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Report On

Emergency Beacons Testing of the
Jotron AS
Tron SA20
In accordance with Cospas-Sarsat T.007

Document 75956621 Report 08 Issue 3

October 2023



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REPORT ON

Emergency Beacons Testing of the
Jotron AS
Tron SA20

Document 75956621 Report 08 Issue 3

October 2023

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DATED

17 October 2023





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SECTION 1

REPORT SUMMARY

Emergency Beacons Testing of the
Jotron AS
Tron SA20



1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Jotron AS Tron SA20 to the requirements of Cospas-Sarsat T.007.

The scope of testing was defined between C/S and the Manufacturer.

Objective	To perform Emergency Beacon Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Jotron AS
Model Number(s)	Tron SA20
Serial Number(s)	101 115 120 157
Number of Samples Tested	4
Test Specification/Issue/Date	Cospas-Sarsat T.007 Issue 5 Rev 9 November 2022
Date of Receipt of Test Samples	8 December 2022
Order Number	P55347
Date	16 September 2022
Start of Test	09 December 2022
Finish of Test	22 May 2023
Name of Engineer(s)	P Adams M Sellers C Bland
Related Documents	Cospas-Sarsat T.001 Issue 4 Rev 10 Nov 2022 Cospas-Sarsat T.IP (TCXO) Issue 1 Rev 5 Oct 2013



1.2 APPLICATION FORM

G.1 - Beacon Manufacturer and Beacon Model	
Beacon Manufacturer	Jotron AS
Beacon Manufacturer's Address	Ringdalskogen 8, 3270 Larvik
Beacon Model Name	Tron SA20
Additional Beacon Model Names	

G.1 - Beacon Type and Operational Configurations			Tick Where Appropriate (X)
Beacon Type	Beacon Used While		
EPIRB Float Free	Floating in water or on deck or in a safety raft		
EPIRB Non-Float Free (automatic and manual activation)	Floating in water or on deck or in a safety raft		
EPIRB Non-Float Free (manual activation only)	Floating in water or on deck or in a safety raft		
EPIRB Float Free with VDR	Floating in water or on deck or in a safety raft		
PLB	On ground and above ground		x
	On ground and above ground and floating in water		
	On ground, above ground, and on a personal flotation device*		
ELT Survival	On ground and above ground		
	On ground and above ground and floating in water		
ELT Auto Fixed	Fixed ELT with aircraft external antenna		
ELT(DT)	Distress Tracking ELT with aircraft external antenna		
ELT Auto Portable	In aircraft with an external antenna		
	On ground, above ground, or in a safety raft with an integrated antenna		
ELT Auto Deployable	Deployable ELT with attached antenna		
Other (specify)			

* Applicable only to PLBs with integral antennas operated while attached to personal flotation devices (e.g. lifejackets) where the PLB and its antenna are mounted on PFD in such a position, that, in the nominal mode of operation, they are kept above water.



G.1 - Beacon Characteristics		
Characteristic	Declared Value	
Operating frequency (406 MHz operating channel = 406.nnn)	406.031 MHz	
Operating temperature range	Tmin = -20 °C Tmax= 55 °C	
Temperature, at which minimum duration of continuous operation is expected (Submit C/S T.007 Section 5, part s, if applicable)	Tmin ☒	or Other (nn °C)
Manufacturer-declared Minimum Operating Lifetime* * this value is specified by National Administrations or International Organisations	Yes	24 hours
	No	48 hours, or
	No	168 hours, or
	No	Other hours
	<< Specify >>	
Beacon power supply type (internal non-rechargeable, internal re-chargeable, external, combined, other)	Internal non-rechargeable	
External power supply parameters (AC/DC, nominal voltage, nominal minimum and nominal maximum voltage)	Current (AC / DC): << AC / DC >>	
	Nominal Voltage (V): << Nominal Voltage >>	
	Nominal Minimum Voltage (V): << Nominal Minimum Voltage >>	
	Nominal Maximum Voltage (V): << Nominal Maximum Voltage >>	
Is external power supply needed to energise the beacon or its ancillary devices in any of operational modes (N/A or Yes or No)	N/A	



Battery cell chemistry	Lithium/Iron Disulfide (Li/FeS2)	
Battery cell model name, cell size, number of cells in a battery pack, and details of the battery pack electrical configuration	Cell Model Name:	L91
	Cell Size:	AA size
	Number of Cells in Battery Pack:	4
	Details of the battery pack electrical configuration:	4S
Battery cell manufacturer	Enerizer	
Battery pack manufacturer and part number	Battery Pack Manufacturer Name:	Jotron AS
	Battery Pack Part Number:	103929
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	years	
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	years	
Oscillator type (e.g. OCXO, MCXO, TCXO)	12.5	
Oscillator manufacturer	TCXO	
	RAKON	
Oscillator model name/ part number	Model Name:	Pluto
	Part Number:	E8149LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes	
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integral	
Antenna manufacturer	Jotron AS	
	OEM Model Name:	N/A
Antenna part name and part number (OEM, if applicable, and beacon manufacturer's)	OEM Part Number:	N/A
	Beacon Manufacturer's Model Name:	N/A
	Beacon Manufacturer's Part Number:	103719
Antenna cable assembly min/max RF- losses at 406 MHz, if applicable	Minimum loss (dB):	
	Maximum loss (dB):	
Navigation device type (Internal, External or None)	Internal	
Features in beacon that prevent degradation to 406 MHz signal or other beacon performances resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	Yes	



Features in beacon that ensure erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes	
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes	
Encoded position update capability (Yes, No, N/A) and	Yes	
Encoded position update interval value (range)	4:45 - 6:00	minutes
For Internal Navigation Devices		
Geodetic reference system (WGS 84 or GTRF)	WGS 84	
GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes	
Navigation device manufacturer	µ-Blox	
Navigation device model name and part Number	Model Name: MAX-M10	
	Part Number: MAX-M10S	
Internal navigation device antenna type(integrated, internal, external, passive/active) , manufacturer and model	Integrated	
GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS, Galileo, Glonass	
For External Navigation Devices		
Data protocol for GNSS receiver to beacon interface		
Physical interface for beacon to navigation device		
Electrical interface for beacon to navigation device		
Part number of the external navigation interface device (if applicable)		
Navigation device model and manufacturer (if beacon designed to use specific devices)		
Self-Test Mode Characteristics:	Self-Test Mode	Optional GNSS Self-test Mode
Activated by a separate switch/ separate switch position (Yes or No)	Yes	Yes
Self-test/GNSS self-test mode switch automatically returns to normal position when released (Yes or No)	Yes	Yes
Self-test/ GNSS self-test activation can cause an operational mode transmission (Yes or No)	No	No
Results in transmission of a single self-test burst only, regardless of how long the self-test activation mechanism is applied (Yes or No)	Yes	Yes



Results of self-test / GNSS self-test are indicated by (provide details, e.g. Pass / Fail indicator light, strobe light, etc.)	1 Test-LED flash Green= OK Test-LED flashes RED= Fail	1 Test-LED flash Green= OK Test-LED flashes RED= Fail
The content of the encoded position data fields of the self-test message has default values	Yes	N/A
Performs an internal check and indicates that RF-power is being emitted at 406 MHz and 121.5 MHz, if beacon includes a 121.5 Hz homer (Yes or No)	Yes	Yes
Self-test results in transmission of a signal other than at 406 MHz (Yes & details or No)	Yes, 121.5 MHz	Yes, 121.5 MHz
Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
List of Items checked by self-test	RF-transmitters, Sufficient energy (PIE), GNSS functional test, Check for RLS protocol	RF-transmitters, Sufficient energy (PIE), GNSS functional test, GNSS position acquired, Check for RLS protocol, Max number of GNSS self-tests
Self-test/ GNSS self-test 406 MHz burst duration (440 or 520 ms)	520 ms	520 ms
Self-test message length format flag in bit 25, ("0" or "1")	"1"	"1"
Maximum duration of a self-test mode, sec	9	150
Maximum recommended number of self-tests / GNSS self-tests during battery pack replacement period (as applicable)	150	60
Distinct indication of self-test start (Yes or No)	Yes	Yes
Indication of self-test results (Yes or No)	Yes	Yes
Distinct indication of insufficient battery capacity (Yes or No)	Yes	Yes
Automatic termination of self-test mode immediately after completion of the self-test cycle (Yes or No)	Yes	Yes
GNSS Self-test results in transmission of a single burst, irrespectively of the test result (Yes or No)	N/A	No
Self-test / GNSS self-test can be activated from beacon remote activation points (Yes & details or No)	No	No
List all methods of Self-test mode and GNSS Self-test modes activation. Provide details on a separate sheet to describe	Press TEST button in 2 seconds, test-LED lights up.	Press TEST button in 7 seconds, test-LED and GNSS LED lights up
Repetitive Automated Interrogation of a Beacons Status (Yes & details per section 5.1, item (y), or No)	No	



Message Coding Protocols	Protocol Option	Tick Where Appropriate (X)
User Protocol	Maritime with MMSI	
	Maritime with Radio Call Sign	
	EPIRB Float Free with Serial Number	
	EPIRB Non Float Free with Serial Number	
	Radio Call Sign	
	Aviation	
	ELT with Serial Number	
	ELT with Aircraft Operator and Serial Number	
	ELT with Aircraft 24-bit Address	
	PLB with Serial Number	
	National (Short Message Format)	
	National (Long Message Format)	
	EPIRB with MMSI	X
Standard Location Protocol	EPIRB with Serial Number	X
	ELT with 24-bit Address	
	ELT with Aircraft Operator Designator	
	ELT with Serial Number	
	PLB with Serial Number	X
	National Location: EPIRB	
National Location Protocol	National Location: ELT	
	National Location: PLB	X
	ELT with Serial Number	
ELT(DT) Location Protocol	ELT with Aircraft Operator and Serial Number	
	ELT with Aircraft 24-bit Address	
	ELT with Serial Number and 3LD in PDF-2	
	ELT with Aircraft 24-bit Address and 3LD in PDF-2	
	EPIRB	X
RLS Location Protocol (TAC or NRN and Serial Number)	ELT	
	PLB	X
	EPIRB	X
RLS Location Protocol (MMSI)	PLB	X
	Maritime with MMSI	
	Maritime with Radio Call Sign	
User Location Protocol	EPIRB Float Free with Serial Number	



	EPIRB Non Float Free with Serial Number	
	Radio Call Sign	
	Aviation	
	ELT with Serial Number	
	ELT with Aircraft Operator and Serial Number	
	ELT with Aircraft 24-bit Address	
	PLB with Serial Number	



Other Declarations	Declared Value		
Beacon includes a homer transmitter(s) (Yes or No)	Yes		
	Frequency	Power (dBm)	Yes / No
	121.5 MHz	17dbm±3 dB	Yes
	243.0 MHz	<< Power >>	No
	AIS		No
	Other (MHz)	>27 dBm	No
	<< frequency >>	<< Power >>	<< Yes / No >>
	Description:	<< Description >>	
	96% DC for 121.5 MHz	%	
	35	%	
	Yes		
	>0.75	cd	
	21	flashes per minute	
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)	Yes		
Other ancillary devices (e.g. voice transceiver, remote control, external audio and light indicators, external activation device). List details on a separate sheet if insufficient space to describe.	Night vision low-duty cycle light		
Beacon includes automatic activation mechanism (Yes or No). Specify type of automatic beacon activation mechanism	Yes / No :	No	
	Description:		
	Yes / No :	No	
	If Yes, specify: (dBm)	<<dBm>>	
	If Yes, specify: (MHz)	<<MHz>>	
	Yes / No :	<< Yes / No >>	
	"Time-out timer" (minutes):	<< minutes / n/a >>	
	On time (hours : minutes):	<< hours >> : <<minutes>>	
Beacon includes a voice-transceiver (Yes or No), and if Yes specify: Voice transmitter nominal output power Voice transmitter operating frequencies - provides prevention against continuous operation of voice transmitter (Yes or No), and if Yes specify: - maximum continuous voice-transmission operation ("time-out timer") - maximum cumulative transmit-mode on-time ("On time")			



Beacon includes features and functions not listed above, related or non-related to 406 MHz (Yes or No). List features and use a separate sheet if insufficient space	Yes	
	Description:	NFC - Tag
	P/N 103675 Rev 03	
	104721 Rev 1.3 (30. Nov 2022)	
	N/A	
	P/N 103905 - Rev 2137	
Beacon model hardware part number (P/N) and version	No	
Beacon model multiple programmable options, except message coding protocols (Yes/No)	If Yes, List all programmable options associated with this type-approval application:	
Known non-compliances with C/S T.001 requirements (Yes or No). If Yes, provide details (Submit C/S T.007 Section 5, part t, if applicable)	No	
Beacon Manufacturer Point of Contact (POC) for this Type Approval application:		
Name and Job Title:	Frank Løke, Certification Manager, Jotron AS	
Phone:	+47 90 01 30 51	
E-mail:	frank.loke@jotron.com	
Dated(*) 12.10.2023		
Signed(*) 		
(Name, Position and Signature of Beacon Manufacturer Representative)		



Information Provided by the Cospas-Sarsat Accepted Test Facility

Name and Location of Beacon Test Facility: TÜV SÜD, United Kingdom

Date of Submission for Testing: 8 December 2022

Applicable C/S Standards:

Document	Issue	Revision	Date
C/S T.001	4	10	November 2022
C/S T.007	5	9	November 2022
IP (TCXO)	-	5	October 2013

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the Cospas-Sarsat Type Approval Standard (C/S T.007) and complies with the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001) as demonstrated in the attached report.

