



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: Tron SA20, S/N: 157, TUV Ref: TSR4 and Modification State 0						
Biphase-L	P / F	P / F	NT	P	NT	
Rise time (maximum)	50 - 250	NT	NT	139.4	NT	
Rise time (minimum)	50 - 250	NT	NT	130.9	NT	
Fall time (maximum)	50 - 250	NT	NT	136.4	NT	
Fall time (minimum)	50 - 250	NT	NT	128.8	NT	
Phase deviation: positive (maximum)	+(1.0 to 1.2)	NT	NT	1.133	NT	
Phase deviation: positive (minimum)	+(1.0 to 1.2)	NT	NT	1.050	NT	
Phase deviation: negative (maximum)	-(1.0 to 1.2)	NT	NT	-1.147	NT	
Phase deviation: negative (minimum)	-(1.0 to 1.2)	NT	NT	-1.056	NT	
Symmetry measurement	≤ 0.05		NT	0.02979	NT	
5. 406 MHz Transmitted Frequency						Result: Pass
Model: Tron SA20, S/N: 157, TUV Ref: TSR4 and Modification State 0						
Nominal Value (maximum)	C/S T.001	MHz	NT	406.0310336	NT	
Nominal Value (minimum)			NT	406.0310334	NT	
Short-term stability (maximum)	≤ 2x10 ⁻⁹	/100ms	NT	1.82E-10	NT	
Short-term stability (minimum)			NT	1.29E-10	NT	
Medium-term stability – Slope (maximum)	(-1 to +1)x10 ⁻⁹	/minutes	NT	8.03E-11	NT	
Medium-term stability – Slope (minimum)			NT	2.05E-11	NT	
Medium-term stability – Residual frequency variation (maximum)	≤ 3x10 ⁻⁹		NT	1.63E-10	NT	
Medium-term stability – Residual frequency variation (minimum)			NT	7.45E-11	NT	

NT = Not Tested



Parameters to be Measured	Range of Specification	Units	Test Results				Comments
14. Satellite Qualitative Tests						Result: Pass	
Model: Tron SA20, S/N: 157, TUV Ref: TSR4 and Modification State 0							
Test Configuration	As per C/S T.007		Configuration				
			7				
15 Hex ID Decoded by LUT	correct	P / F	P				
Doppler Location results with error ≤ 5km	≥ 80	%	100				
17. Navigation System						Result: Pass	
Model: Tron SA20, S/N: 157, TUV Ref: TSR4 and Modification State 0							
Location protocol	C/S T.001		National	Standard	User	RLS	
Configuration 7							
Position accuracy - A.3.8.2.1	C/S T.001	m	NT	NT	NT	22.82	
Position Acquisition Time - A.3.8.2.1	<10/1	min	NT	NT	NT	0.95	
Position accuracy - A.3.8.2.2	C/S T.001	m	NT	NT	NT	35.53	
Position Acquisition Time - A.3.8.2.2	<10/1	min	NT	NT	NT	0.95	

NT = Not Tested



2.12 Buoyancy Test

2.12.1 Specification Reference

RTCM 11010.4, Clause A.15

Test applicable only for Category 1 PLBs and Tron SA20 PLB is a Class 2 PLB.



2.13 Homing Signal tests

2.13.1 Specification Reference

RTCM 11010.4, Clause A.16

Refer to Document 75956621-03, Section 2.1, 2.2, 2.3, 2.4 and 2.6



2.14 Solar Radiation

2.14.1 Specification Reference

RTCM 11010.4, Clause A.17
IEC 60945, Clause 8.10
Manufacturer Waiver – Refer to Annex A.



2.15 Oil Resistance

2.15.1 Specification Reference

RTCM 11010.4, Clause A.18
IEC 60945, Clause 8.11
Manufacturer Waiver – Refer to Annex A.



2.16 Corrosion

2.16.1 Specification Reference

RTCM 11010.4, Clause A.8
IEC 60945, Clause 8.12
Manufacturer Waiver – Refer to Annex A.



2.17 Compass Safe Distance

2.17.1 Specification Reference

RTCM 11010.4, Clause A.19
IEC 60945, Clause 11.2

2.17.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 157 - Modification State 0

2.17.3 Date of Test

23 January 2023

2.17.4 Test Method

Battery Powered - Transmitter Idle

The EUT was setup on an East to West oriented level non-magnetic surface.

A magnetometer was used to take a horizontal magnetic flux density measurement and from this measurement, a standard and an emergency compass deflection was calculated.

A ships magnetic compass was located at the west end of the non-magnetic surface.

The compass was zeroed and the EUT was gradually moved from the east to the west end of the non-magnetic surface towards the compass centre in all 6 of its orthogonal planes and in 3 different states until the calculated compass deflection was achieved, or the EUT had reached the boundary of the ships magnetic compass.

Once all raw readings had been obtained, the worst case reading for each state was rounded up to the nearest 50mm or 100mm.

2.17.5 Test Results

Results for Configuration and Mode: Battery Powered - Transmitter Idle.

Performance assessment of the EUT made during this test: Pass.

Detailed results are shown below.

Deflection Calculation Table:

Horizontal Maximum Flux Density, Magnetic North (H)	Standard Compass Deviation Limit (5.4/H in Degrees)	Emergency Compass Deviation Limit (18/H in Degrees)
19.8	0.3	0.9

Table 47

Test Results

Equipment Under Test	EUT Face Under Test	Un-Powered State		Normalised		Powered State	
		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
PLB	Front Face	160	160	160	160	160	PLB
PLB	Rear Face	160	160	160	160	160	PLB
PLB	Left Face	228	160	231	160	216	PLB
PLB	Right Face	183	160	199	160	191	PLB
PLB	Top Face	160	160	160	160	268	PLB
PLB	Bottom Face	255	160	216	160	245	PLB

Table 48

Final Results

Unit Under Test	Standard Compass Safe Distance (mm)	Emergency Compass Safe Distance (mm)
PLB	300mm	200mm

Table 49



Figure 53 - Test Setup



Figure 54 - PLB Measurement Setup

2.17.6 Test Location and Test Equipment Used

This test was carried out in EMC Open Area Test Site.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Magnetometer	Bartington	MAG01	671	36	05-Jul-2024
Marine Binnacle Compass with Repeater Display	Cassens & Plath	Compass: Type 11	3834	-	TU

Table 50

TU – Traceability Unscheduled



2.18 Miscellaneous Test

2.18.1 Specification Reference

RTCM 11010.4, Clause A.20

2.18.2 Equipment Under Test and Modification State

N/A

2.18.3 Date of Test

N/A

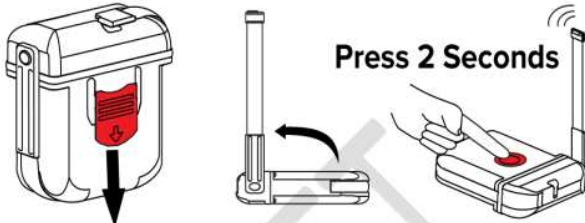

2.18.4 Test Results

The following review was carried out on the following Manufacturer documents.






















Where updates were later provided the modified version of the document is detailed in the table below for the relevant clause:

User Manual: UM Tron SA20 PLB_P02.pdf
EUT Labelling: Tron SA20 PLB Labels 01.pdf
Packaging Labelling: Tron SA20 PLB Packing Box Ver01.pdf
Tron SA20 PLB Packing box ID Label.png



A.20 Miscellaneous		
Sub clause	Statement	Comment
A.20.1 Controls and Indicators		
	<p>The PLB shall be inspected to ensure that all the requirements of paragraphs 4.3.1 to 4.3.4 are met. All controls shall be operated by a person wearing gloves or mittens from an IMO SOLAS 21 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 no longer meet the operational lifetime requirement 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.</p> <p>The functioning of the GNSS indicator shall be checked during either the Cospas-Sarsat Navigation System tests, or the tests in Annex G to determine that it meets the requirements in paragraph 4.3.1. The 406 MHz transmissions shall be monitored, to check that the PLB provides an indication when these occur.</p>	<p>The EUT is activated by sliding down the red cover, and then pressing and holding the red button for 2 seconds. The antenna should be unfolded and tilted to the vertical position.</p> <p>1 PLB activation</p>  <p>1. Slide the red cover downwards. 2. Unfold and tilt the antenna to vertical position. 3. Press and hold the red button for 2 seconds.</p> <p> Warning! For emergency use only!</p>



4.3.1	Controls and Indicators																									
4.3.1	<p>All controls shall be clearly and durably marked, see section 4.5.2. 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 and if applicable, activation cancellation of the PLB.</p> <p>Activation of the PLB shall not require the use of two hands.</p> <p>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 an immersion suit mitten or glove (complying with the IMO Life-Saving Appliance Code Resolution MSC.48 (66), section 2.3). The Cancellation mode shall not be combined with the Off mode.</p> <p>All PLBs shall have integral manual controls to operate the device in the following modes as a minimum (note Cancellation only applies to SGB PLBs):</p> <ul style="list-style-type: none"> • OFF - In the OFF mode, the PLB is deactivated. • ON - In the ON mode, the PLB is activated. • TEST – See sections 4.2.8 and 4.3.5. • CANCELLATION – Deactivates the PLB, but also sends a specific cancellation message used in the case of false alert / activation (if applicable) <p>On Category 2 PLBs there shall not be a manual control to enable and disable the AIS signal.</p> <p>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 which shall commence within 1 second of activation and shall continue at regular intervals which are easily discernible to the user all the time that the PLB is active and transmitting at least one signal. If the PLB ceases to transmit all signals, then this indication shall cease.</p>	<p>The EUT has two physical buttons: ON button and a combined SELF-TEST / GNSS SELF-TEST and OFF button labelled with a T on the button and OFF just to the side. When used as an OFF button after beacon activation, depress the TEST/OFF button for 4 seconds to deactivate the beacon. When used as a SELF-TEST button the button should be depressed for 2 seconds or 7 seconds for a GNSS SELF-TEST.</p> <p>It is possible to activate the EUT with one hand.</p> <p>The EUT was operated by a TUV SUD engineer wearing an immersion suit glove.</p> <p>When activated, the beacon strobe light emits a white flashing LED and flashes 21 times per minute. There will be other coloured LED flashes dependant if RLS is enabled or not.</p> <table border="1" data-bbox="931 619 1942 927"> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Position indicator</td> <td></td> <td>RLS indicator</td> </tr> <tr> <td>Waiting for position</td> <td></td> <td>Waiting for RLS</td> <td></td> </tr> <tr> <td></td> <td>Triple flashes</td> <td>RLS acknowledged</td> <td></td> </tr> <tr> <td>Position achieved</td> <td></td> <td>RLS disabled (PLB is not equipped with RLS protocol)</td> <td></td> </tr> <tr> <td></td> <td>Steady flashes</td> <td></td> <td>No light</td> </tr> </table>						Position indicator		RLS indicator	Waiting for position		Waiting for RLS			Triple flashes	RLS acknowledged		Position achieved		RLS disabled (PLB is not equipped with RLS protocol)			Steady flashes		No light
																										
