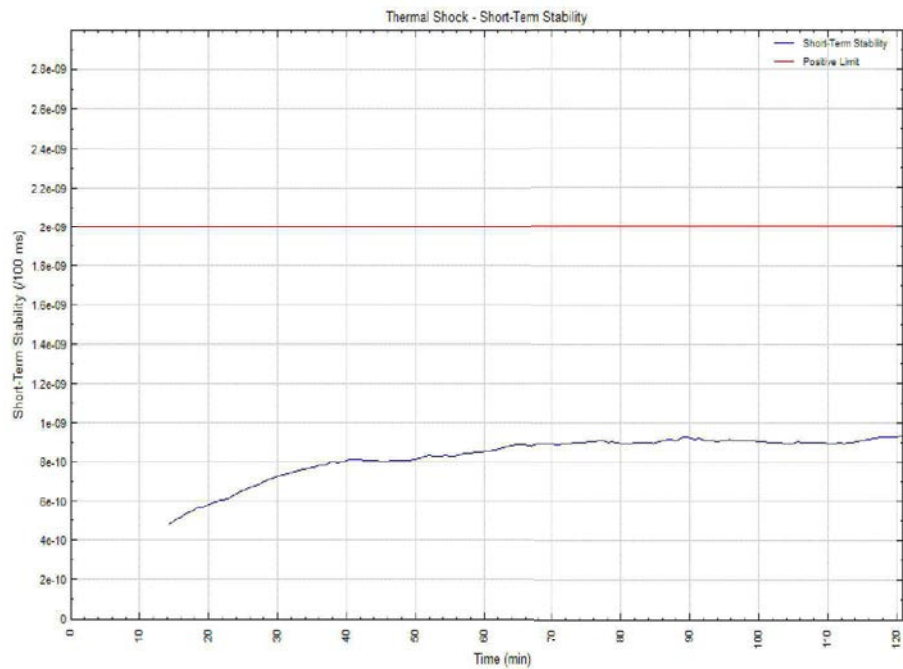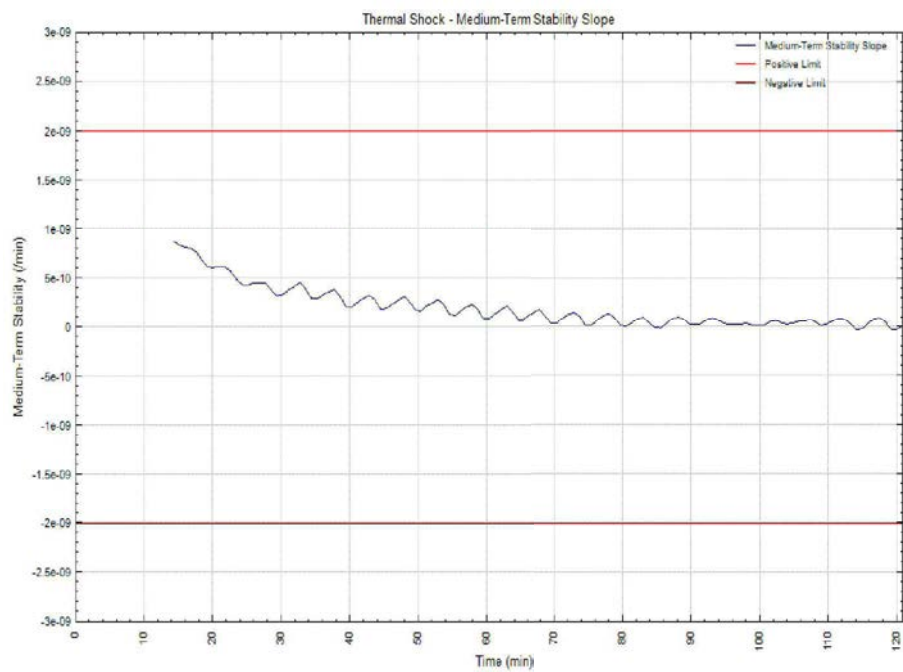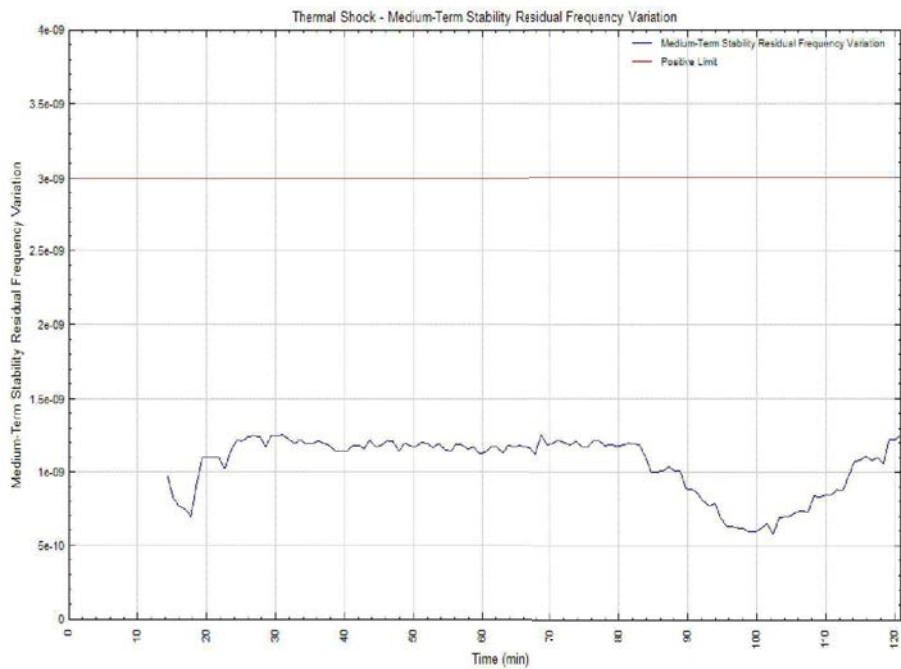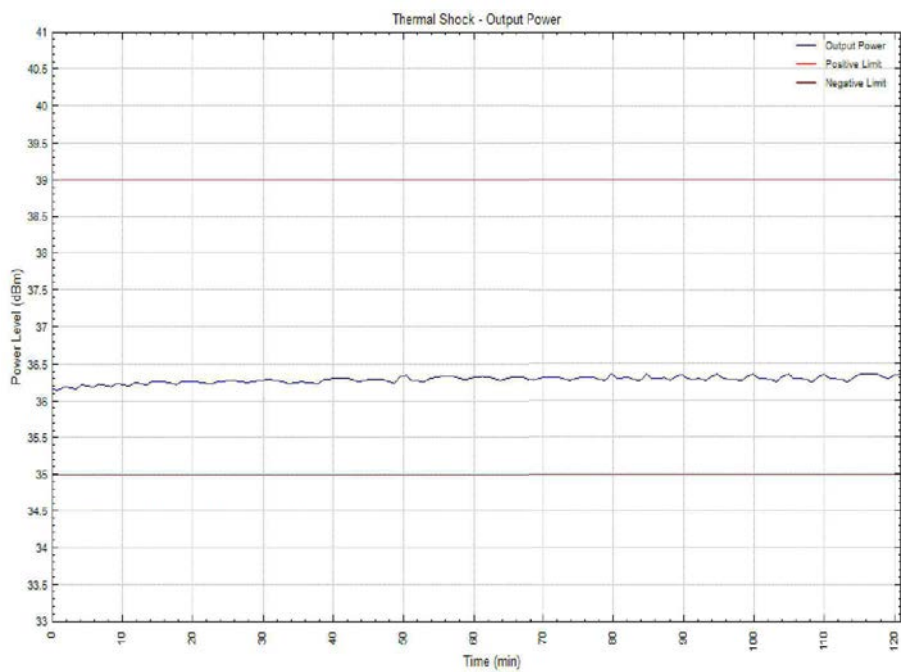Short Term Stability