Detail any observed non-compliances and/or deviations from standard test procedures here:

Non-compliances:

For MTS analysis the EUT fails to comply with the limits stated in Cospas-Sarsat IP (TCXO) – Rev.5 October 2013. However, the results fall within the MU provided in Cospas-Sarsat IP (TCXO) – Rev.5 October 2013.

Deviations:

None

Notes:

The manufacturer has provided a statement (see Annex A, Manufacturer Supplied Information) identifying a transmission loss in the BNC antenna to pin-head adapters fitted on the conducted samples provided for this approval. The transmission loss is as follows:

- 406 MHz: +0.3 dB, and
- 121.5 MHz: +0.1 dB.

The results in Test Results Table include the raw power measurement along with results which have the 406 MHz offset with applied offset in brackets next to the measured values.

Signed:

Name:

Martin Hardy

Position Held:

Authorised Signatory

Date:

17 October 2023

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Jotron AS Tron SA20 as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test

1.3.2 Physical Test Configuration

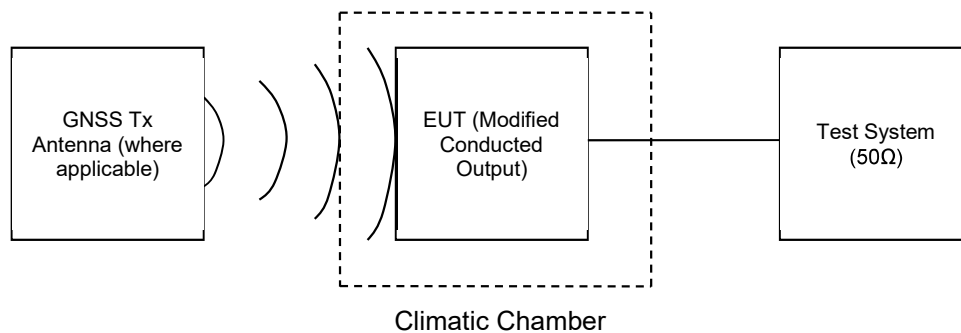
The Equipment Under Test (EUT) was operated using its own power source (internal battery). One EUT was configured so that the antenna port was connected to the 50 Ω test system using a coaxial cable (S/N 101). See the note section above regarding a manufacturer declared cable loss for the conducted samples. The test configuration for all tests is identical with the exception of Antenna Characteristics and Satellite Qualitative.

Two fully packaged beacons were supplied, similar to the proposed production beacons equipped with their proper antennas (S/N 115, 157). One EUT was used to perform Antenna Characteristics (157) and the second for Satellite Qualitative (115). The test configuration for these tests is a function of the beacon type and the operational environments supported by the beacon, as declared by the manufacturer.

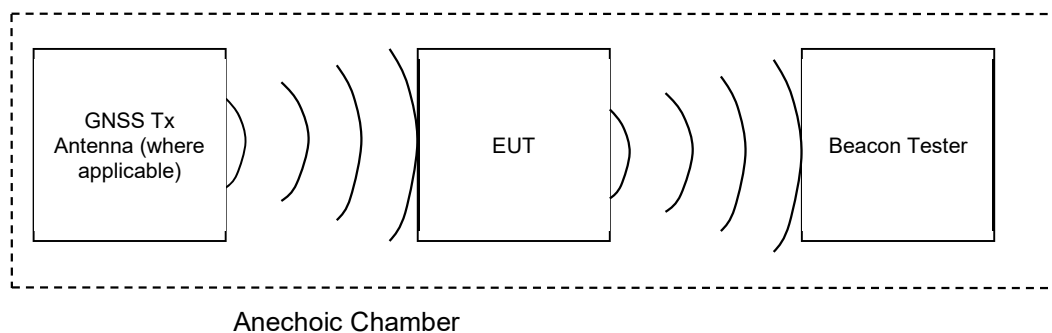
The final EUT was a fully packaged beacon with an additional NMEA data output which enabled monitoring of the GNSS Receiver for the RLM Reception Verification tests (S/N 120).

System Configurations

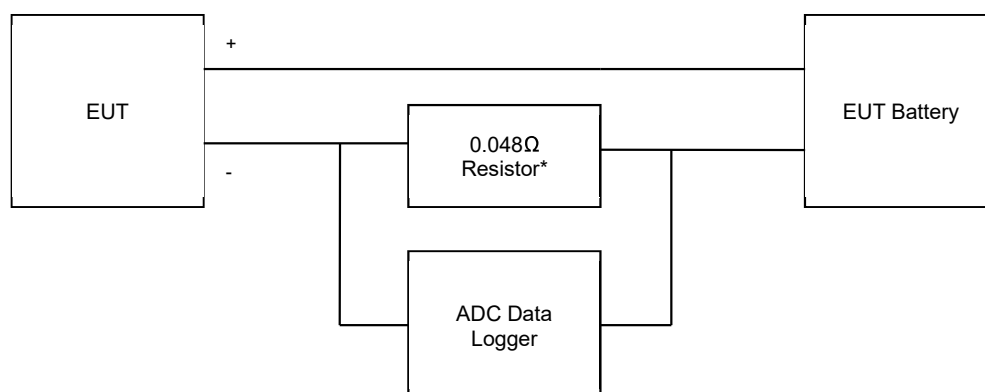
Conducted Laboratory Tests



A.3.8.3 Navigation Test



Battery Current Measurements



Note: The resistor in series with negative line of battery

* Removed for Standby mode measurements



For other Navigation, Satellite and Antenna test configurations, see photographs in section 4 of this report.

Further Information

Battery current measurements (see 'Operating lifetime', section 2.7) concluded that the 'worst case' (highest current) operating mode of the EUT was On at EUT (A3) (GNSS Search), subject to the EUT Duty cycle (see Manufacturer document "Statements and descriptions" Rev 03 in Annex A). All tests were carried out in this mode.

The Battery conditioning was performed with a 0.07 h deficit. This was taken into account with the test results provided.

The EUT is fitted with a TCXO. The model and serial number of this oscillator used for this Type Approval is Model: E8149, S/No: VP8476.

The EUT is fitted with an internal GNSS receiver. From cold start, without GNSS signal data present, the duty cycle of the receiver is as described in the manufacturer information (see Annex A). After a 15 minute warm up, electrical and functional tests were carried out for 30 minutes to ensure that measurements were made during periods when the GNSS receiver was active and inactive.



1.3.3 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Off/Standby Mode

- No apparent Activity

NFC Mode

- Interrogate the NFC device with an NFC field

Self-test

- Black "Test" Button held and released after 2 seconds.
- List of items checked as per Customer Supplied Information (Application Form)
- No Navigation data applied.

Long/GPS/GNSS Self-test

- Black "Test" Button held and released after 7s
- List of items checked as per Customer Supplied Information (Application Form)
- Navigation data applied as applicable (e.g. none applied for timeout, data applied for 'fast acquisition')

Operating

- Slide the red cover down. Unfold and tilt the antenna into the vertical position. Press the Red "ON" Button for 2s.
- 121 Homer active and offset
- GNSS operating in normal duty cycle.
- No navigation data applied (unless otherwise stated).

All modes

All mode descriptions are applicable to all tests unless otherwise stated.

All Navigation input descriptions are applicable to all tests unless otherwise stated.



1.4 TEST LOCATIONS

Satellite Qualitative/Navigation test A.3.8.2.1: Daedalus Airfield, Lee-on-the-Solent, Hants, UK
All other tests: Octagon House Laboratory, Fareham, Hampshire, UK

1.5 MODIFICATIONS

Modification 0 - No modifications were made to the test sample during testing.

1.6 REPORT MODIFICATION RECORD

Issue 1 – First Issue

Issue 2 – Update to manufacturer supplied information and Table F.E-5.

Issue 3 – Decoded messages throughout the report inspected and corrected. Digital message generator requirements updated in summary table. Beacon coding software summary table updated with full file name declared by manufacturer. Position data encoding summary table updated with full file name declared by manufacturer. Navigation test results for A.3.8.3 have been updated to reflect the correct limits and the results have been updated to reflect the testing performed. The RLS GNSS Receiver Tracking Test in the summary table has been updated to reflect the correct limits. Battery current pre-discharge calculation amended. Annex G updated as supplied by Manufacturer.



SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
Jotron AS
Tron SA20



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						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Transmitter power output	35 - 39 (maximum) (minimum)	dBm	36.40 (36.70)* 36.31 (36.61)*	36.35 (36.65)* 36.33 (36.63)*	36.36 (36.66)* 36.35 (36.65)*	*Power offset applied
Power output rise time	< 5 (maximum) (minimum)	ms	1.896 1.876	1.869 1.847	1.808 1.775	
Power output 1ms before burst	< -10 (maximum) (minimum)	dBm	-19.98 -33.81	-21.73 -37.04	-22.03 -34.51	
2. Digital Message Coding						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Bit Sync	1 - 15	P / F	P	P	P	
Frame sync	16 - 24	P / F	P	P	P	
Format flag	25	bit value	1	1	1	
Protocol flag	26	bit value	0	0	0	
Identification / position data	27 - 85	P / F	P	P	P	
BCH code	86 -106	P / F	P	P	P	
Emerg. Code/nat. use/supplem. Data	107 - 112	bit value	111000	111000	111000	
Additional data / BCH (if applicable)	112 - 144	P / F	P	P	P	
Position Error (if applicable)	< 5	km	N/A	N/A	N/A	
Result: Pass						



Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
3. Digital Message Generator						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Repetition rate, T _R :						
Average T _R	48.5 ≤ T _{Ravg} ≤ 51.5	seconds	49.867	50.125	50.011	
Minimum T _R	47.5 ≤ T _{Rmin} ≤ 48.0	seconds	47.863	47.839	47.706	
Maximum T _R	52.0 ≤ T _{Rmax} ≤ 52.5	seconds	52.301	52.288	52.32	
Standard deviation	0.5 - 2.0	seconds	1.363	1.568	1.394	
Bit rate						
Minimum fb	≥ 399.6	bits/sec	399.91	399.91	399.91	
Maximum fb	≤ 400.4	bits/sec	400.00	400.00	400.00	
Total transmission time						
Short message	(maximum)	ms	N/A	N/A	N/A	
	(minimum)		N/A	N/A	N/A	
Long message	(maximum)	ms	521.258	521.461	521.602	
	(minimum)		521.187	521.437	521.562	
Unmodulated carrier						
Minimum T1	≥ 158.4	ms	159.055	159.180	159.242	
Maximum T1	≤ 161.6	ms	159.125	159.211	159.602	
First burst delay	≥ 47.5	seconds	53.9	53.8	53.4	
Result: Pass						



Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
4. Modulation						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Biphase-L		P / F	P	P	P	
Rise time	(maximum)	50 - 250	129.5	138.7	130.5	
	(minimum)	50 - 250	137.8	130.3	137.3	
Fall time	(maximum)	50 - 250	137.1	136.0	135.8	
	(minimum)	50 - 250	129.5	129.8	130.4	
Phase deviation: positive	(maximum)	+(1.0 to 1.2)	1.146	1.126	1.121	
	(minimum)	+(1.0 to 1.2)	1.050	1.053	1.054	
Phase deviation: negative	(maximum)	-(1.0 to 1.2)	-1.155	-1.140	-1.139	
	(minimum)	-(1.0 to 1.2)	-1.060	-1.070	-1.073	
Symmetry measurement		≤ 0.05	0.02932	0.02910	0.02949	
5. 406 MHz Transmitted Frequency						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Nominal Value	(maximum) (minimum)	C/S T.001	406.031104983 406.031105171	406.031056712 406.031056908	406.031097565 406.031098744	
Short-term stability	(maximum) (minimum)	≤ 2x10 ⁻⁹	2.24E-10 1.69E-10	2.04E-10 1.80E-10	2.03E-10 1.75E-10	
Medium-term stability – Slope	(maximum) (minimum)	(-1 to +1)x10 ⁻⁹	4.59E-11 -1.88E-10	3.86E-11 1.88E-11	3.72E-10 7.31E-11	
Medium-term stability – Residual frequency variation	(maximum) (minimum)	≤ 3x10 ⁻⁹	5.05E-10 1.90E-10	1.66E-10 9.57E-11	3.46E-10 1.60E-10	
6. Spurious Emissions into 50ohms						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
In band (406.0 – 406.1 MHz)		C/S T.001 mask	P	P	P	
Result: Pass						



Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
7. 406 MHz VSWR Check						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Nominal Value	(maximum) (minimum)	C/S T.001	406.0311048 406.0311033	406.0310573 406.0310575	406.0311005 406.0311002	
Modulation rise time	(maximum) (minimum)	50-250	139.1 129.7	137.7 130.4	137.5 130.1	
Modulation fall time	(maximum) (minimum)	50-250	136.8 129.5	136.4 129.5	136.3 130.4	
Modulation phase deviation: positive	(maximum) (minimum)	+ (1.0 to 1.2)	1.130 1.040	1.126 1.039	1.124 1.059	
Modulation phase deviation: negative	(maximum) (minimum)	- (1.0 to 1.2)	-1.157 -1.066	-1.154 -1.072	-1.140 -1.069	
Modulation symmetry measurement		≤ 0.05	0.02945	0.02957	0.02959	
Digital Message		correct	P	P	P	
Result: Pass						



Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
8(a). Self-test Mode						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Frame sync	011010000	P / F	P	P	P	
Format flag	1 / 0	bit value	1	1	1	
Single radiated burst	≤440 / 520 (±1%)	ms	521.38	521.50	521.67	
Default position data (if applicable)	correct	P / F	P	P	P	
Description	provided	Y / N		Y		
Design data on protection against repetitive self-test mode transmissions	provided	Y / N		Y		
Single burst verification	one burst	P / F	P	P	P	
Provides for 15 Hex ID	correct	P / F	P	P	F	
121.5 MHz RF power (if applicable)	verify that RF power emitted	P / F	P	P	P	
406 MHz power	verify that RF power emitted	P / F	P	P	P	
Distinct indication of Self-Test	provided	Y / N	Y	Y	Y	
Distinct indication of RF power being emitted	provided	Y / N	Y	Y	Y	
Indication of Self-Test result	provided	Y / N	Y	Y	Y	
Distinct indication of insufficient battery capacity	provided	Y / N		Y		
Maximum duration of Self-Test mode	≤ maximum duration of Self-Test	sec	8	8	8	
Automatic termination of Self-Test mode upon completion of Self-Test and indication of Self-Test results	verify automatic termination, irrespective of the switch position	Y / N	Y	Y	Y	
Manufacturer specified value: 9						

Result: Pass



Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			Tmin	Tamb	Tmax	
			(-20°C)	(+21°C)	(+55°C)	
8 (b). GNSS Self-Test Mode (if applicable)						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Frame sync	011010000	P / F	P	P	P	Manufacturer specified value: 150 Manufacturer specified number: 60
Format flag	1 / 0	bit value	1	1	1	
Radiated burst duration	≤ 520 (+1%) must be within 500 m (or 5.25 km for User Location Protocol) of the actual position	ms	521.38	521.5	521.5	
Position data except for ELT (DT) (if applicable)	must be within 200 m of the actual horizontal position and 700 m of the altitude	P / F	P	P	P	
Position data for ELT(DT)		P / F	N/A	N/A	N/A	
Position data from External Navigation Input	must be within 200m (or 5.25 km for User Location Protocol) of the location data obtained from the external navigation interface	P / F	N/A	N/A	N/A	
Design data showing how GNSS Self-test is limited in number of transmissions and duration	provided	Y / N		Y		
Single burst verification (if applicable)	one burst	P / F	P	P	P	
121.5 MHz RF power (if applicable)	verify that RF power is emitted	Y / N	Y	Y	Y	
406 MHz power (if applicable)	verify that RF power is emitted	Y / N	Y	Y	Y	
Maximum duration of GNSS Self-tests	Manufacturer to specify value	s	133	136	134	
Actual duration of Self-test with encoded location	Less than maximum duration	s	34	40	33	
Maximum number of GNSS Self-tests (only beacons with internal navigation devices)	Manufacturer to specify number	Number		60		
Distinct indication to register successful completion or failure of the GNSS self-test	must be provided	Y/N	Y	Y	Y	
Distinct indication that a maximum number of GNSS self-tests has been attained after GNSS self-test mode activation and without transmission of a test message or further GNSS receiver current drain	must be provided	Y/N		Y		
Automatic termination of the GNSS self-test mode upon completion of the GNSS self-test cycle and indication of the results	verify automatic termination of GNSS self-test mode, irrespective of the switch position	Y / N	Y	Y	Y	

8 (b). GNSS Self-Test Mode (if applicable)

Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0

Result: Pass



Parameters to be Measured	Range of Specification	Units	Test Results	Comments
9. Thermal Shock				
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0				
Soak Temperature	30°C difference	°C	22	*Power offset applied
Measurement Temperature		°C	-8	
Transmitted Frequency			Min	
Nominal value			Max	
Short-term stability	C/S T.001 ≤ 2x10 ⁻⁹	MHz	406.0310831	
Medium-term stability – Slope	(-2 to +2)x10 ⁻⁹	/100ms	1.59E-10	
Medium-term stability – Residual frequency variation	≤ 3x10 ⁻⁹	/min	-1.19E-10	
Transmitter power output	35 - 39	dBm	9.36E-11	*Power offset applied
Digital message	correct	P/F	36.27 (36.57)*	
			P	



Parameters to be Measured	Range of Specification	Units	Test Results	Comments
10. Operating Lifetime at Minimum Temperature				
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0				
Pre-test battery discharge duration (operating) required		Hours	7.71	Discharged at a constant current of 50mAh.
Pre-test battery discharge duration (operating) Duration	>24	Hours	8.73	
Effective Operating Lifetime duration	>24	Hours	36.93 Hours at Tmin = -20°C 36.93 Hours at Tmin = -20°C	Time to first failure 36:56:47
Transmitted Frequency			Min Max	Min/Max results are up to the manufacturer declared lifetime of 24hrs. MTS results exclude the first 30 mins of data (included in the test results section of this report).
Nominal value	C/S T.001	MHz	406.0311019	
Short-term stability	$\leq 2 \times 10^{-9}$	/100ms	6.68E-11	
Medium-term stability – Slope	(-1 to +1) $\times 10^{-9}$	/min	-6.44E-11	
Medium-term stability – Residual frequency variation	$\leq 3 \times 10^{-9}$		6.94E-11	
Transmitter power output	35 - 39	dBm	36.64 (36.94)*	*Power offset applied
Digital message	correct	P/F	P	
Homer transmitter continuous operation during the lifetime test		hours	42.7	
Homer frequency			Start of Test End of Test	End of test taken as 24hrs (Manufacturer declared lifetime).
Homer peak power level		MHz	121.499498998	
Homer transmitter duty cycle		dBm	21.8 (21.9)*	*Power offset applied
		%	98.92	
			98.89	



Parameters to be Measured	Range of Specification	Units	Test Results		Comments
11. Temperature Gradient (5°C/hr)					
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0					
Full Test					
Transmitted Frequency	C/S T.007 ≤ 2x10 ⁻⁹ (-1 to +1)x10 ⁻⁹ (-2 to +2)x10 ⁻⁹ ≤ 3x10 ⁻⁹ 35 – 39 correct	MHz	Min	Max	Data for points A to B, C+15 min to D and E+15 min to F Data for points B to C+15 min and D to E+15 min *Power offset applied
Nominal value			406.0310489	406.0311085	
Short-term stability		/100ms	1.40E-10	2.33E-10	
Medium-term stability – Slope ¹		/min	-8.38E-11	4.46E-10	
Medium-term stability – Residual frequency variation		/min	-8.34E-10	7.39E-10	
Transmitter power output	35 – 39 correct	dBm	6.56E-11	1.44E-09	*Power offset applied
Digital message		P/F	36.01 (36.31)*	36.23 (36.53)*	
12. Oscillator Aging					
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State					
5 year carrier nominal frequency variation	provided	Y / N	Y		* The EUT fails to comply with the limits stated in Cospas-Sarsat IP (TCXO) – Rev.5 October 2013. However, the results fall within the MU provided in Cospas-Sarsat IP (TCXO) – Rev.5 October 2013.
MTS analysis (if applicable)	Must demonstrate compliance	P / F	F *		
13. Protection Against Continuous Transmission					
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0					
Description	provided	Y / N	Y		Applicant's data, see Annex A for details



14. Satellite Qualitative Tests						Result: Pass
Model: Tron SA20, S/N: 115, TUV Ref: TSR5 and Modification State 0						
Test Configuration	As per C/S T.007	P / F	Configuration			
			5	6	7	8
15 Hex ID Decoded by LUT	correct		N/A	N/A	P	P
Doppler Location results with error ≤ 5km	≥ 80	%	N/A	N/A	100	94.7
Result: Pass						
15. Antenna Characteristics						
Model: Tron SA20, S/N: 157, TUV Ref: TSR4 and Modification State 0						
Test Configuration	As per C/S T.007		Configuration			
			1	2	3	4
Polarisation	linear or RHCP		N/A	N/A	Linear	Linear
VSWR	≤ 1.5		N/A	N/A	N/A	N/A
EIRP _{LOSS}	≤ 43	dB	N/A	N/A	-0.42	-0.42
EIRP _{maxEOL}	≥ 32*	dBm	N/A	N/A	42.70	41.36
EIRP _{minEOL}		dBm	N/A	N/A	34.44	37.06
* EIRP _{minEOL} limit decreases to 30 dBm for Configuration 4						
Result: Pass						
16. Beacon Coding Software						
Model: Tron SA20, S/N: (Stated in Manufacturer Supplied Report)						
Sample message for each coding option of the applicable coding types	correct	P / F	Configuration			
			1	2	3	4
Sample self-test message for each coding option of the applicable coding types	correct		N/A	N/A	P	P
Applicant's data, Refer to Manufacturer's supplied document: Tron SA20 PLB Jottron_A2.8_Beacon_coding_software_rev_C						

N/A = Not Applicable



Parameters to be Measured	Range of Specification	Units	Test Results			Comments
17. Navigation System						
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0						
Location protocol	C/S T.001		National	Standard	RLS	
Internal Navigation Device						
Position data default values	Correct	P / F	P	P	P	
Configuration 7						
Position accuracy - A.3.8.2.1	C/S T.001	m	22.82	22.18	22.19	
Position Acquisition Time - A.3.8.2.1	<10/1	min	0.88	0.87	0.86	
Position accuracy - A.3.8.2.2	C/S T.001	m	35.53	35.53	35.53	
Position Acquisition Time - A.3.8.2.2	<10/1	min	0.88	0.89	0.87	
Configuration 8						
Position accuracy - A.3.8.2.1	C/S T.001	m	64.90	22.18	22.19	
Position Acquisition Time - A.3.8.2.1	<10/1	min	0.87	0.87	0.87	
Position accuracy - A.3.8.2.2	C/S T.001	M	35.53	35.53	35.53	
Position Acquisition Time - A.3.8.2.2	<10/1	min	0.95	0.88	0.95	
- encoded position data update interval		min	4.93	4.98	4.98	
- for beacons that do not allow encoded position data updates	encoded position data does not change	P / F	N/A	N/A	N/A	
- for beacons with internal navigation device and capable to provide the encoded position data updates (except for ELT(DT)s) for the duration of operating lifetime.	encoded position data remains unchanged for 6 to 20 bursts	P / F	P	P	P	
	Beacon Encoded Position Update Interval (mm:ss)	max	05:55	05:55	05:10	
		min	05:41	05:44	04:50	
Result: Pass						