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4.3.1	Controls and Indicators continued
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<p>The PLB may include a flashing light to assist searcher detection. If it does include a flashing light then it should include a near IR component with a dominant wavelength at 770-890 nm. If such a light is provided it shall not be possible to confuse this with any of the other required indicators apart from the indication that the PLB is active and transmitting, where it may also fulfil this function.</p> <p>The PLB shall indicate when 406 MHz transmissions are occurring.</p> <p>The PLB shall indicate whether it has a valid location provided by the GNSS receiver or whether it is trying / waiting to obtain a location. A valid location is a position that complies with Cospas-Sarsat Internal Navigation Device Encoded Position Data requirements.</p> <p>The PLB shall provide Self-Test indications as required by Sections 4.2.8 and 4.3.5.</p> <p>The manufacturer may if they wish, include additional modes of indication or additional indicators to further quantify the operation of the various transmitted signals.</p>	<p>The EUT includes a strobe light which indicates that it is active as well as indicating when 406 MHz transmissions occur. It also includes an IR light.</p> <div data-bbox="913 371 1377 614" style="border: 1px solid black; padding: 5px;"> </div> <p>See the pictures above as to how the EUT indicates that a valid location has been provided or that it is waiting to obtain a location.</p> <p>See section 4.3.5 below.</p>	<p>7.2 Strobe light</p> <table border="1" data-bbox="1391 403 1942 499"> <tr> <th colspan="2">Infrared (IR) light</th> </tr> <tr> <td>Wavelength:</td> <td>770-890 nm</td> </tr> <tr> <td>Intensity:</td> <td>More than 2.5 mW/sr</td> </tr> <tr> <td>Flash rate:</td> <td>21 flashes per minute</td> </tr> </table> <table border="1" data-bbox="1391 515 1942 611"> <tr> <th colspan="2">Visible light</th> </tr> <tr> <td>Color:</td> <td>White</td> </tr> <tr> <td>Intensity:</td> <td>More than 0.75 cd</td> </tr> <tr> <td>Flash rate:</td> <td>21 flashes per minute</td> </tr> </table>	Infrared (IR) light		Wavelength:	770-890 nm	Intensity:	More than 2.5 mW/sr	Flash rate:	21 flashes per minute	Visible light		Color:	White	Intensity:	More than 0.75 cd	Flash rate:	21 flashes per minute
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<p>A.20.2 Self-test and GNSS Self-Test Function</p>																		
<p>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 4.3.5.</p> <p>The GNSS Self-test function as defined in paragraph 4.3.5 shall be checked by inspection to ensure that it is operated by a Distinct Operation, prevents Inadvertent Operation, is provided with Pass and Fail indications.</p>	<p>See section 4.3.5 below.</p>																	



4.3.5	Regular Self-Test and GNSS Self-Test Function	<p>The EUT has one physical button which combines the SELF-TEST / GNSS SELF-TEST and OFF, labelled with a “T” on the button and “OFF” next to it. When used as a SELF-TEST button the button should be depressed for 2 seconds, or 7 seconds for a GNSS SELF-TEST.</p> <p>See section 2.10 of this report for the Self-test performance.</p> <p>Note that the extended self-test can only be performed 60 times. After that the self-test will indicate “Maximum number of extended self-tests exceeded”.</p>																																																												
4.3.5.3	Self-test indication of insufficient battery energy	<p>The PLB shall provide an indication to the user during the self-test when it is unlikely to meet the PLB minimum duration of continuous operation in Table 4 (section 4.3.7), or as declared by the manufacturer if greater than this, as specified in C/S T.001 or C/S T.018 as applicable.</p> <p>The LED will flash red 7 times as shown in the table below.</p> <table border="1" data-bbox="913 722 1906 1294"> <thead> <tr> <th>Test sequence</th> <th>Position indicator</th> <th>RLS indicator</th> <th>Test indicator</th> </tr> </thead> <tbody> <tr> <td>Extended self-test started</td> <td>-</td> <td>-</td> <td>On</td> </tr> <tr> <td>Waiting for position</td> <td>●●●●● Triple flashes</td> <td>-</td> <td>-</td> </tr> <tr> <td>Position achieved</td> <td>● On for 1 second</td> <td>-</td> <td>-</td> </tr> <tr> <td>Self-test started</td> <td>-</td> <td>-</td> <td>On</td> </tr> <tr> <td>Signals transmitted</td> <td>-</td> <td>-</td> <td>●● Two short off periods</td> </tr> <tr> <td>RLS enabled *</td> <td>-</td> <td>● On for 1 second</td> <td>-</td> </tr> <tr> <td>Extended self-test successful</td> <td>-</td> <td>-</td> <td>● On for 3 seconds</td> </tr> <tr> <td colspan="4">If one of the above tests are unsuccessful, the remaining test sequences will not be performed, and the test indicator will indicate self-test failure.</td> </tr> <tr> <td>Self-test failure</td> <td>-</td> <td>-</td> <td>●●●● Multiple red flashes**</td> </tr> </tbody> </table> <table border="1" data-bbox="1355 938 1906 1294"> <thead> <tr> <th>Number of flashes</th> <th>Failure indication</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>Battery failure</td> </tr> <tr> <td>3</td> <td>Transmitter failure</td> </tr> <tr> <td>4</td> <td>-</td> </tr> <tr> <td>5</td> <td>No position</td> </tr> <tr> <td>6</td> <td>-</td> </tr> <tr> <td>7</td> <td>Maximum number of extended self-tests exceeded</td> </tr> <tr> <td>8</td> <td>-</td> </tr> <tr> <td>9</td> <td>-</td> </tr> <tr> <td>10</td> <td>Wrong programming</td> </tr> </tbody> </table>	Test sequence	Position indicator	RLS indicator	Test indicator	Extended self-test started	-	-	On	Waiting for position	●●●●● Triple flashes	-	-	Position achieved	● On for 1 second	-	-	Self-test started	-	-	On	Signals transmitted	-	-	●● Two short off periods	RLS enabled *	-	● On for 1 second	-	Extended self-test successful	-	-	● On for 3 seconds	If one of the above tests are unsuccessful, the remaining test sequences will not be performed, and the test indicator will indicate self-test failure.				Self-test failure	-	-	●●●● Multiple red flashes**	Number of flashes	Failure indication	2	Battery failure	3	Transmitter failure	4	-	5	No position	6	-	7	Maximum number of extended self-tests exceeded	8	-	9	-	10	Wrong programming
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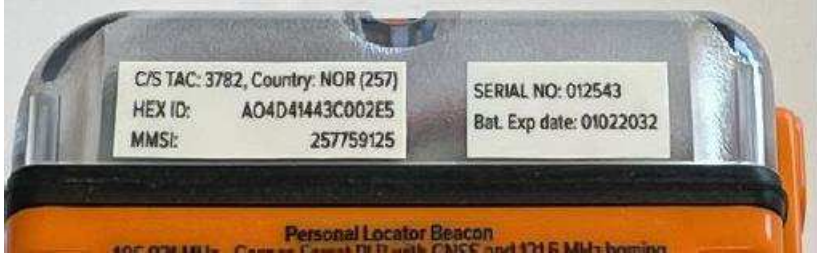


A.20.3 Battery		
	<p>The manufacturer shall provide evidence that the design of the PLB includes measures to protect the batteries from reversal of polarity, shorting, self-heating, cell-to-cell charging and forced discharging. The manufacturer shall declare the useful life of the battery and its expiration date and provide evidence to support these as required by paragraph 4.3.6. The battery shall be inspected to ensure that all the labelling requirements of paragraph 4.5.1 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, Sixth Revised Edition, PART III, Section 38.3 (ST/SG/AC.10/11/Rev.7) as amended.</p>	<p>Refer to Manufacturer supplied documents: Tron SA20 PLB PLB - Statement batteries Tron SA20 PLB PLB 5(g) Statement self-discharge L91 105454987HD-001 Jotron SA20 PLB UN 38.3 Test Report Issue 1 Statement Battery Tron SA20 PLB</p> <p>See section 4.3.6 below.</p>



4.3.6	Battery											
4.3.6	<p>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. If the battery is user-replaceable, provision shall be made to ensure watertight integrity during and upon replacement of the battery.</p> <p>The PLB battery shall comply with the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, 7th Revised Edition, PART III, Section 38.3 (ST/SG/AC.10/11/Rev.7 as amended).</p> <p>The PLB manufacturer shall establish a useful life and an expiration date for the battery. 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 +20°C ±5°C):</p> <ul style="list-style-type: none"> a) Testing, as recommended by the manufacturer, including GNSS Self Tests, or as required by the regulatory authority, whichever is the more demanding. b) Self-discharge of the battery pack. c) Standby loads. <p>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.</p>	<p>The device has its own primary non-rechargeable battery source.</p> <p>The battery pack is an integral part of the EUT.</p> <p>The battery pack is not user replaceable.</p> <p>7.6 Battery information</p> <table border="1" data-bbox="920 512 1610 715"> <tr> <td>Capacity:</td> <td>6 V / 3.4 Ah</td> </tr> <tr> <td>Lithium metal content:</td> <td>Below 1 gram per cell</td> </tr> <tr> <td>Approximate weight:</td> <td>15 g per cell</td> </tr> <tr> <td>Chemical system:</td> <td>Lithium metal</td> </tr> <tr> <td>Battery life:</td> <td>10 years *</td> </tr> </table> <p>*) Exact date is printed on the battery expiry label. See chapter 7.3</p> <p>See the manufacturers supplied documentation.</p> <p>See Document 75956621-05, Section 2.10.</p>	Capacity:	6 V / 3.4 Ah	Lithium metal content:	Below 1 gram per cell	Approximate weight:	15 g per cell	Chemical system:	Lithium metal	Battery life:	10 years *
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Battery life:	10 years *											





4.5.1	Battery Labelling	
4.5.1	<p>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.</p>	<p>The EUT contains a label which states the voltage and chemical composition of the battery while a separate label shows the expiration date of the battery. See the manufacturers user manual for the appropriate handling and disposal.</p> <div data-bbox="920 400 1149 839" style="border: 1px solid black; padding: 5px;"> <p>WARNING! Regulated lifesaving device. Unauthorized battery replacement may lead to failure. For details: jotron.com</p> <p>Lithium metal 6 V / 3400 mAh Tron SA20 PLB</p> <p> RoHS COMPLIANT</p> <p> </p> </div> <div data-bbox="913 847 1727 1102" style="text-align: center;">  <p>C/S TAC: 3782, Country: NOR (257) HEX ID: AO4D41443C002E5 MMSI: 257759125</p> <p>SERIAL NO: 012543 Bat. Exp date: 01022032</p> <p>Personal Locator Beacon 405 MHz, 1575 MHz, 1616 MHz, 1626.5 MHz, 1679.5 MHz, 1710 MHz, 1735 MHz, 1780 MHz, 1800 MHz, 1850 MHz, 1900 MHz, 1950 MHz, 2025 MHz, 2170 MHz, 2200 MHz, 2237.5 MHz, 2280 MHz, 2310 MHz, 2344 MHz, 2375 MHz, 2400 MHz, 2450 MHz, 2483.5 MHz, 2500 MHz, 2550 MHz, 2610 MHz, 2660 MHz, 2700 MHz, 2750 MHz, 2800 MHz, 2850 MHz, 2900 MHz, 2950 MHz, 3000 MHz, 3050 MHz, 3100 MHz, 3150 MHz, 3200 MHz, 3250 MHz, 3300 MHz, 3350 MHz, 3400 MHz, 3450 MHz, 3500 MHz, 3550 MHz, 3600 MHz, 3650 MHz, 3700 MHz, 3750 MHz, 3800 MHz, 3850 MHz, 3900 MHz, 3950 MHz, 4000 MHz, 4050 MHz, 4100 MHz, 4150 MHz, 4200 MHz, 4250 MHz, 4300 MHz, 4350 MHz, 4400 MHz, 4450 MHz, 4500 MHz, 4550 MHz, 4600 MHz, 4650 MHz, 4700 MHz, 4750 MHz, 4800 MHz, 4850 MHz, 4900 MHz, 4950 MHz, 5000 MHz, 5050 MHz, 5100 MHz, 5150 MHz, 5200 MHz, 5250 MHz, 5300 MHz, 5350 MHz, 5400 MHz, 5450 MHz, 5500 MHz, 5550 MHz, 5600 MHz, 5650 MHz, 5700 MHz, 5750 MHz, 5800 MHz, 5850 MHz, 5900 MHz, 5950 MHz, 6000 MHz, 6050 MHz, 6100 MHz, 6150 MHz, 6200 MHz, 6250 MHz, 6300 MHz, 6350 MHz, 6400 MHz, 6450 MHz, 6500 MHz, 6550 MHz, 6600 MHz, 6650 MHz, 6700 MHz, 6750 MHz, 6800 MHz, 6850 MHz, 6900 MHz, 6950 MHz, 7000 MHz, 7050 MHz, 7100 MHz, 7150 MHz, 7200 MHz, 7250 MHz, 7300 MHz, 7350 MHz, 7400 MHz, 7450 MHz, 7500 MHz, 7550 MHz, 7600 MHz, 7650 MHz, 7700 MHz, 7750 MHz, 7800 MHz, 7850 MHz, 7900 MHz, 7950 MHz, 8000 MHz, 8050 MHz, 8100 MHz, 8150 MHz, 8200 MHz, 8250 MHz, 8300 MHz, 8350 MHz, 8400 MHz, 8450 MHz, 8500 MHz, 8550 MHz, 8600 MHz, 8650 MHz, 8700 MHz, 8750 MHz, 8800 MHz, 8850 MHz, 8900 MHz, 8950 MHz, 9000 MHz, 9050 MHz, 9100 MHz, 9150 MHz, 9200 MHz, 9250 MHz, 9300 MHz, 9350 MHz, 9400 MHz, 9450 MHz, 9500 MHz, 9550 MHz, 9600 MHz, 9650 MHz, 9700 MHz, 9750 MHz, 9800 MHz, 9850 MHz, 9900 MHz, 9950 MHz, 10000 MHz</p> </div>

