that test would produce a Self-Test fail indication: a red LED flashed at the end of the test. The tests are briefly summarized below:

1. 406 MHz RF power – Tested by placing a wrong component in the circuit thus inducing a power mismatch in the 406 RF circuit and by disconnecting the 406 RF power input into the micro.
2. PLL Lock Detect – Tested by disconnecting a component in the PLL lock detect circuit so the signal oscillated and never locked.
3. Non-Volatile Memory (NVM) – Tested by writing the wrong checksum for the 406 message data into NVM.
4. GPS Module – Tested by both disconnecting the GPS module without any NMEA message injected on the GPS data line into the micro and disconnecting the GPS module and injecting the wrong NMEA message header into the micro's GPS data line.

4.4.2 c) Any transmission in either self-test mode is limited to one burst:

Self-test or GNSS Self-Test runs only once and transmits only one 406 message. This was confirmed by running each test and picking up the Self-Test 406 transmission with the FPR-300 data logger and confirming that only one 406 transmission was detected; the unit power was also monitored and the unit turned off as expected after both Self-Tests.

4.4.2 d) GNSS Self-Test mode is not provided with this beacon.

4.4.2 e) GNSS Self-Test mode is not provided with this beacon.

4.4.2 f) GNSS Self-Test mode is not provided with this beacon.

A Brand Of Drew Marine
ACR Electronics, Inc.
5757 Ravenswood Road
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ACR RTCM 11010.2 A.20.6 declaration

July 6, 2017

Subject Print Labelling for SarLink SOS 300

Please be advised that labels used on the exterior of SarLink SOS 300 were passed testing for abrasion resistance, per RTCM 11010.2 (A.20.6), by ACR Electronics Inc. The same label printing process was widely used on numerous ACR products over many years without exhibiting degradation.

ACR Electronics Inc., hereby declares that the labels used on SarLink SOS 300 fully comply with the requirements of RTCM 11010.2, section A.20.6.

Thank you,

Dan Stankovic
Director of Certification and Test
ACR Electronics, Inc.

Photos


SOS-300 Photos
A1-20-1845A.PDF
TOP
A1-20-1926T1.pdf
A1-20-1847B.pdf
LEFT SIDE
FRONT
RIGHT SIDE
BACK
A1-20-1844BDASH.PDF
A1-20-1661B.PDF
A1-20-1843BDASH.PDF
BOTTOM

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
ACR Electronics, Inc.	)	WT Docket No. 15-85
	)	
Request for Waiver of Section 95.1402(b)	)	

ORDER

Adopted: December 8, 2015 **Released: December 8, 2015**

By the Deputy Chief, Mobility Division, Wireless Telecommunications Bureau:

1. *Introduction*. On March 5, 2015, ACR Electronics, Inc. (ACR), filed a request for waiver of Section 95.1402(b) of the Commission's Rules[1] to permit equipment authorization and use of its 2-Way Communicator Personal Locator Beacon (SARLink), an emergency alerting device that is intended to provide a means for individuals in remote areas to alert others of an emergency situation and to aid search and rescue (SAR) personnel to locate those in distress.[2] As discussed below, we grant the waiver request subject to the conditions set forth herein.

2. *Background*. The SARLink provides two-way text messaging and tracking capability through the Iridium satellite system, and distress alerting on the 406-406.1 MHz (406 MHz) COSPAS-SARSAT satellite system.[3] In its waiver request, ACR characterizes the device as a Personal Locator Beacon (PLB).[4] PLBs are emergency radiobeacons intended for use by individuals in remote areas, which transmit a distress signal on 406 MHz for communication with the COSPAS-SARSAT satellite system and a lower-powered signal on frequency 121.5 MHz that is used by SAR personnel as a homing beacon to help locate persons in distress. PLBs must conform to the Radio Technical Commission for Maritime Services (RTCM) standard that contains minimum requirements for PLBs' functional and technical performance.[5]

[1] 47 C.F.R. § 95.1402(b).