Result: Pass



Position clearance after deactivation	Cleared	P / F	P	P	P	P
Position data encoding	Correct	P / F	P	P	P	P
Retained last valid position after navigation input lost	240(±5)	min	241.38	241.95	241.38	
Default position data transmitted after 240(±5) minutes without valid position data	Cleared	P / F	P	P	P	P
Information on protection against beacon degradation due to navigation device, interface or signal failure or malfunction	provided	Y / N	Y			Applicant's data, see Annex A for details

Refer to Manufacturer's supplied document: Tron SA20
PLB A3.8.7 Position Data Encoding



Parameters to be Measured	Range of Specification	Units	Test Results	Comments
18. Return Link Service (RLS)				Result: Pass
Model: Tron SA20, SN: 120, TUV Ref: TSR25 and Modification State 0				
A.3.8.1 RLM Reception Verification Test	Test RLM message received		Pass	
A.3.8.2 Offset Test – Config 8 Above Ground				
Self-Test for correct 15 Hex ID	193BF6A031BFDFF	N/A	193BF6A031BFDFF	
a) RLS Indication RLS request unique distinct indication	≤ 5 seconds after first transmission of RLS request until a valid RLM Type 1 or Test RLM message is received	s	1	Test Start 08:12:02 UTC RLS Request 08:12:56 UTC RLS Indication 08:12:57 UTC
RLS indication is readily visible to the user when the beacon is operated in all declared operational configurations	Must be correct	P/F	P	
RLS indication is clearly visible to the user in direct sunlight, at a distance of 1 meter from the beacon.	Must be correct	P/F	P	
RLS indication remain inactive at all times when the beacon is encoded with any protocol other than RLS Location Protocol or RLS Location Test Protocol.	Must be correct	P/F	P	
Distinct indication that the RLM Type- 1 or Test RLM has been received	< 5 sec, after the RLM has been received until either the beacon is deactivated or the beacon battery is expired	s	0	RLM Reception 08:13:44 UTC RLM Indication 08:13:44 UTC
The beacon only provides the indication of receipt of the RLM Type 1 or Test RLM, which contain the beacon 15 Hex ID	Must be correct		Pass	
b) Transmitted Message Bits 109 – 114	100001	N/A	100001	36 Hex message: FFFE2F8C9DFB5018CCD0156FA3B84FBEA8E5
c) GNSS Receiver turns on	≤ 5 seconds after beacon activation	s	1*	* GNSS receiver activates at beacon start up.



Parameters to be Measured	Range of Specification	Units	Test Results	Comments
d) Time to output UTC	Record time since receiver activation	s	10	UTC lock 08:12:12 UTC
e) GNSS Receiver on time	≥ 30 minutes after beacon activation	min	N/T	RLM was received at 08:13:44 UTC, the beacon only supports Type-1 RLM therefore parts e) and h) to k) do not apply.
f) Time to indicate RLM receipt	≤ 30 minutes after beacon activation	min	1.7	
g) Transmitted Message Bits 109 to 114	101001	N/A	101001	36 Hex message: FFFE2F8C9DFB5018CCD0156FA3BA4FBEA421
h) GNSS Receiver reactivation time	Offset minutes +/- 5 seconds past next natural hour	min	N/T	
i) GNSS Receiver on time	≥ 15 minutes after reactivation	min	N/T	
j) GNSS Receiver reactivation time	Offset minutes +/- 5 seconds past next natural hour	min	N/T	
k) GNSS Receiver on time	≥ 15 minutes after reactivation	min	N/T	



Parameters to be Measured	Range of Specification	Units	Test Results	Comments
A.3.8.3 UTC Test - Config 8 Above Ground				
a) Visual Indication	≤ 5 seconds after first transmission	sec	1	Test Start 13:16:12 UTC RLS Request 13:17:08 UTC RLS Indication 13:17:09 UTC
b) Transmitted Message Bits 109 to 114	100001	N/A	100001	36 Hex message: FFFE2F8C9DFB5018CCD0156FA3B84FBEA8E5
c) GNSS Receiver turns on	≤ 5 seconds after beacon activation	s	1*	*GNSS receiver activates at beacon start up.
d) Time to output UTC	Record time since receiver activation	s	9	UTC Lock 13:16:21
e) GNSS Receiver position output Deny Beacon further GNSS signals	Valid Lat/Long No further receiver outputs	N/A N/A	Pass Pass	
f) Transmitted message valid location Message Bits 109 to 114	≤ 500m of actual beacon location 100001	m N/A	22.69 100001	Actual Position: N 50° 52.1423', W 1° 14.6799' Encoded Position: N 50° 52' 8", W 1° 14' 40" Position Error: 22.69 m 36 Hex message: FFFE2F8C9DFE7018CCD0153323784FBEA8E5
g) GNSS Receiver on time	≥ 30 minutes after beacon activation	min	30.2167	GNSS Sleep 13:46:25 UTC
h) GNSS Receiver reactivation time (or must be already on)	Offset minutes +/- 5 seconds past next natural hour	min	54.9667	GNSS Reactivation 13:54:58 UTC
i) GNSS Receiver on time	≥ 15 minutes after reactivation	min	16.05	GNSS Sleep 14:11:01 UTC
j) Transmitted message valid location Message Bits 109 to 114	≤ 500m of actual beacon location 100001	m N/A	22.69 100001	Actual Position: N 50° 52.1423', W 1° 14.6799' Encoded Position: N 50° 52' 8", W 1° 14' 40" Position Error: 22.69 m 36 Hex message: FFFE2F8C9DFE7018CCD0153323784FBEA8E5
k) GNSS Receiver reactivation time (or must be already on)	Offset minutes +/- 5 seconds past next natural hour	min	54.9833	GNSS Reactivation at 14:54:59
m) GNSS Receiver on time	≥ 15 minutes after reactivation	min	N/T	15 min period does not apply as the RLM was received at 14:57:57 UTC and beacon only accepts Type-1 RLM. Part m) is not applicable.
n) Time to indicate RLM receipt	≤ 15 minutes after receiver reactivation	min	2.9667	RLM was received at 14:57:57 UTC
o) Transmitted Message Bits 109 to 114 *	101001	N/A	101001	36 Hex message: FFFE2F8C9DFB5018CCD0156FA3BA4FBEB118



Parameters to be Measured	Range of Specification	Units	Test Results	Comments
RLS GNSS Receiver Tracking Test				
A.3.8.8.5 RLS GNSS Receiver Tracking Test	≥ detection of 90% of RLS-GNSS satellites (rounded down to the nearest integer number) visible at elevation of ≥ 5 degrees at least once for each 15-minute test period	N/A	Pass	Applicant's data reviewed by TUV SUD, Refer to Manufacturer's supplied document: Tron SA20 - RLS GNSS Receiver Satellite Tracking_RevA.
22. Testing Beacon Controls				
Model: Tron SA20, S/N: 101, TUV Ref: TSR3 and Modification State 0				
Self-test controls	Comply with A.3.10.1 (i)	P/F	P	
GNSS self-test controls	Comply with A.3.10.1 (ii)	P/F	P	
Operational controls	Comply with A.3.10.2	P/F	P	
Result: Pass				

2.1 POWER OUTPUT

2.1.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (a)

2.1.2 Equipment Under Test and Modification State

Tron SA20, S/N: 101 - Modification State 0

2.1.3 Date of Test

16 January 2023, 17 January 2023 and 18 January 2023

2.1.5 Test Equipment Used

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

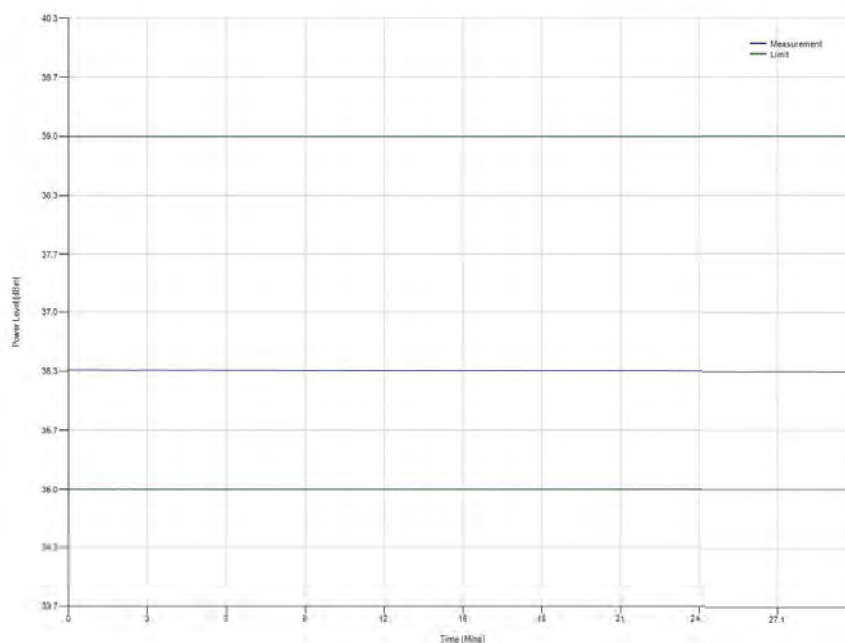
2.1.6 Laboratory Environmental Conditions

Ambient Temperature 21.5 - 22.8°C

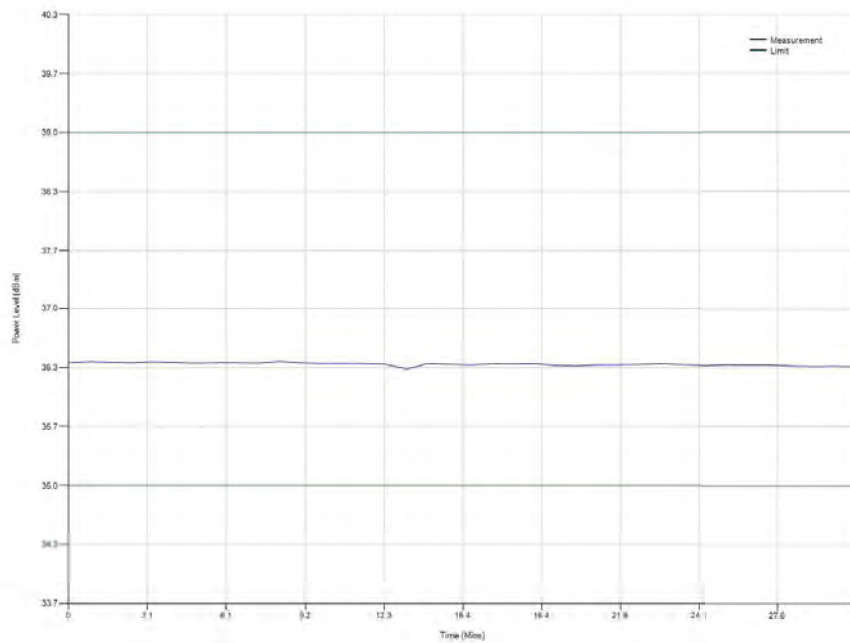
Relative Humidity 19.3 - 29.9%

2.1.7 Test Results

Ambient Temperature



Low Temperature (-20°C)



High Temperature (+55°C)



Summary

The EUT complies with clause A.3.2.2 of Cospas-Sarsat T.007.