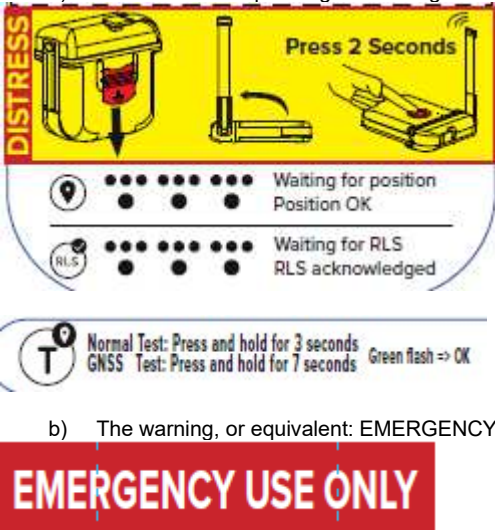


A.20.4 General Construction and Safety Requirements		
	<p>The PLB shall be inspected to ensure that it has no sharp edges or points, likely to cause injury to persons or damage to inflatables or similar survival equipment.</p> <p>The manufacturer shall provide a declaration that the PLB is not hazardous to people using it. The PLB shall be inspected to ensure that it is an integral unit.</p>	<p>The EUT was inspected visually and with the Sharp Edge Tester. All edges of the EUT body were considered to not have any sharp edges.</p> <p>The Tron SA20 PLB meets the safety requirements set out in Directive 2014/30/EU Article 3.1(a) and is tested according to IEC 62368-1(2020) + A11:2020, which guarantees that the non-hazardous requirement is fulfilled. See "Risk Assessment_TroneSA20PLB.pdf" for more details which state that the manufacturers fulfils this requirement</p>
A.20.5 Exterior Finish		
	The PLB shall be inspected to ensure that the exterior finish complies with the requirements of paragraph 4.4.1.	See below.
4.4.1	Exterior Finish	
4.4.1	The PLB case shall be predominantly a highly-visible yellow/orange colour.	The PLB is orange in colour.

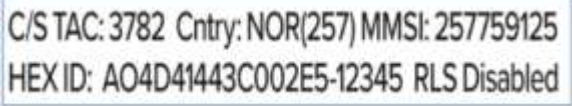
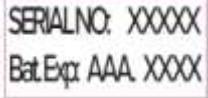
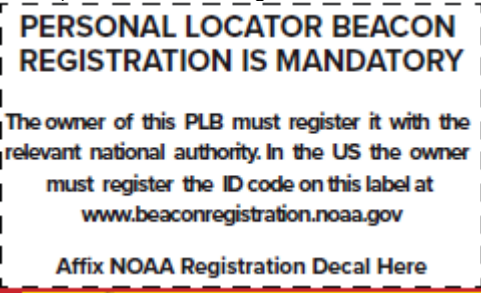


A.20.6 Labelling	
4.5.1	<p>Battery Labelling</p> <p>The labelling of the exterior of the PLB and any labelling permanently attached to the PLB shall be inspected to ensure that they comply with the requirements of paragraphs 4.5.</p> <p>All labelling on the exterior of the PLB shall be tested for abrasion 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.</p> <p>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.</p>
	<p>All labelling is permanently attached to the EUT.</p> <p>See manufacturers documentation "Waiver_TroneSA20_Abrasion Resistance".</p> <p>See testing performed below.</p>



4.5.2	PLB Labelling and Marking	
4.5.2	<p>Labelling / marking for operation controls and indicators should, as far as possible, be understood through graphical images and symbols without the need for text. The symbols provided in Annex H are recommended for this purpose. Text may be used in addition to symbols if required.</p> <p>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.</p> <p>All labelling essential to the safe and effective operation of the PLB shall be in high contrast 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.</p> <p>Items a) through i) in 4.5.2.1 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.) If the PLB is designed to be attached to a belt clip, lifejacket mounting clip or similar and items a) through c) below will be obscured by that clip, then this information shall be repeated on the exterior surface of the clip.</p>	<p>The operating instructions for the PLB provide a basic pictorial description on the label attached to the back of the Tron SA20 beacon.</p> <p>Solar Radiation: Refer to Manufacturer's documentation.</p> <p>Corrosion: Refer to Manufacturer's documentation</p> <p>Oil Resistance: Refer to Manufacturer's documentation..</p> <p>Five test subjects were asked to read the PLB labelling in a room with illumination no greater than 0.3 lux and minimal viewing distance of 150 mm. All of the five test subjects were able to read the Tron SA20 PLB labelling.</p> <div style="display: flex; justify-content: space-around;">   </div>

<p>4.5.2.1</p>	<p>The outside of the PLB shall be marked indelibly and legibly with the following:</p> <p>a) Concise, unambiguous instructions for operating and testing of the PLB that shall be understandable by untrained personnel, including correct orientation of the PLB transmitting and GNSS antennas.</p> <p>b) The warning, or equivalent: EMERGENCY USE ONLY</p>	<p>The following label items / instructions were identified on the PLB:</p> <p>a) Instructions for operating and testing of the PLB</p>  <p>b) The warning, or equivalent: EMERGENCY USE ONLY</p>
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<p>4.5.2.1</p>	<p>c) Space for either 27 or 35 characters (the words 15 (or 23) Hex ID and 12 (or 23) characters, as applicable, plus the 5 character checksum) shall be provided on a label with text identifying this, for example "15 Hex ID followed by 15 characters a space and 5 characters." This unique Hex ID identifier number shall be inserted on the label when the PLB is programmed and should include the checksum.</p> <p>d) The serial number of the PLB</p> <p>e) Instructions to register the PLB with the appropriate authority and the contact details of the authority</p> <p>f) Space for any required registration sticker</p>	<p>c) The unique identification label shown below can be found on a label attached to the PLB:</p>  <p>d) The serial number of the PLB can be found on the label pictured below.</p>  <p>e) Instructions to register the PLB with the appropriate authority and contact details of the authority:</p>  <p>f) Space for any required registration sticker: See e)</p>
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<p>4.5.2.1</p>	<p>g) Any additional labelling requirements required by Cospas-Sarsat within C/S T.001 and/or C/S T.018 as applicable and as required on PLBs by 47 CFR Part 95 for USA approved devices</p> <p>C/S T.001, 4.5.8</p> <p>h) for RLS-capable beacons:</p> <ul style="list-style-type: none"> - wording on the Beacon Identity label (label with C/S TAC Number / 15- Hex ID) indicating whether the RLS function is enabled or disabled, - marking(s) to indicate which are the RLS and RLM indicator(s). <p>FFC part 95.2993</p> <p>(1) The plate or label must contain the following statement: The owner of this 406 MHz PLB must register the identification code on this label with the National Oceanic and Atmospheric Administration (NOAA) whose address is: NOAA/SARSAT Beacon Registration, NSOF, E/SPO53, 1315 East West Hwy., Silver Spring, MD 20910-9684.</p> <p>(2) For PLBs with identification codes that can be changed after manufacture, the identification code shown on the plate or label must be easily replaceable using commonly available tools.</p> <p>FCC Part 2.925</p> <p>(a) Each equipment covered in an application for equipment authorization shall bear a label listing the following:</p> <p>(1) FCC Identifier consisting of the two elements in the exact order specified in § 2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.</p>	<p>g) See part c) above and the picture included below:</p>  <p>Although not provided, the manufacturer advises they have marked the label according to requirements in RTCM 11010.4 and have got an acceptance Waiver from FCC regarding this. The manufacturer has advised this waiver is present in the TCF.</p> <p>The FCC ID can be found on the label of the PLB.</p> 
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	<p>h) The battery expiration date determined in accordance with section 4.3.6</p>	<p>h) The battery expiration date in accordance with section 4.3.6:</p>  <p>The image shows a close-up of a silver Personal Locator Beacon (PLB) with an orange base. A white label is affixed to the top of the device, containing the following information:</p> <table border="1"><tr><td>C/S TAC: 3782, Country: NOR (257)</td><td>SERIAL NO: 012543</td></tr><tr><td>HEX ID: AO4D41443C002E5</td><td>Bat. Exp date: 01022032</td></tr><tr><td>MMSI: 257759125</td><td></td></tr></table> <p>Below the label, the text 'Personal Locator Beacon' is visible on the silver casing.</p>	C/S TAC: 3782, Country: NOR (257)	SERIAL NO: 012543	HEX ID: AO4D41443C002E5	Bat. Exp date: 01022032	MMSI: 257759125	
C/S TAC: 3782, Country: NOR (257)	SERIAL NO: 012543							
HEX ID: AO4D41443C002E5	Bat. Exp date: 01022032							
MMSI: 257759125								




4.5.2.2	Attached labelling	<p>a) The manufacturer's identification is shown on the front face of the beacon.</p>  <p>b) The name can be identified on the PLB.</p> <p>Tron SA20</p> <p>c) The operating temperatures can be found on the PLB in both degrees Celsius and Fahrenheit.</p>  <p>d) An antenna label can be found on the beacon, indicating that the area must "KEEP IN CLEAR VIEW TO SKY":</p> 
4.5.2.3	For Category 2 PLBs	<p>The PLB displays a warning label on the PLB that states "WILL NOT FLOAT". See picture in part c) above.</p>
	<p>The outside of the PLB shall be marked indelibly and legibly with a warning label that states "WILL NOT FLOAT."</p>	

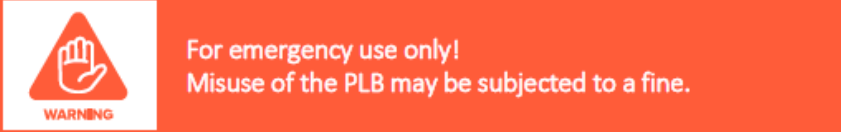


A.20.7 Documentation	
The manufacturer shall supply a copy of the operation manual and this shall be inspected to ensure that it complies with the requirements of paragraph 4.6. The manufacturer shall supply a copy of the end user (consumer) packaging (or the labelling for the packaging) and this shall be inspected to ensure that it complies with the requirements of paragraph 4.7	See sections 4.6 and 4.7 below.

4.6	Documentation	
4.6	<p>The manufacturer shall provide an operation manual which includes the following:</p> <p>a) Complete instructions for operating the PLB including guidance on how to maximize self-locating performance of the PLB including antenna orientation and siting (for both the main PLB antenna and the GNSS antenna) together with any appropriate warnings (such as don't obstruct the antennas, provide a clear view of the sky, do not submerge the antennas etc).</p>	<p>a) The manufacturer provides a user manual which includes complete instructions for operating the PLB and guidance on how to maximise performance of the PLB. Section 3 of the user manual provides information on activating, testing and deactivating the PLB whilst also giving any appropriate warnings and guidance about maximising the performance of the GNSS antenna.</p> <p>The user manual also provides a brief instruction on activation of the PLB at the start.</p> <p>3.1 Activation</p>  <p>To activate the PLB follow these steps:</p> <ol style="list-style-type: none"> 1. Slide the red cover downwards. 2. Unfold and tilt the antenna to vertical position. 3. Press and hold the red button for 2 seconds. <p>To maximize performance:</p> <ul style="list-style-type: none"> • Lay the PLB down on a flat surface with the antenna pointing towards the sky. • Keep the angle between the antenna and the PLB 90°. • Provide a clear view to the sky. • If possible, keep the PLB in an open area, away from any metal objects (ship construction etc.) that may limit the satellite coverage. • Do not submerge the antenna.