[2] Request for Waiver, filed March 5, 2015, by ACR Electronics, Inc. (Request).

[3] COSPAS-SARSAT is an international satellite-based SAR system established by Canada, France, Russia, and the United States. COSPAS is an acronym for a Russian phrase meaning space system for search and distress vessels; SARSAT stands for Search and Rescue Satellite Aided Tracking.

[4] *See* Request at 1.

[5] Section 95.1402 requires PLBs to meet the requirements in RTCM Recommended Standards for 406 MHz Satellite Personal Locator Beacons (PLBs), Version 1.1, RTCM Paper 76-2002/SC110-STD, dated June 19, 2002, but RTCM has revised the standard and the Commission has proposed to amend the rule to require PLBs to meet the requirements in RTCM Standard 11010.2 for 406 MHz Satellite Personal Locator Beacons, with Amendment 1 and Amendment 2, dated June 8, 2012 (RTCM 11010.2). *See* Amendment of the Commission's Rules Regarding Maritime Radio Equipment and Related Matters, *Notice of Proposed Rulemaking*, WT Docket No. 14-36, 29 FCC Rcd 2516, 2521 ¶ 13 (2014). ACR states that the SARLink complies with the RTCM 11010.2 standard.

3. ACR requests a waiver of Section 95.1402(b) because the SARLink does not include a 121.5 MHz beacon. ACR asserts that two-way text messaging capability will provide better distress alerting and locating assistance than a 121.5 MHz homing beacon because SARLink users will be able to text SAR personnel directly and provide location such as physical landmarks and obstacles, and provide important details regarding the emergency, such as the number of people involved and the number and nature of any injuries.[6] ACR argues that certification and use of the SARLink will save lives and reduce the cost of rescues, and is therefore in the public interest.[7]

4. The U.S. Coast Guard and the U.S. SARSAT Program (USCG/SARSAT) submitted joint comments expressing concerns about the waiver request.[8] They state that the lack of a 121.5 MHz homing signal is only mitigated by the text messaging and continuous tracking capability of the Iridium device, and therefore does not increase risk to the safety of the user, when users are highly trained and the distress text messages are routed to a command center with full-time staffing.[9] Consequently, USCG/SARSAT request that the SARLink be approved for use only by government (Federal, State, or local) agencies and high-risk commercial industry entities where potential users are certified and highly trained with an organized support activity or call center to manage and respond to distress calls.[10]

5. In response, ACR explained that the SARLink was developed in conjunction with Federal agencies and high-risk industry representatives to meet the requirements of the performance of their duties, in which case SARLink users would be highly trained and text messages would be routed to a center with full-time staffing.[11] The regular day-to-day use of the device consists of tracking and messaging via the Iridium satellite system, which are predicated on the use of an enterprise back-end platform that is managed through a command and control center.[12] The SARLink adds a 406 MHz COSPAS-SARSAT distress beacon to these functions for use in emergencies.[13]

6. ACR concurs with USCG/SARSAT that sale and use of the SARLink should be limited to government (Federal, State, or local) agencies and high-risk industry entities where potential users are properly trained and where there is an organized support activity or call center to manage and respond to calls, but requests that non-governmental organizations (NGOs) be included among the permitted users.[14] In addition, to ensure that users realize that the device lacks a 121.5 MHz homing beacon, ACR offers to label the device with, and include in the packaging and manual, a notice that the device does not include a

[6] *See* Request at 2-3.

[7] *Id* at 2.