2.2 DIGITAL MESSAGE

2.2.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (b)

2.2.2 Equipment Under Test and Modification State

Tron SA20, S/N: 101 - Modification State 0

2.2.3 Date of Test

2.2.4 16 January 2023, 17 January 2023 and 18 January 2023

2.2.5 Test Equipment Used

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

2.2.6 Laboratory Environmental Conditions

Ambient Temperature 21.5 - 22.8°C
Relative Humidity 19.3 - 29.9%

2.2.7 Test Results

Test Duration: 30 minutes
No. of bursts: 37

Ambient Temperature

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C90FE7018DFFFF8129DF861F0FABE**

The code consists of 36 hexadecimal characters representing a first generation beacon message with the format flag set to Long including bit and frame synchronization pattern prefix (24 bits) as defined by T.001 Issue 4 - Rev 5

Unique Identifier:
190BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111111111	Bit-synchronization pattern consisting of "1"s shall occupy the first 15-bit positions.	True
16-24	000101111	Frame Synchronization Pattern	Normal beacon operation
25	1	Format Flag	Long Message
26	0	Protocol Flag	Location, further information provided in "Protocol Code"
27-36	0011001001	Country code	Albania - 201
		For associated SAR Points of Contact (SPOC) related to Albania - 201	Search Contact link
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-45	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-56	1001110000 0001100011	Last 6 digits MMSI	639075
57-75	011111111	Latitude	Default - no location (Default - no location)
76-85	011111111	Longitude	Default - no location (Default - no location)
86-106	0000001001 0100111011 1	BCH-1 error correcting code	BCH-1 code in message matches the recalculated BCH-1 from the PDF-1 field
107	1	Encoded position source	Encoded position data is provided by an internal navigation device
108	1	±21.5 Mhz Homing Device	Included in beacon
109	1	Beacon capability to process and automatically generated RLM Type-1	Capable to process an automatically generated RLM Type-1
110	0	Beacon capability to process a manually generated RLM Type-1 RLM Type-2	Not capable to process a manually generated RLM Type-2
111	0	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) not received by this beacon
112	0	Beacon Feedback on receipt of RLM Type-2	RLM Type-2 (manual) not received by this beacon
113-114	01	RLS Provider Identification	GALILEO Return Link Service Provider
115-123	100001111	Latitude offset	Default value
124-132	100001111	Longitude offset	Default value
133-144	1010101111 10	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field

Low Temperature (-20°C)

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C90FE7018DFFEF8129DF861F0FABE**

The code consists of 36 hexadecimal characters representing a first generation beacon message with the format flag set to Long including bit and frame synchronization pattern prefix (24 bits) as defined by T.001 Issue 4 - Rev 5

Unique Identifier:
190BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111111111	Bit-synchronization pattern consisting of "1"s shall occupy the first 15-bit positions.	True
16-24	000101111	Frame Synchronization Pattern	Normal beacon operation
25	1	Format Flag	Long Message
26	0	Protocol Flag	Location, further information provided in "Protocol Code"
27-36	0011001001	Country code	Albania - 201
		For associated SAR Points of Contact (SPOC) related to Albania - 201	Search Contact link
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-45	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-56	1001110000 0001100011	Last 6 digits MMSI	639075
57-75	011111111	Latitude	Default - no location (Default - no location)
76-85	011111111	Longitude	Default - no location (Default - no location)
86-106	0000001001 0100111011 1	BCH-1 error correcting code	BCH-1 code in message matches the recalculated BCH-1 from the PDF-1 field
107	1	Encoded position source	Encoded position data is provided by an internal navigation device
108	1	±21.5 Mhz Homing Device	Included in beacon
109	1	Beacon capability to process and automatically generated RLM Type-1	Capable to process an automatically generated RLM Type-1
110	0	Beacon capability to process a manually generated RLM Type-1 RLM Type-2	Not capable to process a manually generated RLM Type-2
111	0	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) not received by this beacon
112	0	Beacon Feedback on receipt of RLM Type-2	RLM Type-2 (manual) not received by this beacon
113-114	01	RLS Provider Identification	GALILEO Return Link Service Provider
115-123	100001111	Latitude offset	Default value
124-132	100001111	Longitude offset	Default value
133-144	1010101111 10	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field

High Temperature (+55°C)

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C90FE7018DFFEF8129DF861F0FABE**

The code consists of 36 hexadecimal characters representing a first generation beacon message with the format flag set to Long including bit and frame synchronization pattern prefix (24 bits) as defined by T.001 Issue 4 - Rev 5

Unique Identifier:
190BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111111111	Bit-synchronization pattern consisting of "1"s shall occupy the first 15-bit positions.	True
16-24	000101111	Frame Synchronization Pattern	Normal beacon operation
25	1	Format Flag	Long Message
26	0	Protocol Flag	Location, further information provided in "Protocol Code"
27-36	0011001001	Country code	Albania - 201
		For associated SAR Points of Contact (SPOC) related to Albania - 201	Search Contact link
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-45	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-56	1001110000 0001100011	Last 6 digits MMSI	639075
57-75	011111111	Latitude	Default - no location (Default - no location)
76-85	011111111	Longitude	Default - no location (Default - no location)
86-106	0000001001 0100111011 1	BCH-1 error correcting code	BCH-1 code in message matches the recalculated BCH-1 from the PDF-1 field
107	1	Encoded position source	Encoded position data is provided by an internal navigation device
108	1	±21.5 Mhz Homing Device	Included in beacon
109	1	Beacon capability to process and automatically generated RLM Type-1	Capable to process an automatically generated RLM Type-1
110	0	Beacon capability to process a manually generated RLM Type-1 RLM Type-2	Not capable to process a manually generated RLM Type-2
111	0	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) not received by this beacon
112	0	Beacon Feedback on receipt of RLM Type-2	RLM Type-2 (manual) not received by this beacon
113-114	01	RLS Provider Identification	GALILEO Return Link Service Provider
115-123	100001111	Latitude offset	Default value
124-132	100001111	Longitude offset	Default value
133-144	1010101111 10	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field



Summary

The EUT complies with clause A.3.1.4 of Cospas-Sarsat T.007.

2.3 MODULATION

2.3.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (d)

2.3.2 Equipment Under Test and Modification State

Tron SA20, S/N: 101 - Modification State 0

2.3.3 Date of Test

16 January 2023, 17 January 2023 and 18 January 2023.

2.3.4 Test Equipment Used

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

2.3.5 Laboratory Environmental Conditions

Ambient Temperature 21.5 - 22.8°C

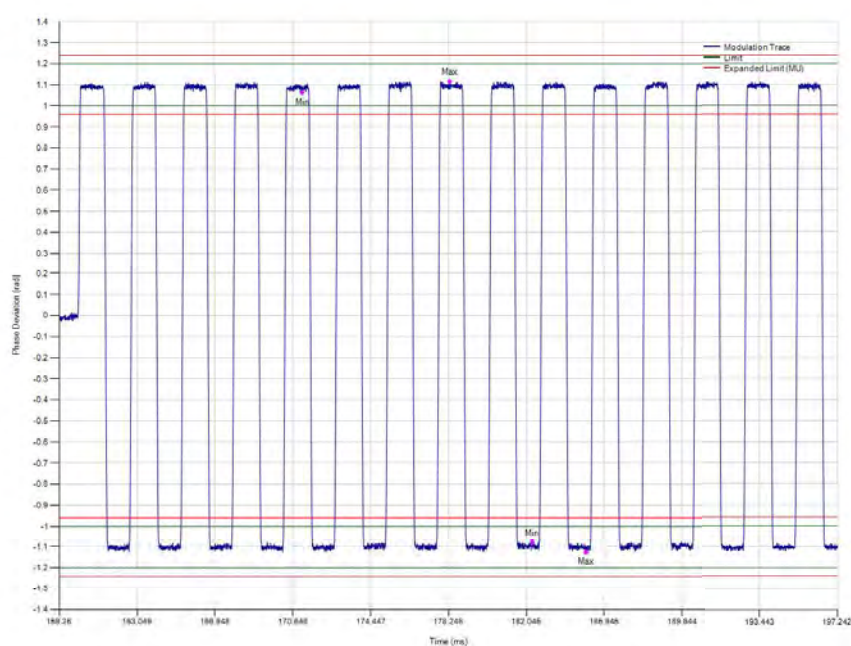
Relative Humidity 19.3 - 29.9%

2.3.6 Test Results

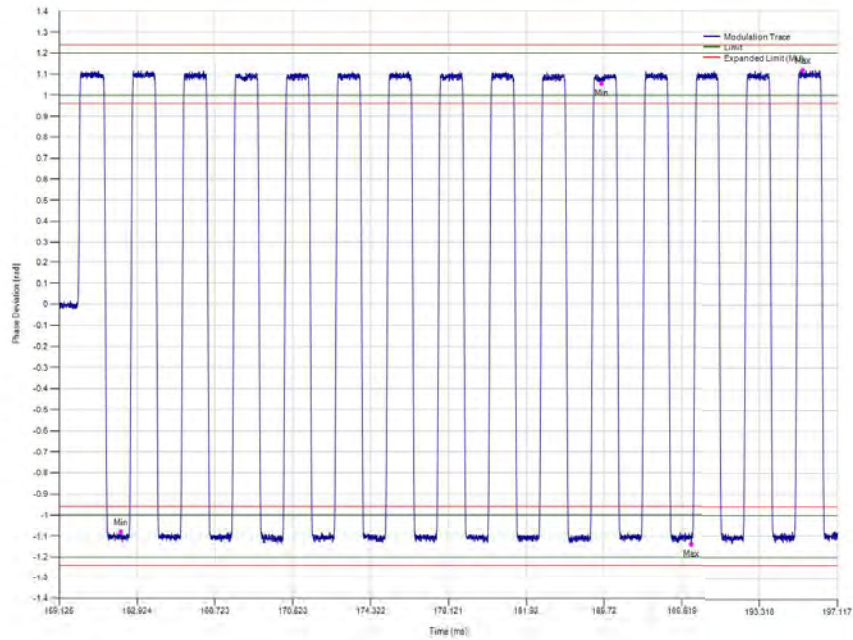
Test Duration: 30 minutes

No. of bursts: 37

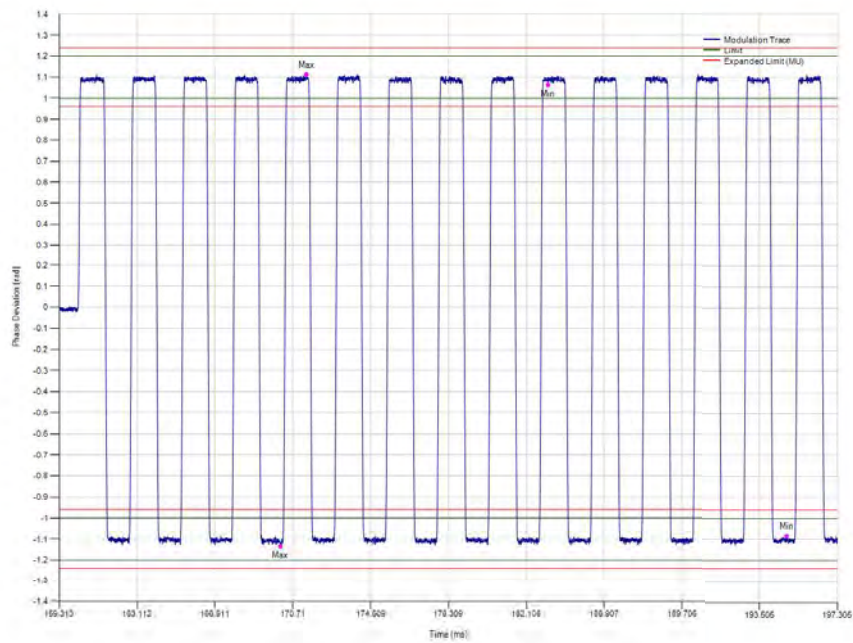
Ambient Temperature



Low Temperature (-20°C)



High Temperature (+55°C)



Summary

The EUT complies with clause A.3.2.5 of Cospas-Sarsat T.007.