<p>4.6</p>	<p>b) Information on the intended usage and any restrictions on usage applicable to that Category and Group of PLB. This shall include guidance as to where that PLB is intended to be used and the restrictions on use as defined in Tables 2 and 3 as applicable.</p> <p>c) Cautions and recommendations to prevent inadvertent activations which result in false alerts.</p> <p>d) 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. For SGBs instructions on the use of the Cancellation Function in relation to false alerts and when and when not to use it.</p>	<p>b) The manufacturer's user manual provides information on the intended usage as well as restrictions on the usage applicable to a Category 2 PLB in Section 3.4.</p> <p>c) The user manual offers cautions and recommendations on how to prevent false alerts in Section 3.7.</p> <p>d) The user manual provides instruction on actions to take in the event of a false alert.</p> <p>3.6 Deactivation of the PLB If the PLB has been accidentally activated or if you want to deactivate it after use, press and hold the PLB Off button for 4 seconds. All three indicators will light up when the button is pressed. Keep pressing until all lights are turned off. Perform a self-test afterwards to verify that the battery has sufficient power.</p> <p>3.7 False alerts</p> <div data-bbox="719 798 1167 874" style="border: 1px solid #0070C0; background-color: #D9E1F2; padding: 5px;"> <p> Important! False alerts are a serious problem for the rescue service. Nearly 90% of the initiated distress alerts turn out to be false alarms.</p> </div> <p>The PLB shall only be used in emergency situations. Misuse may be subjected to a fine.</p> <p>Take the following precautions to prevent inadvertent activation:</p> <ul style="list-style-type: none"> • Keep the PLB away from strong magnetic fields. • Do not remove the red protective cover when performing self-tests. <p>If your PLB is activated in a non-distress situation, or a distress situation which has been resolved and you no longer require assistance, deactivate your PLB and call the number printed on the PLB, or your nearest SAR authority¹.</p> <p>Provide them with the following information:</p> <ul style="list-style-type: none"> • PLB 15 hex ID. See chapter 5.4. • Date, time, and position at time of activation. (Time zone) • Date, time, and position at time of deactivation. (Time zone) • PLB make and model. • Circumstances/cause of activation (if known). <p><small>¹ In the U.S. use telephone 1-800-851-3051</small></p>
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4.6	<p>e) A warning paragraph with, at a minimum, the information in 4.5.2 and the fact that misuse of a PLB may be subject to a fine.</p> <p>f) Instructions on how, when and where to carry out self-tests as recommended by the manufacturer (including both the Regular Self-Test and the GNSS Self-Test), together with any appropriate warnings.</p>	<p>e) The user manual provides the following information regarding section 4.5.2:</p> <ul style="list-style-type: none">Operating instructionsWarningsRegistration informationIdentification of the ManufacturerDevice model name and name under which it was testedOperating temperature range in degrees Celsius and FahrenheitDangerous goods transportation informationAntenna optimization information (clear view to sky, positioning of the device etc)The PLB is not intended to be used in water and will not float  <p>f) Instructions for testing the PLB with Self-Test and GNSS Self-Test can be found in section 3 of the user manual and includes appropriate warnings for conducting these functional tests. It also provides what Group the EUT is in section 7.1.</p> <h3>7.1 General</h3> <table border="1" data-bbox="723 826 1615 1125"><tr><td>Tron SA20 PLB:</td><td></td></tr><tr><td>PLB Class:</td><td>Class 2</td></tr><tr><td>- Operating temperature:</td><td>-20° C to 55° C (-4° F to 131° F)</td></tr><tr><td>- Stowage temperature:</td><td>-30° C to 70° C (-22° F to 158° F)</td></tr><tr><td>PLB Category:</td><td>Category 2 – Designed for use on land.</td></tr><tr><td>PLB Group:</td><td>Group 1 - Includes 406 transmitter and 121.5 homing transmitter</td></tr></table>	Tron SA20 PLB:		PLB Class:	Class 2	- Operating temperature:	-20° C to 55° C (-4° F to 131° F)	- Stowage temperature:	-30° C to 70° C (-22° F to 158° F)	PLB Category:	Category 2 – Designed for use on land.	PLB Group:	Group 1 - Includes 406 transmitter and 121.5 homing transmitter
Tron SA20 PLB:														
PLB Class:	Class 2													
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- Stowage temperature:	-30° C to 70° C (-22° F to 158° F)													
PLB Category:	Category 2 – Designed for use on land.													
PLB Group:	Group 1 - Includes 406 transmitter and 121.5 homing transmitter													




4.6	<p>g) General battery information (e.g., battery replacement instructions, battery type, safety information regarding battery use and disposal).</p>	<p>g) The user manual provides general battery information including battery type and safety information. Battery replacement instructions are not applicable as the EUT is not user serviceable.</p> <p>7.6 Battery information</p> <table border="1"> <tr> <td>Capacity:</td> <td>6 V / 3.4 Ah</td> </tr> <tr> <td>Lithium metal content:</td> <td>Below 1 gram per cell</td> </tr> <tr> <td>Approximate weight:</td> <td>15 g per cell</td> </tr> <tr> <td>Chemical system:</td> <td>Lithium metal</td> </tr> <tr> <td>Battery life:</td> <td>10 years *</td> </tr> </table> <p><small>*) Exact date is printed on the battery expiry label. See chapter 7.3</small></p> <p>7.6.1 Battery safety</p> <p>Due to risk of fire or explosion the batteries shall not be short-circuited, recharged, punctured, incinerated, crushed, immersed, forcibly discharged or exposed to temperatures above the declared operating temperature range of the product. The batteries in this PLB are sealed units which are not hazardous when used according to the recommendations of the manufacturer. Under normal conditions of use, the batteries are hermetically sealed.</p> <p>For information regarding the physical and chemical properties, the potential health and safety measures and the environmental effects of the battery used with this product, refer to the manufacturer's safety information documentation.</p> <p>The safety information is available for download at: http://jotron.com/product/tron-SA20-PLB</p> <p>8.5 Disposal</p> <p>To prevent false alarms, it is important that the battery is removed from the PLB when it has reached the end of its life.</p> <p>All parts of the PLB should be disposed of in a way that is not harmful for the environment. It should not be disposed as normal waste and must be handled in accordance with the applicable federal, state, and local waste disposal regulations in the country where the equipment is used.</p> <p>See jotron.com for updated instructions on disposal.</p>	Capacity:	6 V / 3.4 Ah	Lithium metal content:	Below 1 gram per cell	Approximate weight:	15 g per cell	Chemical system:	Lithium metal	Battery life:	10 years *
Capacity:	6 V / 3.4 Ah											
Lithium metal content:	Below 1 gram per cell											
Approximate weight:	15 g per cell											
Chemical system:	Lithium metal											
Battery life:	10 years *											
	<p>h) 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.</p>	<p>h) The user manual provides information regarding the safe transportation or shipping of the PLB. This can be found in sections 7.6.2 and 8.3.1.</p>										



<p>4.6</p>	<p>i) 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.</p> <p>j) Information related to the requirements of preventive maintenance.</p> <p>k) Minimum operating lifetime and operating and stowage temperature ranges.</p> <p>l) Information explaining the requirement and procedure for licensing and registering PLBs, as appropriate, and encouragement to do so promptly. These instructions shall</p>	<p>i) The user manual provides information regarding the replacement of the battery after activation and Section 3 provides information on how the functional test will display the need for battery replacement. The Tron SA20 PLB is fitted with special lithium batteries, and it is not possible to replace the batteries. The PLB must be replaced when the battery expiry date has passed.</p> <p>Jotron recommends replacing the PLB if it has been activated for any other purpose than a test.</p> <p>j) The user manual includes brief information regarding the maintenance of the PLB.</p> <p>6 Testing and maintenance</p> <p>To ensure reliability and to minimize the risk of false distress alerting it is important that the PLB must undergo testing and maintenance as described in this chapter.</p> <p>6.1 Every month</p> <ul style="list-style-type: none"> • Perform self-test (see chapter 3.5.1) • Visual inspection: <ul style="list-style-type: none"> ○ Check for defects on the PLB. ○ Check the expiry date of the battery. See chapter 7.3 for details. <div style="background-color: #e1f5fe; padding: 5px; border: 1px solid #cfe2f3;"> <p> Note! To reduce traffic on the emergency channels self-tests should be performed during the first 5 minutes of the hour.</p> </div> <p>6.2 Every 3 months</p> <ul style="list-style-type: none"> • Perform an extended self-test instead of the monthly normal self-test. See chapter 3.5.2. <p>k) The user manual provides the operating lifetime and operating and stowage temperature ranges in section 7.1.</p> <p>l) The user manual provides information explaining the requirement and procedure for registering the PLB and encourages the owner to register promptly. It also states that any subsequent owner is required to update these details. This information can be found in section 5.</p>
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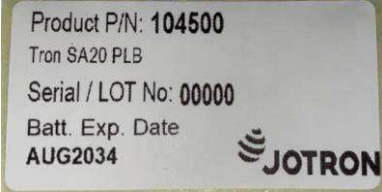



<p>include language directing any subsequent owner to update these registration details.</p> <p>m) For Category 2 PLBs, a warning that states "THIS PLB WILL NOT FLOAT" and, if applicable, the information that when used around water it should be installed in or attached to an auxiliary flotation device, 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.</p> <p>n) 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.</p>	<p>m) The user manual provides a warning that states that the PLB will not float. The user manual also provides the information regarding its waterproof depth and time.</p> <div data-bbox="719 347 1478 657"><p>Warning!</p><ul style="list-style-type: none">• The PLB will float but does not have sufficient buoyancy to meet the category 1 requirements. This is a category 2 PLB and by definition this PLB will not float.• The PLB is not designed to float and transmit a distress signal at the same time.• The PLB may not be substituted for a required EPIRB on a vessel.</div> <p>n) The EUT is a category 2 beacon, so this sub clause is not applicable.</p>
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<p>4.6</p>	<p>o) An overview and explanation of how the Cospas-Sarsat system operates.</p> <p>p) Beacon registration materials and information</p> <p>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:</p> <ol style="list-style-type: none"> 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). <p>r) If the PLB is RLS capable functional and operational details as required by Cospas-Sarsat.</p>	<p>o) The user manual provides an overview and explanation as to how the Cospas-Sarsat system operates and this is found in section 7.7.</p> <p>p) The user manual does not provide any beacon registration materials. However, it does contain useful information regarding the different website URLs and how to register the EUT. This can be found in Section 5.</p> <p>q) The PLB is not capable of connecting to an external GNSS receiver.</p>
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4.7	Packaging Labelling	
4.7	<p>End user (consumer) packaging shall include the following information in a conspicuous location, readily readable and visible to the purchaser without opening the packaging:</p> <p>a) The Category of the PLB: If Category 1, information that the PLB will float. If Category 2, information that the PLB will not float.</p> <p>b) A note to the effect that; THIS PLB IS NOT AN ELT or an EPIRB and does not meet the regulatory requirements for an ELT or an EPIRB.</p> <p>c) The temperature operating range in degrees Celsius and Fahrenheit of the PLB.</p>	<p>a) The end user packaging provides information that the PLB is Category 2 and will not float. It also states that it is a PLB and not an ELT or EPIRB so therefore doesn't meet the regulatory requirements for an ELT or EPIRB.</p> <p>Note! Tron SA20 is a Category 2 PLB (non-buoyant) THIS PLB IS NOT AN ELT or an IMO EPIRB and does not meet the regulatory requirements for an ELT or an IMO EPIRB. PLB registration is mandatory. Operating temperature: -20°C to +55°C (-4°F to +131°F).</p> <p>b) See picture above.</p> <p>c) The end user packaging provides information of the temperature range that the PLB operates within.</p>
	<p>d) The expiration date of the battery.</p> <p>e) The Country that is coded into the 15 / 23 Hex ID</p> <p>f) If the Country Code / identity cannot be readily changed in the field at nominal cost to another Country Code / identity due to the configuration of the PLB, a warning to that effect.</p>	<p>d) The end user packaging displays the battery expiration date.</p>  <p>e) The packaging labelling displays the country code.</p>  <p>f) The PLB can be programmed and re-programmed to any country code by either the factory, or a certified distributor.</p>



A.20.8 Altitude	
	<p>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 30,000 feet (9,144 meters), \pm 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.</p>
	<p>See section 2.19 of this document.</p>

2.19 Altitude

2.19.1 Specification Reference

RTCM 11010.4, Clause A.20.8

2.19.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 107 - Modification State 0

2.19.3 Date of Test

15 March 2023

2.19.4 Environmental Conditions

Ambient Temperature	19.3 - 20.8 °C
Relative Humidity	31.7 - 34.2 %

2.19.5 Test Method

The EUT (powered off) was placed in a climatic chamber where the conditions were increased from laboratory ambient atmospheric pressure to 30,000 ft (300 mbar) at a rate of 1.5 inches of Hg per / min. The conditions were maintained for 2 hours. The conditions were then returned to laboratory ambient atmospheric conditions. The EUT was then subject to a performance check.