[8] *See* Comments of the United States Coast Guard and the United States SARSAT Program, received August 18, 2015 (USCG/SARSAT Comments). The Wireless Telecommunications Bureau's Mobility Division sought comment on the ACR waiver request. *See* Wireless Telecommunication Bureau Seeks Comment on ACR Electronics, Inc. Request for Waiver to Permit Certification and Use of Personal Locator Beacon with Texting Capability in Lieu of 121.5 MHz Homing Signal, *Public Notice*, WT Docket No. 15-85, 30 FCC Rcd 2924 (WTB MD 2015). USCG/SARSAT filed the only comments. ACR filed reply comments. *See* ACR Electronics, Inc. Reply to Comments dated August 19, 2015 (ACR Reply Comments); and Reply to Comments dated October 16, 2015 (ACR Supplemental Reply Comments).

[9] *See* USCG/SARSAT Comments at 1-2.

[10] *Id.* at 3.

[11] *See* ACR Reply Comments at 1-2; ACR Supplemental Reply Comments at 2.

[12] *See* ACR Supplemental Reply Comments at 2.

[13] *Id.*

[14] *See* ACR Reply Comments at 2-3; ACR Supplemental Reply Comments at 2.

121.5 MHz homing beacon.[15] ACR also agrees not to market or otherwise offer the SARLink as a PLB,[16] and that it will not sell it via any retail outlets.[17]

7. *Discussion*. Section 1.925 of the Commission's Rules provides that we may grant a waiver if it is shown that (a) the underlying purpose of the rule(s) would not be served or would be frustrated by application to the instant case, and grant of the requested waiver would be in the public interest; or (b) in light of unique or unusual circumstances, application of the rule(s) would be inequitable, unduly burdensome, or contrary to the public interest, or the applicant has no reasonable alternative.[18] We conclude that ACR has met the first prong.

8. The 121.5 MHz homing beacon is intended to help locate persons in distress. While the SARLink does not include the homing beacon, the global communications capabilities of the Iridium transceiver in the SARLink will allow SAR personnel to receive location information, including physical landmarks and obstacles directly, from the user. In addition, the SARLink will be sold directly by ACR to government agencies and high-risk entities, and will not be sold to the general public via retail outlets. Finally, all users will be required to have a trained organized support activity or call center. We believe that these circumstances render the device a safe and reliable alternative to a PLB.

9. We therefore grant the requested waiver to permit use of the SARLink, subject to the following conditions:

- Eligibility is limited to government (Federal, State and local) agencies and high-risk commercial industry (including NGOs) where potential users are certified and trained, and with an organized support activity or call center to manage and respond to messages. Any offer for sale or lease of the SARLink will state these eligibility limits.

- The SARLink will be labeled with a notice that the device does not include a 121.5 MHz homing beacon. Such a notice also will be included in the packaging and manual.

- The SARLink will not be marketed or otherwise offered as a Personal Locator Beacon or PLB, and will not be sold via retail outlets.

10. ACR must obtain equipment authorization for the SARLink. A copy of this *Order* shall be submitted with the equipment authorization application.

11. *Conclusion*. We therefore grant the request of ACR Electronics, Inc. for waiver of Section 95.1402(b) to permit the equipment authorization and use of its SARLink device, subject to the conditions set forth above.

12. Accordingly, IT IS ORDERED, pursuant to Sections 4(i) and 303(i) of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 303(i), and Section 1.925 of the Commission's Rules, 47 C.F.R. § 1.925, that the waiver request filed by ACR Electronics, Inc. on March 5, 2015 IS GRANTED SUBJECT TO THE CONDITIONS set forth in paragraph 9.

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[15] *See* ACR Reply Comments at 2.

[16] *Id.*

[17] *See* ACR Supplemental Reply Comments at 2.

[18] 47 C.F.R. § 1.925(b)(3); *see also WAIT Radio v FCC*, 418 F.2d 1153, 1159 (D.C. Cir. 1969).

13. This action is taken under delegated authority pursuant to Sections 0.131 and 0.331 of the Commission's Rules, 47 C.F.R. §§ 0.131, 0.331.

FEDERAL COMMUNICATIONS COMMISSION

Scot Stone
Deputy Chief, Mobility Division
Wireless Telecommunications Bureau