2.4 406 MHZ TRANSMITTED FREQUENCY

2.4.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (e)

2.4.2 Equipment Under Test and Modification State

Tron SA20, S/N: 101 - Modification State 0

2.4.3 Date of Test

16 January 2023, 17 January 2023 and 18 January 2023.

2.4.4 Test Equipment Used

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

2.4.5 Laboratory Environmental Conditions

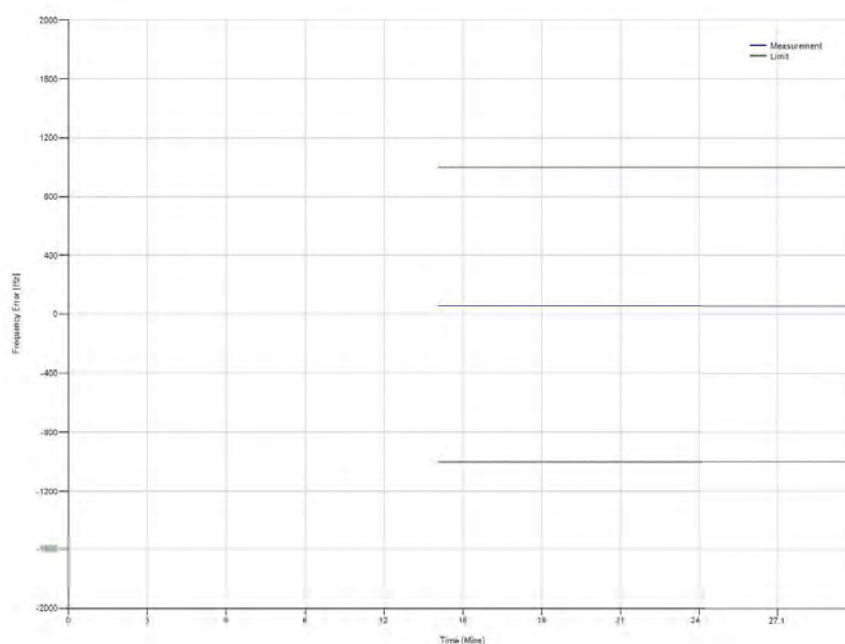
Ambient Temperature 21.5 - 22.8°C

Relative Humidity 19.3 - 29.9%

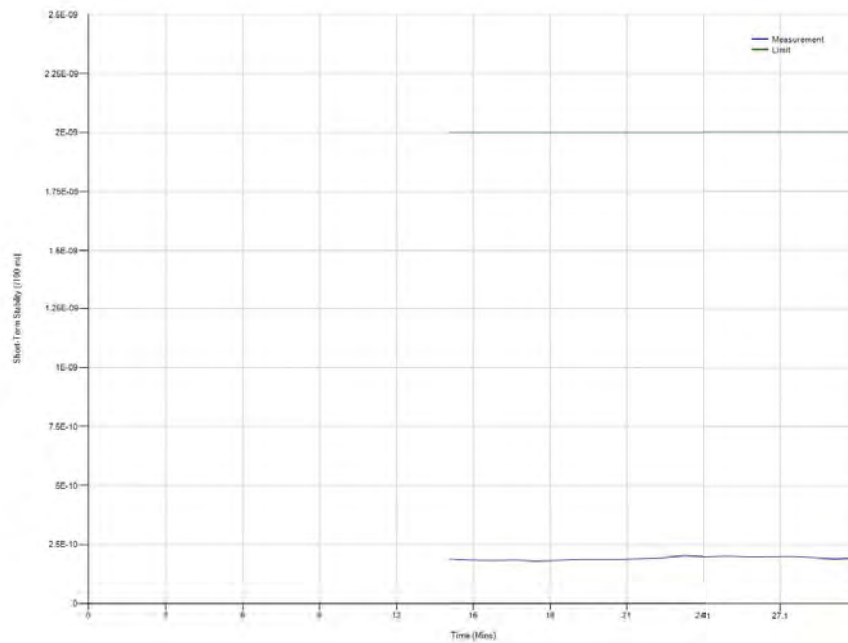
2.4.6 Test Results

Ambient Temperature

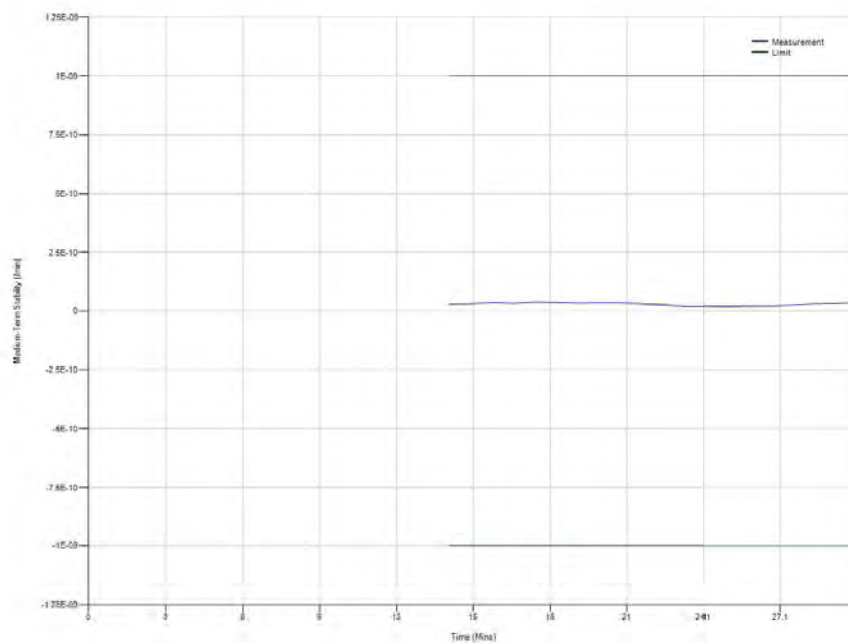
Nominal Frequency



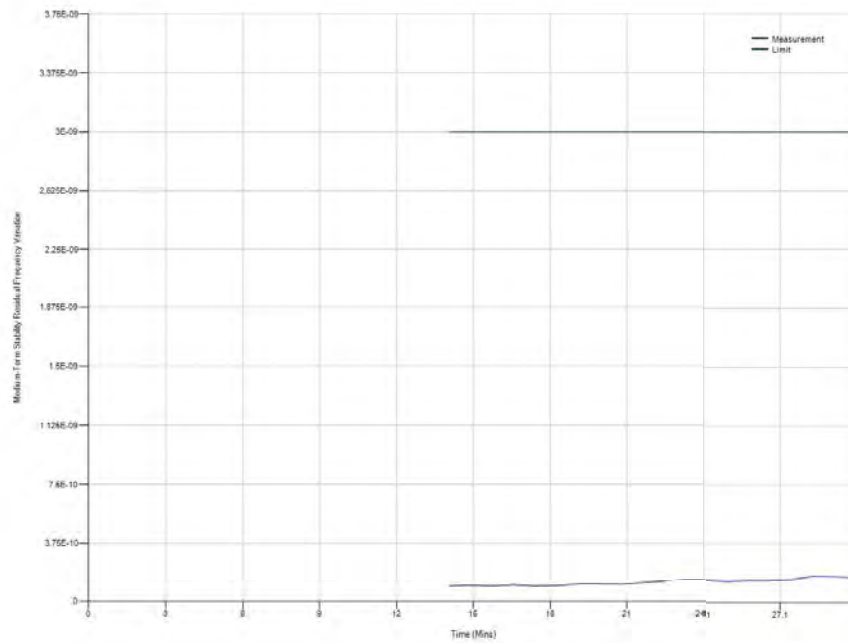
Short Term Stability



Medium Term Stability – Slope

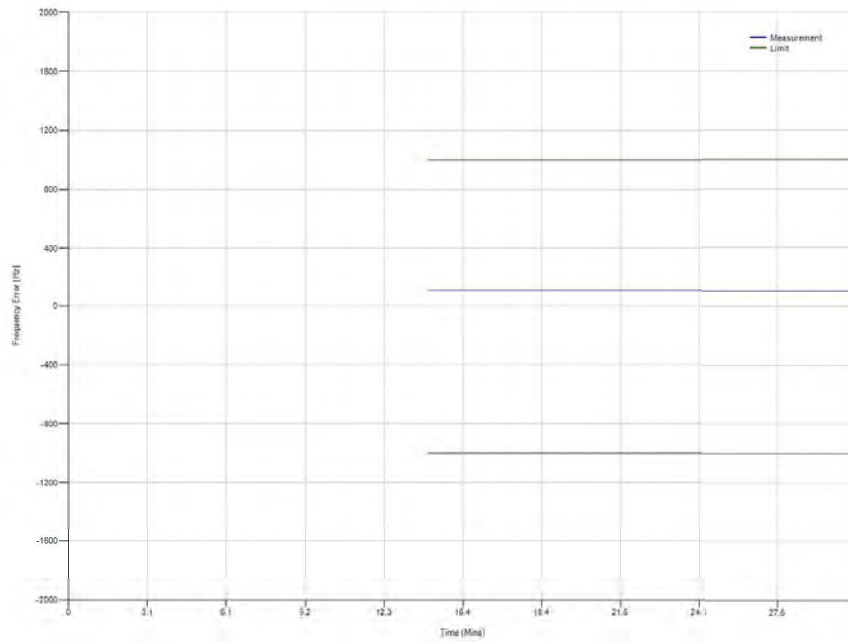


Medium Term Stability – Residual Frequency Variation

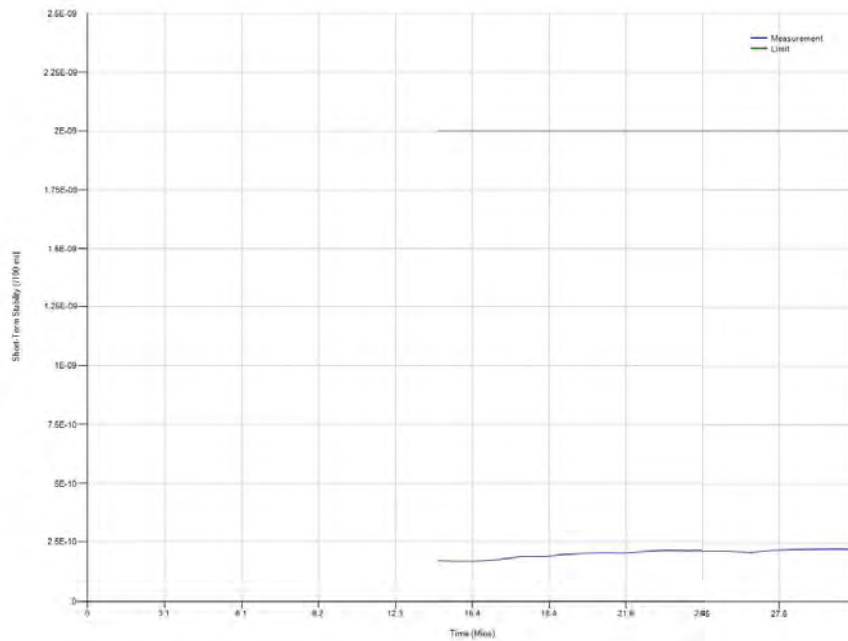


Low Temperature (-20°C)