Figure 55 - Test Setup – Altitude



2.19.6 Test Results

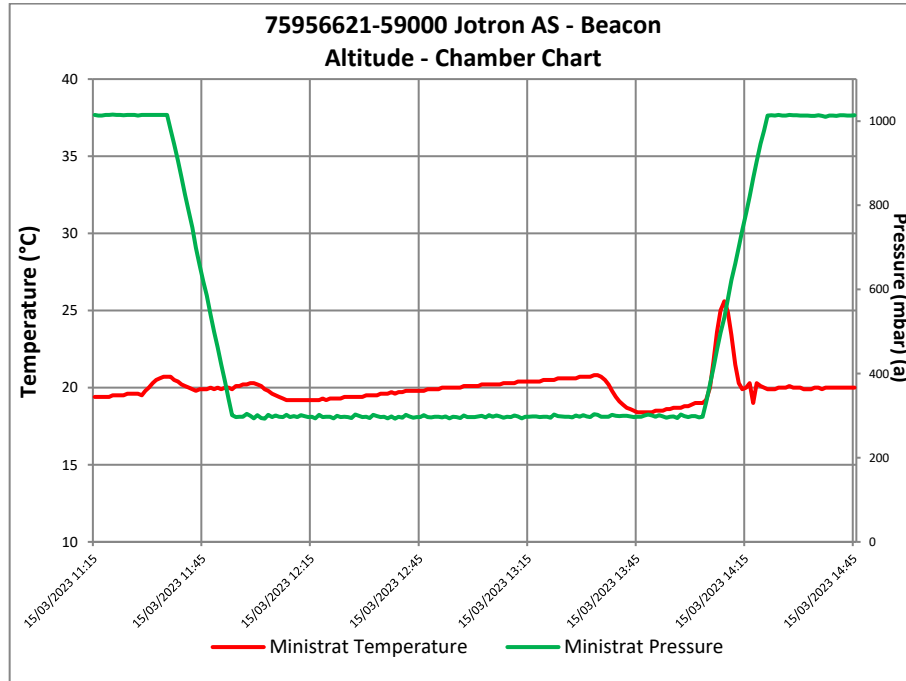


Figure 56 - Temperature Plot – Altitude

Performance Check

Tron SA20 PLB, S/N: 107

Parameter	Result
Normal Mode:	
Normal Message	FFFE2F8C9DFB5018DFEFF84E1D3861F0FABE
406 MHz Frequency	406.031054
121 MHz Presence	Presence Confirmed

Table 51



2.19.7 Test Location and Test Equipment Used

This test was carried out in Climatic Area.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Climatic Chamber	Unitemp	Ministrat	2129	12	24-Mar-2023
Rubidium Frequency Standard	Quartzlock	A10-B	92	12	15-Mar-2023
Tester (Beacon)	WS Technologies	BT200-1100Y	5394	-	TU
MXA Spectrum Analyser	Keysight Technologies	N9020B-ATO-43105	5743	24	10-Feb-2024

Table 52

TU – Traceability Unscheduled

2.20 Internal Navigation Device

2.20.1 Specification Reference

RTCM 11010.4 + Amendment 1, Clause A.21 (Annex G)

2.20.2 Equipment Under Test and Modification State

Tron SA20 PLB, S/N: 115 - Modification State 0

2.20.3 Date of Test

16 March 2023, 17 March 2023, 18 May 2023 and 30 October 2023

2.20.4 Environmental Conditions

Ambient Temperature 19.7 – 24.4 °C
Relative Humidity 34.1 - 50.9 %

2.20.5 Test Method

The internal navigation device tests were performed in an anechoic chamber. The Land and Maritime scenarios were individually applied to the EUT from a simulator and the time taken to achieve each lock was timed. A Beacon test rack was used to monitor the EUT 406 MHz transmission and the resultant location data. For this test, the 121.5 MHz was active.

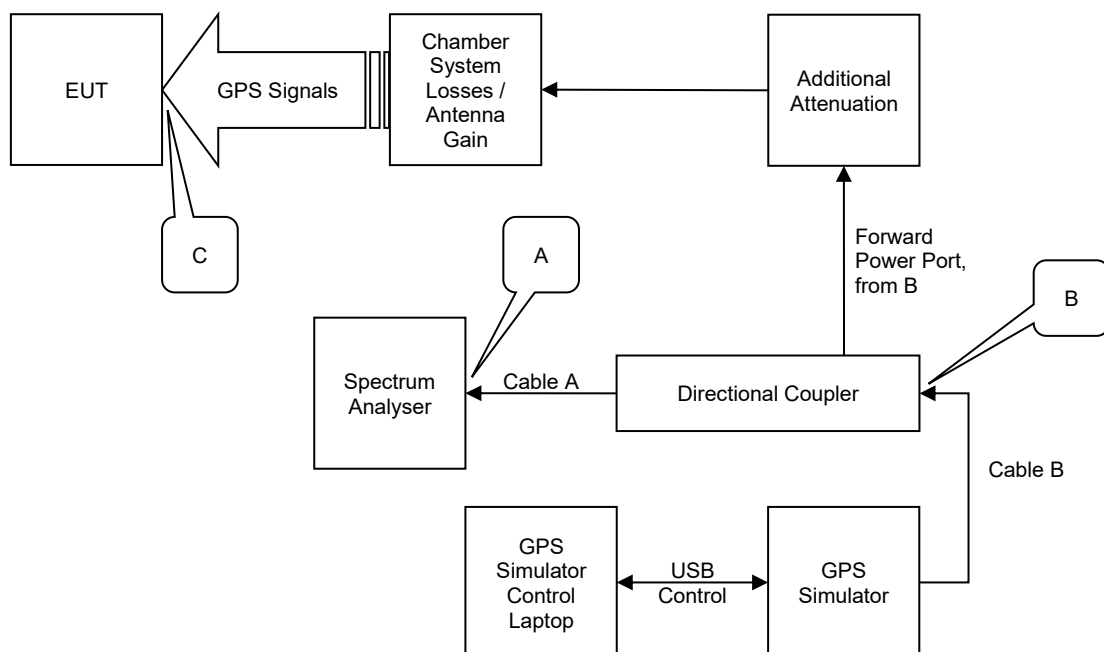


Figure 57 - Field Calibration Schematic

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.

The multi-constellation detection test was a radiated test performed at Octagon House, TUV SUD.

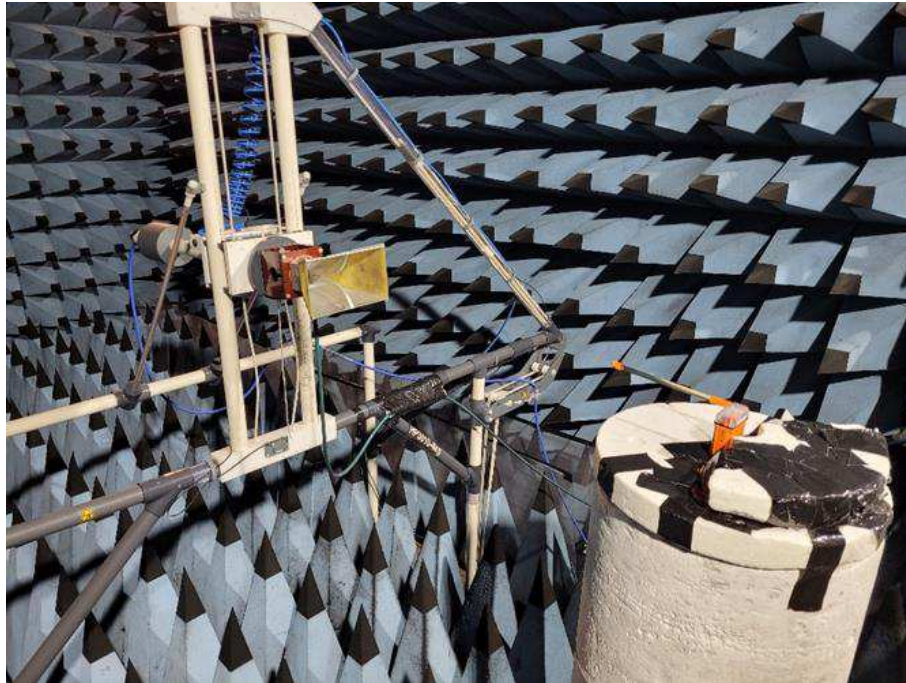


Figure 58 - Annex G – Chamber set up



Figure 59 - Annex G – Multi-constellation set up



2.20.6 Test Results

Land Scenarios

General Note: The standard contains some contradictions, specifically regarding simulated positions. Testing was carried out in accordance with the Land Scenario Tables (G.1).

Scenario P_{RSS} Summary Table:

Scenario #	Number of SVs	HDOP	Required RSS [dBm]	Actual RSS [dBm]
1	3	4	-123	-123.24
2	3	4	-130	-130.21
3	3	4	-137	-137.62
4	3	10	-123	-123.40
5	3	10	-130	-130.21
7	3	20	-123	-123.34
8	3	20	-130	-130.19
13	4	4	-123	-123.06
14	4	4	-130	-130.32
15	4	4	-137	-137.15
16	4	10	-123	-123.03
17	4	10	-130	-130.30
19	4	20	-123	-123.06
20	4	20	-130	-130.30
25	5	4	-123	-123.15
26	5	4	-130	-130.38
27	5	4	-137	-137.35
28	5	10	-123	-123.17
29	5	10	-130	-130.39
31	5	20	-123	-123.12
32	5	20	-130	-130.37
34	6	4	-123	-123.18
35	6	4	-130	-130.26
36	6	4	-137	-137.49
37	4	4	-130	-130.30
38	4	4	-130	-130.33
39	4	4	-130	-130.32
40	4	4	-130	-130.35
41	4	4	-130	-130.32
42	4	4	-130	-130.32



Maritime Scenarios

Scenario P_{RSS} Summary Table:

Scenario #	Number of SVs	Target HDOP	Required RSS [dBm]	Actual RSS [dBm]
1	7	1	-130	-130.44
2	7	1	-130	-130.50
6	7	1	-130	-130.47
7	7	1	-130	-130.57
8	7	1	-130	-130.50
9	7	1	-130	-130.62
12	7	1	-130	-130.58
13	7	1	-130	-130.82
14	7	1	-130	-130.85
16	7	1	-130	-130.48
17	7	2	-130	-130.59
18	7	2	-130	-130.88
20	7	1	-130	-130.60
22	7	1	-130	-130.60
24	7	1	-130	-130.62
26	7	1	-130	-130.53
28	7	1	-130	-130.60
30	7	1	-130	-130.59
32	7	2	-130	-130.57
33	7	2	-135	-135.11
34	7	2	-135	-135.19
35	7	2	-135	-135.11
36	7	2	-135	-135.18
37	7	2	-130	-130.63
38	7	2	-130	-130.67
39	7	2	-135	-135.51



Land Scenarios Test Results (Table G.4):

Scenario #	Constellation Used	Actual HDOP (at start)	TTFF (min : sec)	Simulator Location	Transmitted Location	Location Error (m)
1	GPS	14.87	01:44	39° 36' N 119° 35' W	39° 36' 7.2" N 119° 34' 51.6" W	237.43
2	GPS	14.87	01:44	39° 36' N 119° 35' W	39° 36' 7.2" N 119° 34' 51.6" W	237.43
3	GPS	14.87	00:54	39° 36' N 119° 35' W	39° 36' 7.2" N 119° 34' 51.6" W	237.43
4	GPS	13.26	00:55	39° 36' N 119° 35' W	39° 36' 7.2" N 119° 34' 58.8" W	222.33
5	GPS	13.26	01:43	39° 36' N 119° 35' W	39° 36' 7.2" N 119° 34' 58.8" W	222.33
7	GPS	2.03	00:53	39° 36' N 119° 35' W	39° 35' 56.4" N 119° 34' 58.8" W	111.65
8	GPS	2.03	01:50	39° 36' N 119° 35' W	39° 35' 56.4" N 119° 34' 58.8" W	111.65
13	GPS	4.02	00:51	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 55.2" W	48.11
14	GPS	4.02	00:51	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 55.2" W	48.11
15	GPS	4.02	01:42	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 55.2" W	48.11
16	GPS	11.80	00:52	39° 36' N 119° 35' W	39° 35' 56.4" N 119° 35' 34.8" W	366.03
17	GPS	11.80	00:54	39° 36' N 119° 35' W	39° 35' 56.4" N 119° 35' 34.8" W	366.03
19	GPS	20.49	05:03	39° 36' N 119° 35' W	39° 35' 56.4" N 119° 38' 13.2" W	2086.48
20	GPS	20.49	05:05	39° 36' N 119° 35' W	39° 35' 52.8" N 119° 35' 52.8" W	573.88
25	GPS	3.54	00:52	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
26	GPS	3.54	00:53	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
27	GPS	3.54	01:42	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 55.2" W	48.11
28	GPS	11.52	00:53	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
29	GPS	11.52	00:52	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
31	GPS	23.48	00:52	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
32	GPS	23.48	00:52	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
34	GPS	4.06	00:53	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
35	GPS	4.06	00:52	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
36	GPS	4.06	01:43	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
37	GPS	4.34	04:57	39° 36' N 119° 35' W	39° 36' 0" N 119° 34' 58.8" W	12.03
38	GPS	3.31	02:35	23° 42' 01" S 133° 52' 50" E	23° 42' 0" S 133° 52' 51.6" E	62.07
39	GPS	4.49	02:34	71° 37' 34" N 128° 52' 04" E	71° 37' 37.2" N 128° 52' 1.2" E	196.44
40	GPS	3.77	01:45	23° 42' 01" S 133° 52' 50" E	23° 42' 0" S 133° 52' 51.6" E	31.58
41	GPS	4.82	01:44	71° 37' 34" N 128° 52' 04" E	71° 37' 37.2" N 128° 52' 4.8" E	126.99
42	GPS	3.57	00:54	39° 36' N, 119° 35' W	39° 36' 10.8" N, 119° 34' 48" W	354.05



Maritime Scenarios Test Results (Table G.5):

Scenario #	Constellation Used	Actual HDOP (at start)	TTFF (min : sec)	Simulator Location	Transmitted Location	Location Error (m)
1	GPS	0.92	00:53	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
2	GPS	0.92	00:54	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
6	GPS	1.11	00:52	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 0" E	0.00
7	GPS	1.08	01:44	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
8	GPS	1.08	03:25	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
9	GPS	1.08	fail	0° 0' N 0° 0' E	-	N/A
12	GPS	0.88	00:53	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 0" E	0.00
13	GPS	0.98	01:42	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 0" E	0.00
14	GPS	0.98	00:52	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 3.6" W	12.29
16	GPS	0.89	01:45	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 7.2" W	24.58
17	GPS	1.61	01:44	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 0" E	0.00
18	GPS	1.33	03:24	80° 0' N 0° 0' E	80° 0' 0" N 0° 0' 3.6" E	12.29
20	GPS	0.94	00:54	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
22	GPS	0.94	00:54	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
24	GPS	0.94	00:53	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
26	GPS	0.94	01:43	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
28	GPS	0.94	00:53	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
30	GPS	0.94	01:44	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
32	GPS	0.94	02:32	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
33	GPS	0.92	01:45	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
34	GPS	0.92	01:44	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
35	GPS	0.92	00:53	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
36	GPS	0.92	01:45	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00
37	GPS	0.95	00:52	44° 03' S 174° 09' E	44° 3' 0" S 174° 9' 0" E	0.00
38	GPS	0.95	00:53	47° 21' N 8° 27' W	47° 21' " N 8° 27' 0" W	0.00
39	GPS	0.89	01:48	0° 0' N 0° 0' E	0° 0' 0" N 0° 0' 0" E	0.00



Clause G.3.6.1 (Primary Detection Test Scenarios)

Maritime Scenarios Test Results (Table G.5):

Scenario #	Constellation Used	Actual HDOP (at start)	TTF (min : sec)	Simulator Location	Transmitted Location	Location Error (m)
2	Glonass	1.24	02:34	0° 0' N 0° 0' E	0° 0' 0" S 0° 0' 0" W	0.00

Maritime Scenarios Test Results (Table G.5):

Scenario #	Constellation Used	Actual HDOP (at start)	TTF (min : sec)	Simulator Location	Transmitted Location	Location Error (m)
2	Galileo	1.10	01:43	0° 0' N 0° 0' E	0° 0' 0" S 0° 0' 0" W	0.00

Result Summary

The test was completed as per the standard and the above Method and Setup, results follow:

Results Analysis (Table G.6 Land Scenarios):

Criteria	Limit / Condition	Result
No of successful Tests	TTF ≤ 13 minutes	30
Total No of Land Scenarios	30	N/A
TTF Percentage Success Rate	(No Success tests / 30)*100	100%
TTF Pass / Fail Limit	≥ 70%	N/A
No of Locations with Errors	≤ 650m	29
No of scenarios with locations	Enter result	30
Location Accuracy Percentage Pass Rate	(No Location Errors ≤ 650m / No Scenarios with Location) * 100	96.7
Location Accuracy Pass / Fail Limit	≥ 70%	Pass



Results Analysis (Table G.7 Maritime Scenarios):

Criteria	Limit / Condition	Result
No of successful Tests	TTFF ≤ 13 minutes	25
Total No of Land Scenarios	26	N/A
TTFF Percentage Success Rate	(No Success tests / 26)*100	96.2%
TTTTFF Pass / Fail Limit	≥ 70%	N/A
No of Locations with Errors	≤ 650m	25
No of scenarios with locations	Enter result	25
Location Accuracy Percentage Pass Rate	(No Location Errors ≤ 650m / No Scenarios with Location) * 100	100%
Location Accuracy Pass / Fail Limit	≥ 70%	Pass

Pass / Fail Analysis (Table G.8):

Criteria	Result
Land TTFF Success Rate ≥	Pass
Land Location Accuracy Pass Rate ≥ 70%	Pass
Maritime TTFF Success Rate ≥	Pass
Maritime Location Accuracy Pass Rate ≥ 70%	Pass
All four results must be a "pass" for the PLB to pass, any one or more "Fails" indicates failure.	

Table G.9 – Multi-constellation Detection Results

Test #	GNSS Constellation Detected	Satellite IDs Detected	Constellation HDOP (from GSA sentence)	Combined HDOP (from GNS sentence)
1	GPS	2, 8, 10, 16, 27, 23	0.80	0.80
	GLONASS	88, 87, 71, 72, 79, 77	0.80	
	Galileo	15, 21, 13	0.80	

*NOTE: For the multi-constellation detection test, the 406 MHz and 121.65 MHz were active.



2.20.7 Test Location and Test Equipment Used

This test was carried out at Octagon House Laboratory, Fareham, Hampshire, UK.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna (Double Ridge Guide)	EMCO	3115	34	12	16-Oct-2023
Power Meter	Hewlett Packard	436A	94	12	5-Apr-2023
Load (50ohm/30W)	Weinschel	50T-054	285	12	31-Jul-2024
Termination (50ohm)	Diamond Antenna	DL-30N	337	12	5-Jan-2024
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	15-Feb-2024
Directional Coupler	Narda	3022	503	-	O/P Mon
Spectrum Analyser	Agilent Technologies	E4407B	1154	12	4-Jan-2024
Roberts Antenna 406MHz	Compliance Design		1860	24	17-Aug-2024
Attenuator (3dB, 20W)	Aeroflex / Weinschel	23-03-34	3162	12	6-Jul-2023
Power Sensor	Agilent Technologies	8482A	3290	12	20-Sep-2023
Power Meter	Rohde & Schwarz	NRP	3491	12	13-Jan-2024
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	13-Jan-2024
Copper GRP	TUV SUD	27cm Diameter	3538	-	TU
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	14-Feb-2024
1 MHz / 10 MHz reference	Quartzlock	E10-X	4973	12	23-Feb-2024
Cable (18 GHz)	Rosenberger	LU7-036-1000	5026	-	O/P Mon
Cable (18 GHz)	Rosenberger	LU7-036-1000	5034	12	28-Mar-2023
Cable (18 GHz)	Rosenberger	LU7-036-2000	5035	-	O/P Mon
Analyser (Spectrum)	Rohde & Schwarz	FPL1003	5349	12	2-Jan-2024
Desktop Stopwatch	Radio Spares	RS Pro	5570	12	30-Nov-2023
Desktop Stopwatch	Radio Spares	RS Pro	5571	12	20-Jul-2024
RF Distribution Box	TUV SUD	N/A	5904	-	O/P Mon
50 ohm Termination Load (10 Watt)	Telegartner	N/A	5905	6	14-Apr-2024
Attenuator 3dB 10w	Huber-Suhner	5903_N-50-010	5927	12	19-Apr-2024
Attenuator 3dB 10w	Huber-Suhner	5903_N-50-010	5928	12	19-Apr-2024
Cable (N to N 2m)	Amphenol RF	N/A	5949	12	21-May-2024
Cable (N to N 2m)	Amphenol RF	N/A	5951	12	21-May-2024



Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Antenna (Double Ridge Guide)	EMCO	3115	34	12	16-Oct-2023
Cable (N to N 2m)	Amphenol RF	N/A	5953	12	26-Jun-2024
Humidity & Temperature meter	Rotronic	HP31 HygroPalm	6247	12	21-Sep-2023
Signal Generator 1RF	Spirent	GSS7000	6312	12	26-Jan-2024
8m Coaxial Cable Assy	Junkosha	MWX221-08000NMSNMS/A	6412	-	O/P Mon

Table 53

O/P Mon – Output Monitored using calibrated equipment



3 Incident Reports

No incidents reports were raised.



4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Compass Safe Distance	$\pm 0.1^\circ$

Table 54

Worst case error for both Time and Frequency measurement 12 parts in 10^6 .

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.



ANNEX A

MANUFACTURER SUPPLIED INFORMATION



Tron SA20 PLB

SN 151 Coax test cable repair and verification





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2	Peek output power for 121,5MHz and 406,031MHz.....	2

Revision history

Revision	Date	Reason for revision	Author
A	25.01.2023	Issued for release	MK/AL

1 Introduction

Tron SA20 PLB sample with Jotron serial no 151 (conducted) mal functioned at TUV test, unit returned to Jotron for repair 23.01.2023.

Two Internal test coax verified broken.

Coax replaced by same type and length. Verified to be functional for continued testing.

NB: Unit returned with battery replacement, battery drained by 24h runtime.

2 Peek output power for 121,5MHz and 406,031MHz

Peek output power measured 25.01.2023 in 50 Ohm connector, room temp 21°C:

Test no.	121,5 MHz	406,031 MHz
1	20,54 dBm	
2		36,53 dBm



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Report No. REP100693

Test Report Reliability

Product	Tron SA20 PLB (Personal Locator Beacon)	
Name and address of the applicant	Jotron AS Ringdalskogen 8 3270 Larvik Norway	
Name and address of the manufacturer	Jotron AS Ringdalskogen 8 3270 Larvik Norway	
Trademark		
Tested according to	IEC/EN 60945:2002 + Cor1:2008	
Project number	PRJ0035679	
Tested in period	2023-04-28 – 2023-05-01	
Issue date	2023-06-08	
Name and address of the testing laboratory	Nemko Scandinavia AS Philip Pedersens vei 11, 1366 Lysaker, Norway	 
 Prepared by [Steinar Jensen]		
 Approved by [Espen Eriksen]		



TEST REPORT
Report No. REP100693

REPORT REVISIONS

Report Edition	Date	Project	Description
A	2023-06-08	PRJ0035679	First issued



THIS REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATION(S) TESTED.

It is the manufacturer's responsibility to assure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is responsible to the authorities for any modifications made to the product, which result in non-compliance to the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements, are not part of the current accreditation. Neither is opinions expressed regarding model variants covered by the testing performed in this report.

Deviations from, additions to, or exclusions from the test specifications are described in "Test Report Summary".