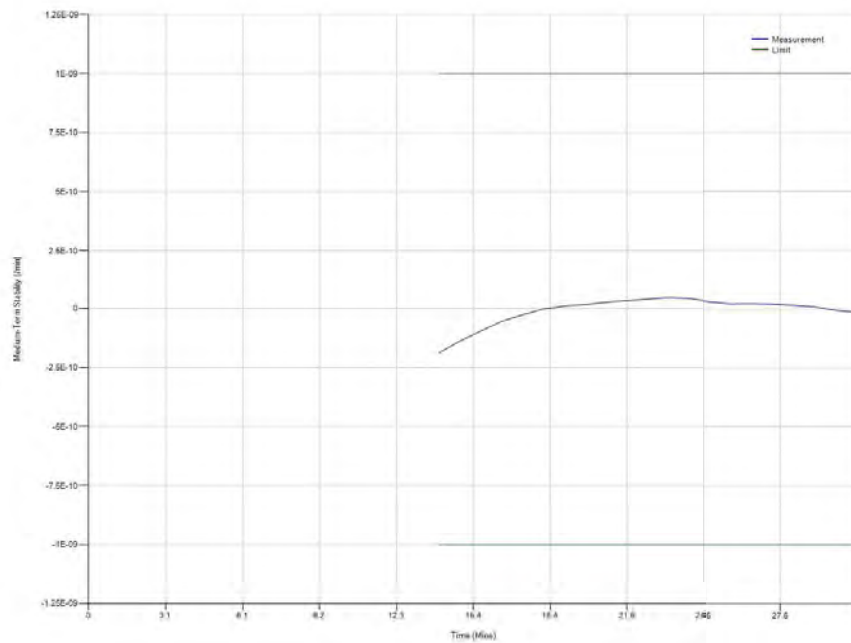
Nominal Frequency



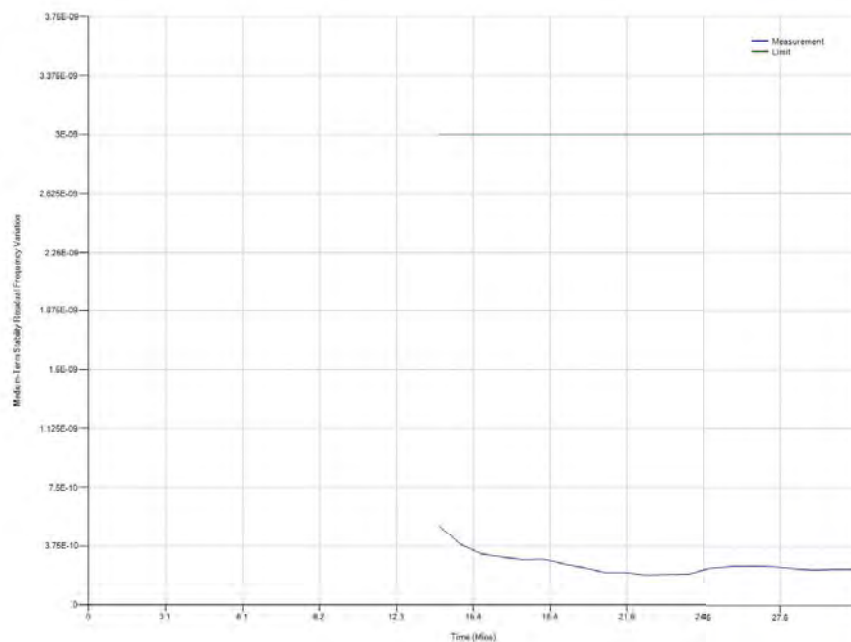
Short Term Stability



Medium Term Stability – Slope

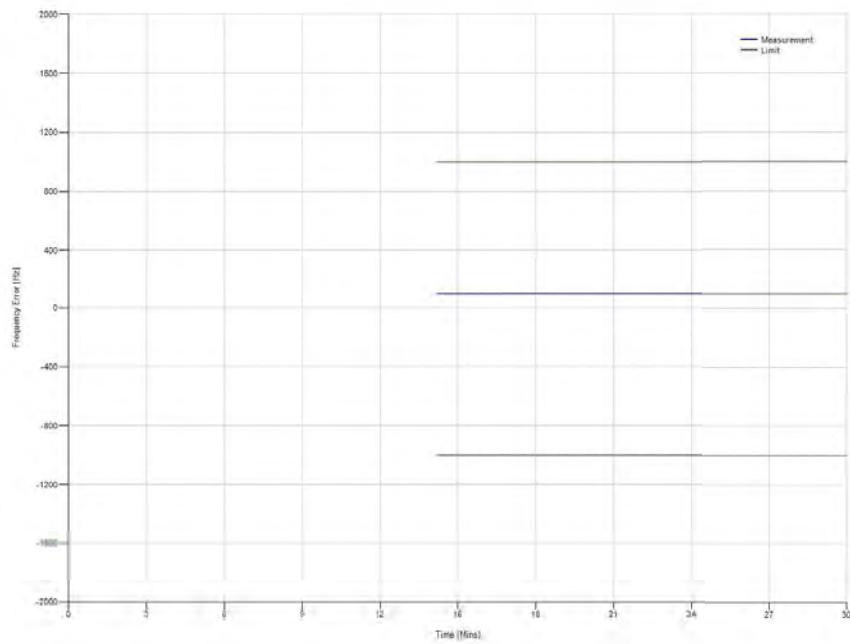


Medium Term Stability – Residual Frequency Variation

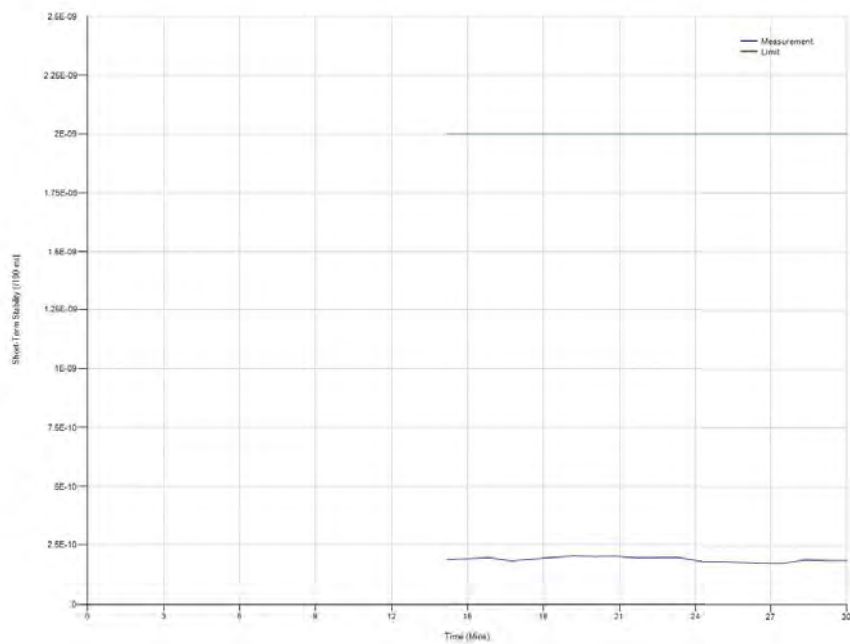


High Temperature (+55°C)

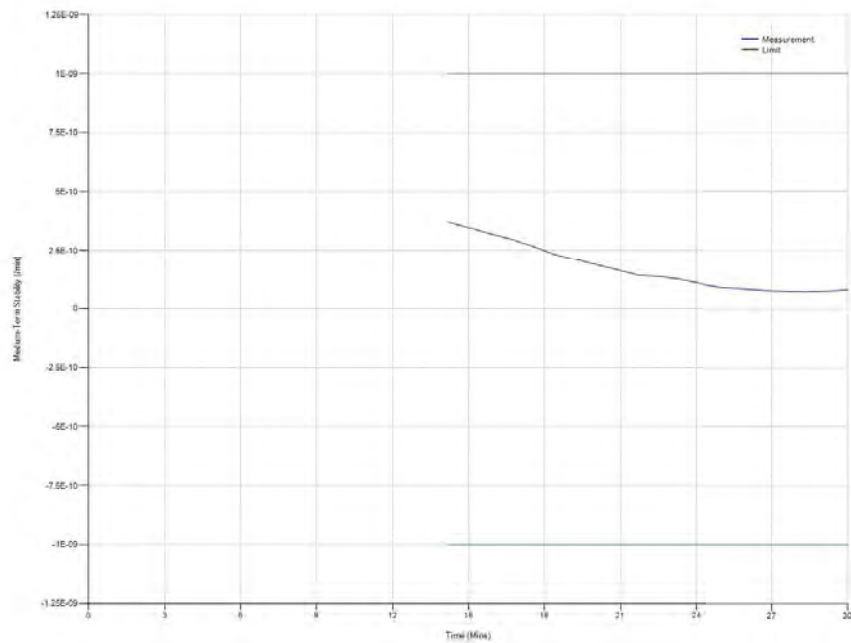
Nominal Frequency



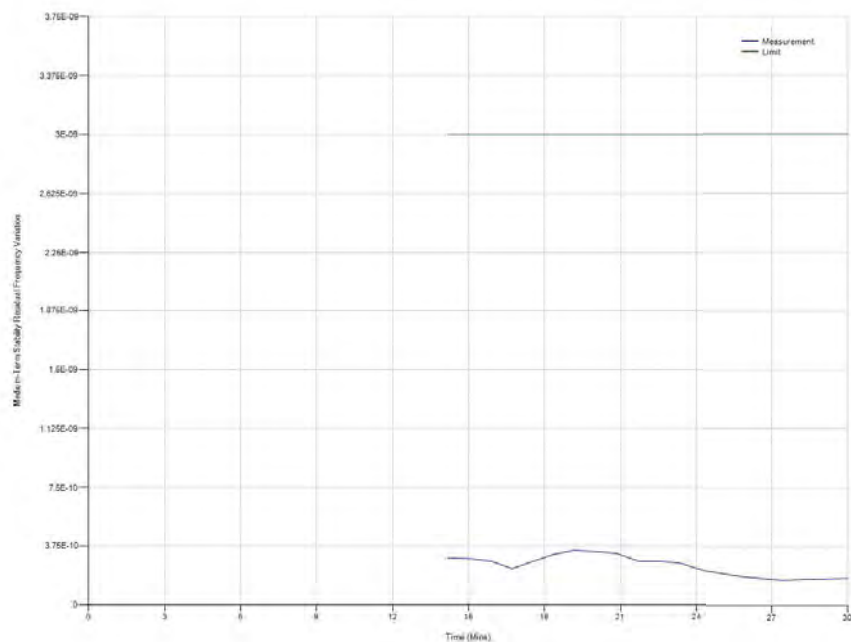
Short Term Stability



Medium Term Stability – Slope



Medium Term Stability – Residual Frequency Variation



Summary

The EUT complies with clause A.3.2.1 of Cospas-Sarsat T.007.



2.5 SPURIOUS EMISSIONS INTO 50 OHMS

2.5.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (f)

2.5.2 Equipment Under Test and Modification State

Tron SA20, S/N: 101 - Modification State 0

2.5.3 Date of Test

16 January 2023, 17 January 2023, 18 January 2023

2.5.4 Test Equipment Used

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

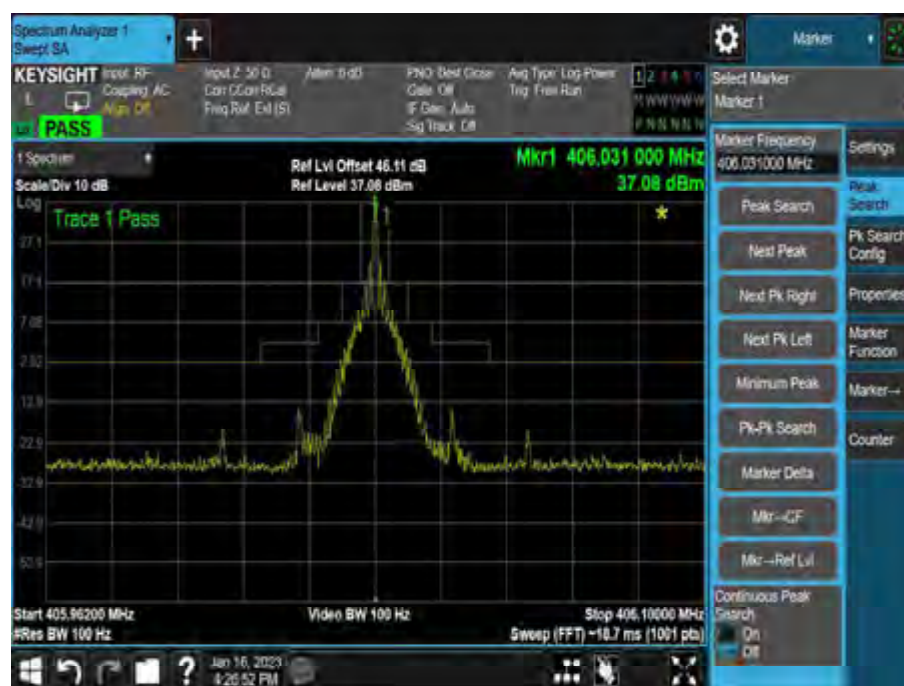
2.5.5 Laboratory Environmental Conditions