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Report No. REP100693

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PHOTOS AND DRAWINGS

Copy of marking label..... :	/
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Photo of the test item..... :	/
-------------------------------	---

OTHER INFORMATION

Modifications..... :	/
----------------------	---

Additional information..... :	/
-------------------------------	---



TEST REPORT
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TEST ENVIRONMENT

Test laboratory	<input type="checkbox"/> KJELLER (Instituttveien 6, N-2007 Kjeller, Norway) <input checked="" type="checkbox"/> LYSAKER (Philip Pedersens vei 11, N-1366 Lysaker, Norway) <input type="checkbox"/> ASKER (Gamle Borgenvei 3, N-1383, Asker)
Environmental conditions	<p>The climatic conditions during the tests are within limits specified by the manufacturer for the operation of the product and the test equipment. The climatic conditions during tests are within the following limits:</p> <p style="margin-left: 40px;"> Ambient temperature: 15 – 35 °C Relative humidity: 25 – 75 %RH Atmospheric pressure: 86 – 106 kPa </p> <p>If explicitly required by the test standard, or the requirements are tighter than the above; the climatic conditions are recorded and documented separately in this test report.</p>
Calibration	<p>All instruments used in the tests of this test report are calibrated and traceable to national or international standards. Between calibrations test set-ups are controlled and verified on a regular basis by intermediate checks to ensure, with 95% confidence that the instruments remain within their calibrated levels. The instrumentation accuracy is within limits agreed by the IEC/CTL and defined by Nemko reference document TM-NO/301.</p>
Measurement uncertainties	<p>Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Environmental chamber uncertainties are calculated according to IEC 60068-3-11. Uncertainty figures are found in an appendix to this report. Further information about measurement uncertainties is provided on request.</p>



TEST REPORT
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TEST REPORT SUMMARY

TEST SUMMARY

Requirements – Tests	Reference standards	Verdict
Solar Radiation	80 hours 1120W/m ² . At the end of test EUT shall subjected to a performance test and examination with the naked eye	Tested

- PASS : Tested and complied with the requirements
- FAIL : Tested and failed the requirements
- N/A : Test not relevant to this specimen (evaluated by the test laboratory)
- : Test not performed (instructed by the applicant)
- * : An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
- # : A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

ABOUT REFERENCE STANDARDS AND TEST LEVELS

Product standards with dated references to basic standards may have been performed according to the newest edition of the basic standard. This may impact the compliance criteria or technical performance of the test, still this is adequate if the test is expected to confirm compliance to the intention of the product standard. The table above lists the actual editions of the basic standards which have been used during testing.



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Test Results



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VISUAL INSPECTION

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Procedure

The specimen and its packaging was visually inspected in order to confirm that no transport damages had occurred.

The specimen was visually inspected upon arrival at the test laboratory. The conformance to drawings and specifications was investigated.

State of the specimen

- Production sample
- Prototype

Conformity

Verdict:

Tested

Test engineer:

Omar Runcie

OBSERVATIONS

The condition of the test specimen and its packaging was good. There were no signs of external damages. The conformance to drawings and specifications was demonstrated.



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SOLAR RADIATION (UV EXPOSURE)

TEST DESCRIPTION

Method
The reference method for this test is listed in the table under clause TEST SUMMARY.

Procedure
The specimen was subject to accelerated weathering.

- The specimen was subject to a performance test after exposure.
- The specimen was examined for external indications of damage after exposure.
- The specimen was examined for ingress of water after test.

Test severity and time range:
80 hours 1120W/m²

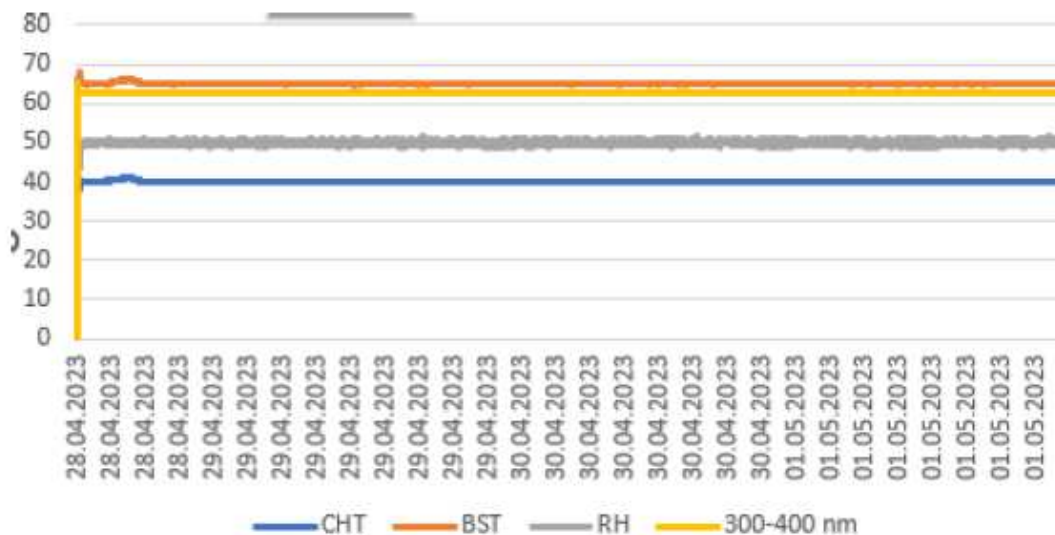
Irradiance:
UVA-340 set to 0.77W/m²/nm

Test Duration:
 80 hrs
 500 hrs
 1006 hrs

Instruments used during measurement
Instrument list: Atlas Suntest XXL+ (N-5058) (04/2024)

Conformity
Verdict: TESTED
Test engineer: Omar Runcie

DETAILED TEST LOG



CONCLUSION
No damages were detected after the applied test(s)









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Annexes



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PHOTOS

<p>Test set-up for UV tests:</p> 		
<p>Test set-up (All samples)</p> 		
<p>Before test 5A20 PLB, original material all parts, Lables in Orajel 3551 / Orajel 293</p> 		
<p>Before test 5A20 PLB, original material in all parts, Lables in Orajel 3551 / Orajel 293</p> 		



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 <p>Before test TRON SA20 PLB; Hoda proposed material, no label</p>	 <p>After test</p>
 <p>Before test Tron SA20 PLB Soft pouch with print outside</p>	 <p>After test</p>
 <p>Before test Tron SA20 PLB Hard pouch</p>	 <p>After test</p>

Oil resistance test

Tron SA20 PLB





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Revision history

Revision	Date	Reason for revision	Author
01	15.05.2023	Issued for release	MK



1 Introduction

The oil resistance test described in IEC 60945 ED4 §8.11, RTCM 11010.4 A.18 and ETSI EN 302 152-1 v1.1.1 §4.2 simulates the effects of mineral oil on equipment.

The requirements of the performance check shall be met. The equipment under testing shall show no signs of damage such as shrinking, cracking, swelling, dissolution or change of mechanical characteristics.

The described test is to verify that all Tron SA20 PLB materials withstands mineral oil as per IEC 60945 ED4 §8.11, RTCM 11010.4 A.18 and ETSI EN 302 152-1 v1.1.1 §4.2.



2 Test Setup

Test equipment:

- Oil, IRM 901 "ASTM Reference Oil for Testing Purposes"
(Replaces the former ASTM oil no. 1, as described in ASTM D471 Standard Test Method)
- Small plastic containers

Test units:

- Cut-out pieces of each item to be tested.
- Cut-out pieces of each item as references

Test method: IEC 60945 ED4, § 8.11

Test date: 01.10.2022

Responsible: Morten Kristensen

Test description:

The EUT are immersed at a temperature of $19\text{ °C} \pm 5\text{ °C}$ for more than 3 h in a mineral oil, IRM 901, and placed into separate plastic containers. The plastic containers have been verified to not influence test results.

After the test, the EUT is cleaned by wiping off oil remnants using paper towels. The EUT are compared to corresponding references using visual inspection in good light conditions.



3 Results

List of EUT shown in figure 1:

1. 103720, Tron SA20 PLB Clear Cap
2. 103724, Tron SA20 PLB Housing
3. 103718, Tron SA20 PLB Gasket, Black
4. 103726, Tron SA20 PLB Red Button
5. 103725, Tron SA20 PLB Black Button
6. 103719, Tron SA20 PLB Antenna Complete
7. 103750, Tron SA20 PLB Button Cover
8. 103953, Ejot PT K22x12 WN1451 A2
9. 104800, Tron SA20 PLB User Guide Label
10. 104802, Tron SA20 PLB Design by Label, same build up for the 104800, 104801 and 104803
11. 104804, Tron SA20 PLB Indicator Label, different text color.
12. 104806, Tron SA20 PLB Seal Label, same build up for the 104807 and 104808.
13. 87196, Loctite 406, used to fasten 103725 and 103726 to 103724



Figure 1: EUT after test



4 Conclusion

EUT were inspected by three persons in good light condition. All EUT were found to be without any signs of damage such as shrinking, cracking, swelling, dissolution or change of mechanical characteristics.

All EUT are verified to withstand mineral oil as per IEC 60945 ED4 §8.11, RTCM 11010.4 A.18 and ETSI EN 302 152-1 v1.1.1 §4.2.

Test passed.



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Report No. REP007192

Test Report

Product	Personal Locator Beacon
Name and address of the applicant	Jotron AS Ringdalskogen 8 3270 Larvik Norway
Name and address of the manufacturer	Jotron AS Ringdalskogen 8 3270 Larvik Norway
Model	Tron SA20
Rating	6.0V DC
Trademark	
Additional information	/
Tested according to	ETSI EN 302 152-1 V1.1.1 (2003-11) IEC/EN 60945:2002 + Cor1:2008
Project number	PRJ0013990
Tested in period	2023-01-11 to 2023-02-22
Issue date	2023-02-22
Name and address of the testing laboratory	Nemko Scandinavia AS Philip Pedersens vei 11, 1366 Lysaker, Norway
  <small>An accredited technical test executed under the Norwegian accreditation scheme</small>	
<div style="display: flex; justify-content: space-around; align-items: center;"><div style="text-align: center;"> Prepared by [Steinar Jensen]</div><div style="text-align: center;"> Approved by [Eспен Eriksen]</div></div>	



TEST REPORT
Report No. REP007192

REPORT REVISIONS

Report Edition	Date	Project	Description
REP007192A	2023-02-22	PRJ0013990	First issued



THIS REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATION(S) TESTED.

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Deviations from, additions to, or exclusions from the test specifications are described in "Test Report Summary".