Ambient Temperature 21.5 - 22.8°C

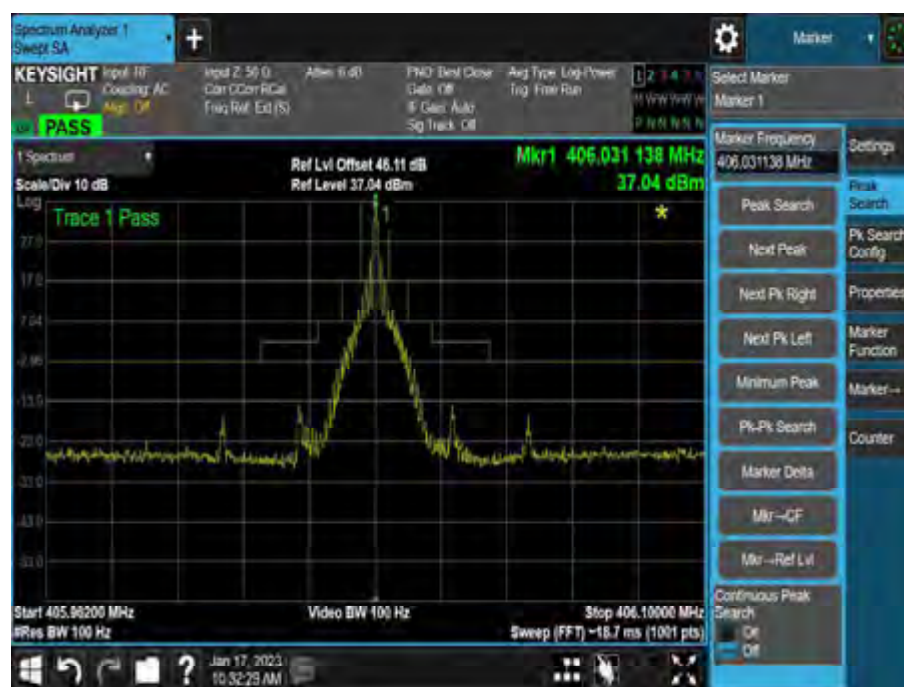
Relative Humidity 19.3 - 29.9%

2.5.6 Test Results

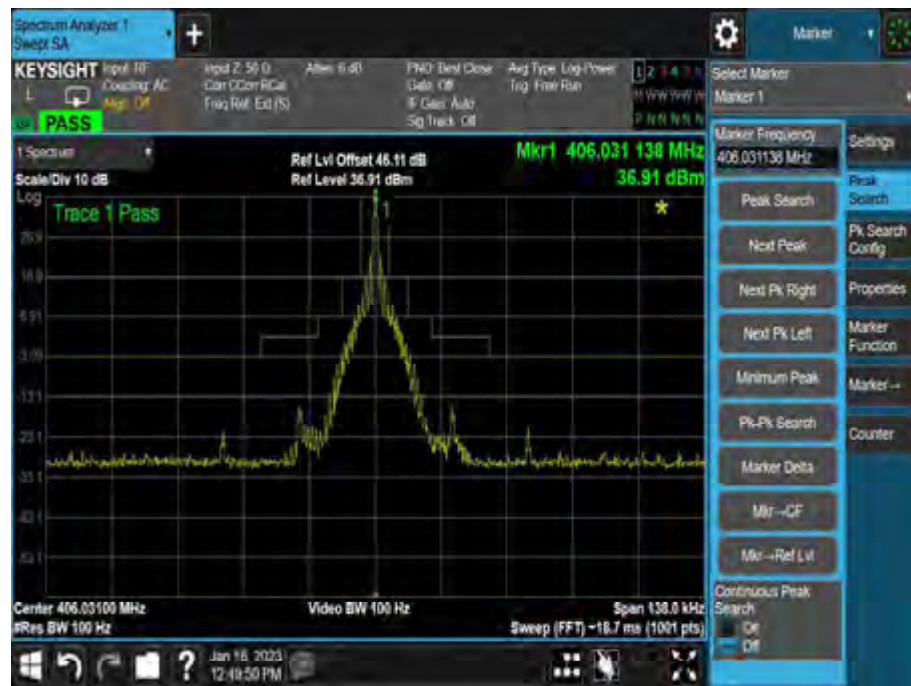
Ambient Temperature



Low (-20°C) Temperature



High (+55°C) Temperature



Summary

The EUT complies with clause A.3.2.4 of Cospas-Sarsat T.007.



2.6 406 MHZ VSWR CHECK

2.6.1 Specification

Cospas-Sarsat T.007, Clause A.2.1 (g)

2.6.2 Equipment Under Test and Modification State

Tron SA20, S/N: 101 - Modification State 0

2.6.3 Date of Test

16 January 2023, 17 January 2023 and 18 January 2023

2.6.4 Test Equipment Used

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

2.6.5 Laboratory Environmental Conditions

Ambient Temperature 21.3 - 23.3°C
Relative Humidity 19.3 - 29.6%

2.6.6 Test Results

Test Duration: 30 minutes
No. of bursts: 37

Ambient Temperature

Decoded Beacon Message

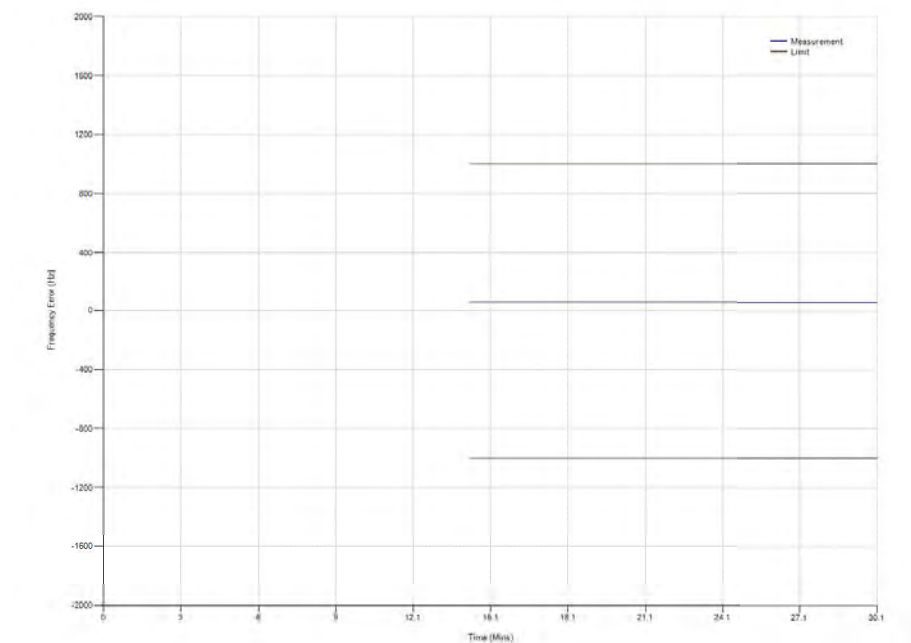
Hexadecimal code: **FFFE2F8C90FE7018DFFEF8129DF861F0FABE**

The code consists of 36 hexadecimal characters representing a first generation beacon message with the format flag set to Long including bit and frame synchronization pattern prefix (24 bits) as defined by T.001 Issue 4 - Rev 5

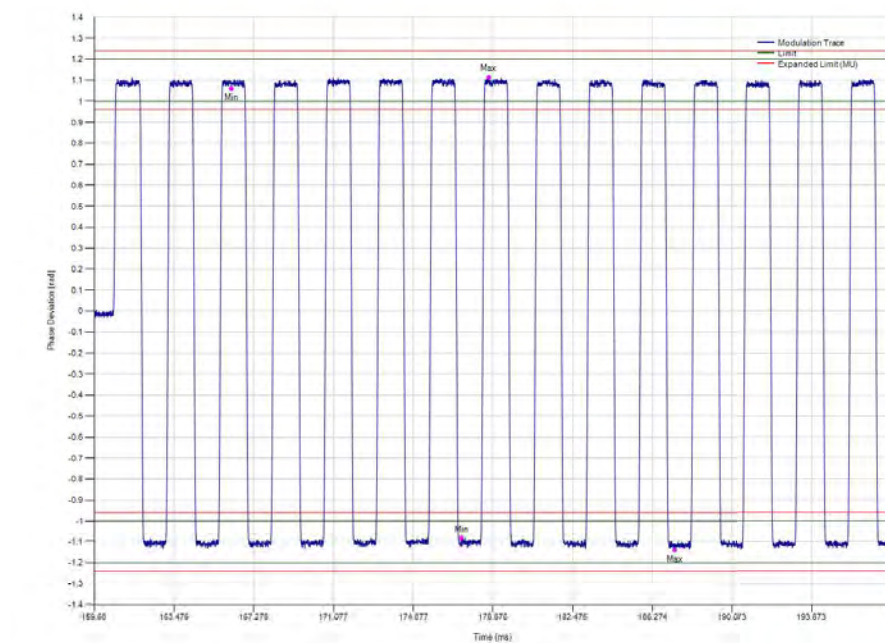
Unique Identifier:
190BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111111111	Bit-synchronization pattern consisting of "1"s shall occupy the first 15-bit positions.	True
16-24	000101111	Frame Synchronization Pattern	Normal beacon operation
25	1	Format Flag	Long Message
26	0	Protocol Flag	Location, further information provided in "Protocol Code"
27-36	0011001001	Country code	Albania - 201
		For associated SAR Points of Contact (SPOC) related to Albania - 201	Search Contact link
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-45	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-56	1001110000 0001100011	Last 6 digits MMSI	639075
57-75	011111111	Latitude	Default - no location (Default - no location)
76-85	011111111	Longitude	Default - no location (Default - no location)
86-106	0000001001 0100111011 1	BCH-1 error correcting code	BCH-1 code in message matches the recalculated BCH-1 from the PDF-1 field
107	1	Encoded position source	Encoded position data is provided by an internal navigation device
108	1	±21.5 Mhz Homing Device	Included in beacon
109	1	Beacon capability to process and automatically generated RLM Type-1	Capable to process an automatically generated RLM Type-1
110	0	Beacon capability to process a manually generated RLM Type-1 RLM Type-2	Not capable to process a manually generated RLM Type-2
111	0	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) not received by this beacon
112	0	Beacon Feedback on receipt of RLM Type-2	RLM Type-2 (manual) not received by this beacon
113-114	01	RLS Provider Identification	GALILEO Return Link Service Provider
115-123	100001111	Latitude offset	Default value
124-132	100001111	Longitude offset	Default value
133-144	1010101111 10	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field

Frequency Plot



Modulation Plot



Low Temperature (-20°C)

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C90FE7018DFFEF8129DF861F0FABE**

The code consists of 36 hexadecimal characters representing a first generation beacon message with the format flag set to Long including bit and frame synchronization pattern prefix (24 bits) as defined by T.001 Issue 4 - Rev 5

Unique Identifier:
190BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111111111	Bit-synchronization pattern consisting of "1"s shall occupy the first 15-bit positions.	True
16-24	000101111	Frame Synchronization Pattern	Normal beacon operation
25	1	Format Flag	Long Message
26	0	Protocol Flag	Location, further information provided in "Protocol Code"
27-36	0011001001	Country code	Albania - 201
		For associated SAR Points of Contact (SPOC) related to Albania - 201	Search Contact link
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-45	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-56	1001110000 0001100011	Last 6 digits MMSI	639075
57-75	011111111	Latitude	Default - no location (Default - no location)
76-85	011111111	Longitude	Default - no location (Default - no location)
86-106	0000001001 0100111011 1	BCH-1 error correcting code	BCH-1 code in message matches the recalculated BCH-1 from the PDF-1 field
107	1	Encoded position source	Encoded position data is provided by an internal navigation device
108	1	±21.5 Mhz Homing Device	Included in beacon
109	1	Beacon capability to process and automatically generated RLM Type-1	Capable to process an automatically generated RLM Type-1
110	0	Beacon capability to process a manually generated RLM Type-1 RLM Type-2	Not capable to process a manually generated RLM Type-2
111	0	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) not received by this beacon
112	0	Beacon Feedback on receipt of RLM Type-2	RLM Type-2 (manual) not received by this beacon
113-114	01	RLS Provider Identification	GALILEO Return Link Service Provider
115-123	100001111	Latitude offset	Default value
124-132	100001111	Longitude offset	Default value
133-144	1010101111 10	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field