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TEST REPORT
Report No. REP007192

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TEST REPORT
Report No. REP007192

DESCRIPTION OF TESTED ITEM(S)

Product description	Personal Locator Beacon
Model/type	Tron SA20
Serial number	155
Operating voltage.....	6V DV
Maximum power/current.....	3.5 A
Insulation class	-
Hardware version	2137
Software version	1.3
Mounting position	<input type="checkbox"/> Tabletop equipment <input type="checkbox"/> Wall/ceiling mounted equipment <input type="checkbox"/> Floor standing equipment <input checked="" type="checkbox"/> Handheld equipment <input type="checkbox"/> Rack mounted equipment <input type="checkbox"/> Console equipment <input type="checkbox"/> Other:

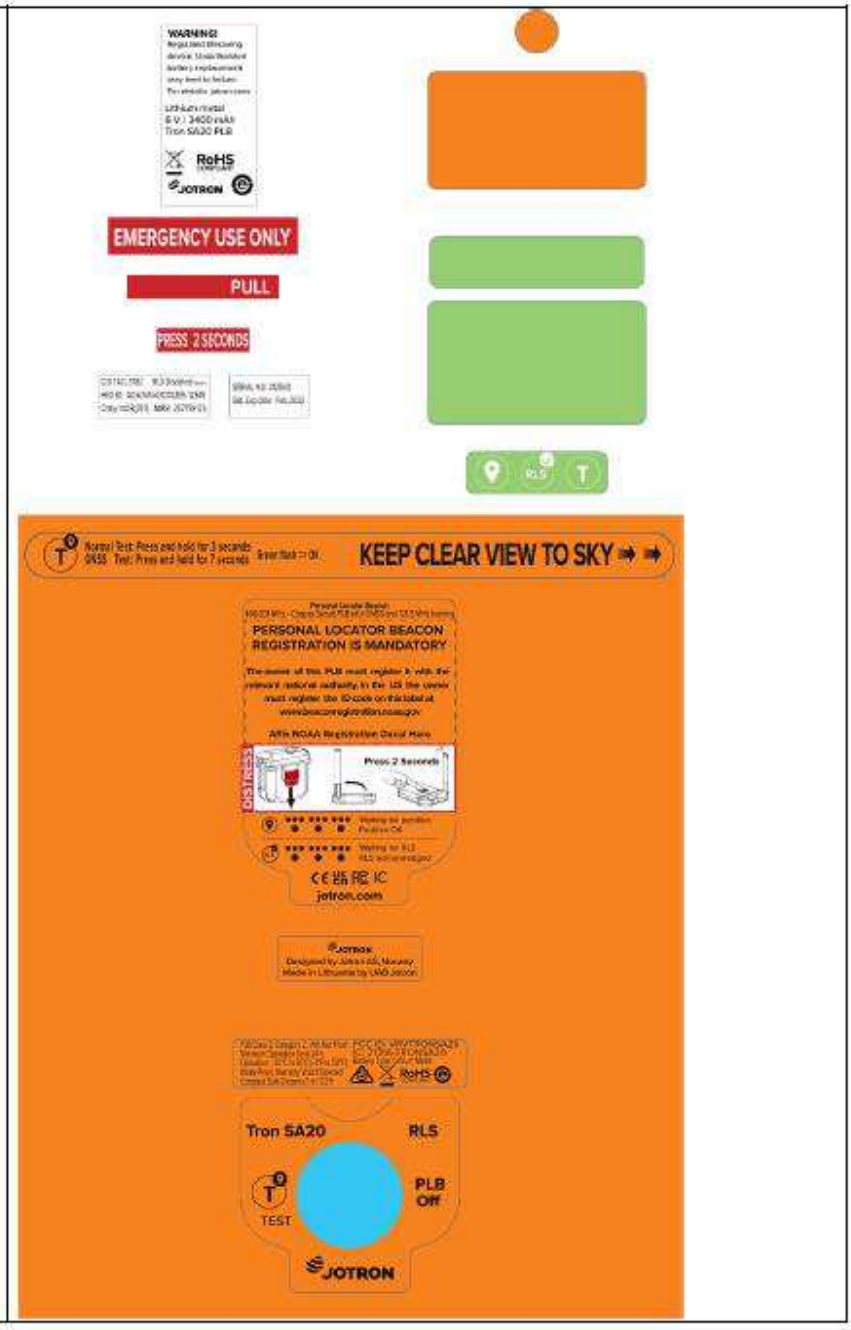
This equipment has been tested with certain cable types and cable configurations. Any changes to these parameters when installed may influence the EMC properties of this equipment.

PHOTOS AND DRAWINGS



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Copy of marking label.....






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TEST REPORT
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TEST ENVIRONMENT

Test laboratory	<input type="checkbox"/> KJELLER (Instituttveien 6, N-2007 Kjeller, Norway) <input checked="" type="checkbox"/> LYSAKER (Philip Pedersens vei 11, N-1366 Lysaker, Norway)
Laboratory accreditation	 Norsk Akkreditering – TEST 033 P05 – Electrical testing P06 – Electromagnetic Compatibility P17 – Environmental testing
Environmental conditions	The climatic conditions during the tests are within limits specified by the manufacturer for the operation of the product and the test equipment. The climatic conditions during tests are within the following limits: Ambient temperature: 15 – 35 °C Relative humidity: 25 – 75 %RH Atmospheric pressure: 86 – 106 kPa If explicitly required by the test standard, or the requirements are tighter than the above; the climatic conditions are recorded and documented separately in this test report.
Calibration	All instruments used in the tests of this test report are calibrated and traceable to national or international standards. Between calibrations test set-ups are controlled and verified on a regular basis by intermediate checks to ensure, with 95% confidence that the instruments remain within their calibrated levels. The instrumentation accuracy is within limits agreed by the IEC/CTE and defined by Nemko.
Measurement uncertainties	Uncertainty in EMC emission measurements stated in this report are calculated from the standard measurement uncertainties multiplied by the coverage factor k=2. It was determined in accordance with CISPR 16-4-2. The true value is in the corresponding interval with a probability of 95%. Uncertainties for continuous immunity tests are calculated based on the same principles as for EMC emission uncertainties. For Harmonics and Flicker measurements the measurement uncertainty is calculated based on the same principles as for EMC emission uncertainties. Uncertainties for transient immunity are kept within the requirements of the relevant basic standard. Environmental chamber uncertainties are calculated according to IEC 60068-3-11. Further information about measurement uncertainties is provided on request
Decision rules	As specified by CISPR 16-4-2; if our measurement uncertainty U_{LAB} is less than or equal to U_{CISPR} , compliance is deemed to occur if no measured disturbance level exceeds the limit hence "PASS" is indicated, and non-compliance is deemed to occur if any measured disturbance level exceeds the limits hence "FAIL" is indicated. For continuous immunity tests, uncertainties are not considered when applying the calibrated test levels. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen. For transient immunity tests, uncertainties are not considered if the test equipment is kept within the requirements of the relevant basic standard. Tests are performed at the test levels specified by the test standard. PASS and FAIL decisions are based on behaviour observations of the specimen. For Harmonics and Flicker measurements the measurement uncertainty is considered, and measurements are marked if necessary. In doing so, the associated uncertainty of measurement has been considered. Further information about decision rules is provided on request.



TEST REPORT
Report No. REP007192

EVALUATION OF PERFORMANCE

PERFORMANCE CRITERIA FOR ENVIRONMENTAL TESTS

Performance criteria is	<input checked="" type="checkbox"/> based on the applied product standard
	<input type="checkbox"/> based on a declaration from the customer
For the specimen to pass each test, it shall meet the following criteria	Runing selftest



TEST REPORT
 Report No. REP007192

TEST REPORT SUMMARY

APPLIED STANDARDS

Standards	Titles
DNV-CG-0339:2021 ETSI EN 302 152-1 V1.1.1 (2003-11)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Satellite Personal Locator Beacons PBLs) operating in the 406,0 MHz to 406,1 MHz frequency band; Part 1: Technical characteristics and methods of measurement
IEC/EN 60945:2002 + Cor1:2008	Maritime navigation and radiocommunication equipment and systems - General requirements - Methods of testing and required test results

TEST SUMMARY

Requirements – Tests	Reference standards	Verdict
Corrosion Test	ETSI EN 302 152-1 V1.1.1 (2003-11)	PASS
Corrosion Test	IEC/EN 60945:2002 + Cor1:2008 EN 60068-2-52:2017, Ed.3.0	PASS

- PASS : Tested and complied with the requirements
- FAIL : Tested and failed the requirements
- N/A : Test not relevant to this specimen (evaluated by the test laboratory)
- : Test not performed (instructed by the applicant)
- * : An asterisk (*) placed after the verdict in the Result column indicates test items that are not within Nemko's scope of accreditation
- # : A grid (#) placed after the verdict in the Result column indicates test items that are only partly covered by Nemko's scope of accreditation. Further information is detailed in the test section

ABOUT REFERENCE STANDARDS AND TEST LEVELS

Product standards with dated references to basic standards may have been performed according to the newest edition of the basic standard. This may impact the compliance criteria or technical performance of the test, still this is adequate if the test is expected to confirm compliance to the intention of the product standard. The table above lists the actual editions of the basic standards which have been used during testing.

The choice of immunity test levels could be higher than those specified by the reference standards when we consider the nature of the specimen and its intended use or based on customer requests.

NOTES

None



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Test Results



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CORROSION TEST

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Procedure

The equipment shall be turned off during test.

Precondition room temperature 2 hours

48 hours salt fog

24 hours room room temperature

12 hours salt fog

12 hours room temperature

Salt compound:

- 1 kg NaCl dissolved in 19 litres of demineralized water.
- 34.51g compound (in accordance with Table B of LR TS No.1) dissolved in demineralized water to volume 1 litre.

Damp heat conditioning:

- +35 °C 90-95 % RH
- +40 °C 90-95 % RH
- Other:

Rate of Change:

- 3 hours
- Other: Specified in standard

Uncertainty figures: Temperature: $\pm 2.5K$; Humidity: $\pm 6 \%RH$

Instruments used during test

Instrument list: Salt Spray Chamber: Ascott / 51300ip (N-4787) (09/2023)

Conformity

Verdict:

PASS

Test engineer:

Steinar Jensen

OBSERVATIONS

No corrosion damages were observed after the applied test.



TEST REPORT
Report No. REP007192

CORROSION TEST

TEST DESCRIPTION

Method

The reference method for this test is listed in the table under clause TEST SUMMARY.

Procedure

The specimen was subject to 4 cycles of salt mist exposure followed by a damp heat conditioning period.

- First part of the cycle was a 2h exposure to salt mist in a salt spray chamber at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
- Second part of the cycle was a 7 day conditioning period in damp heat conditions.

State of the specimen during conditioning

The specimen was left de-energized during the whole test.

Initial measurements

Functional test was performed before test.
 Insulation Resistance test.

Final measurements

After test, the specimen was dried and then visually inspected for any damages and/or corrossions.
 Functional test was performed after test.
 Insulation Resistance test.

Salt compound:

1 kg NaCl dissolved in 19 litres of demineralized water.
 34.51g compound (in accordance with Table 8 of LR TS No.1) dissolved in demineralized water to volume 1 litre.

Damp heat conditioning:

$+35^{\circ}\text{C}$ 90-95 % RH
 $+40^{\circ}\text{C}$ 90-95 % RH
 Other:

Rate of Change:

3 hours
 Other:

Uncertainty figures: Temperature: $\pm 2.5\text{K}$; Humidity: $\pm 6\% \text{RH}$

Instruments used during test

Instrument list: Salt Spray Chamber: Ascott / 51300ip (N-4787) (09/2023)
Climatic Chamber: Vötsch / VC 4100 (N-4341) (09/2023)

Conformity

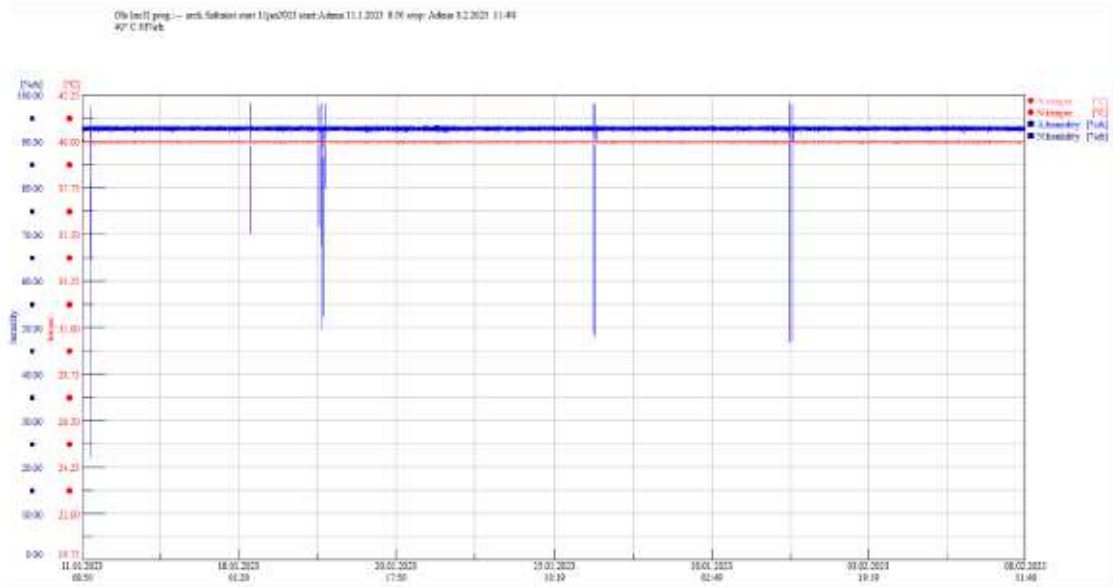
Verdict: **PASS**

Test engineer: **Steinar Jensen**



TEST REPORT
Report No. REP007192

DETAILED TEST LOG



OBSERVATIONS

No corrosion damages were observed after the applied test.



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Annexes



TEST REPORT
Report No. REP007192

PHOTOS