Medium Term Stability, Mean Slope

Medium Term Stability, Residual Frequency Variation

Output Power

Digital Message

Burst 1

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C9DFE7018DFEFF8129DF861F0FABE**

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.6.

Unique identifier:
193BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111 11111	Dit-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 list here
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-46	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-66	1001110000 0001100011	Last 6 digits MMSI	639075
67-75	011111111	Latitude	Default - no location (Default - no location)
76-85	0111111111	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	121.5 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.2.2 of Cospas-Sarsat T.007.

2.9 SATELLITE QUALITATIVE TESTS

2.9.1 Specification

Cospas-Sarsat T.007, Clause A.2.5

2.9.2 Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000013 - Modification State 1 (SLP Configurations 5 and 8)
EPIRB3 Pro S/N: TA000013 - Modification State 2 (SLP Configuration 7)

2.9.3 Date of Test

24 March 2022, 25 March 2022, 28 March 2022 & 29 March 2022, 13 April 2022 & 14 April 2022

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 4.1.

2.9.5 Laboratory Environmental Conditions

Ambient Temperature 11.1 – 22.4°C
Relative Humidity 24.8 - 78.6%

2.9.6 Test Results

Configuration 5

Test Start: 15:43
Test End: 09:10
15 Hex ID: 193DF380C665C05

Actual location of the test beacon: 50.814333
(Daedalus Airfield, Lee-on-the-Solent, Central) -1.2017389

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	TCA	CTA (deg)	Location Error (km)
12	67649	193DF380C665C05*	50.814	-1.203	2022-03-24 17:10:41	14.921	0.093
10	86814	193DF380C665C05*	50.817	-1.2	2022-03-24 19:05:48	19.661	0.324
13	49371	193DF380C665C05*	50.817	-1.196	2022-03-24 19:23:20	12.918	0.503
12	67651	193DF380C665C05*	50.816	-1.2	2022-03-24 20:31:57	-15.266	0.225
10	86815	193DF380C665C05*	50.819	-1.198	2022-03-24 20:45:10	6.537	0.585
13	49372	193DF380C665C05*	50.816	-1.207	2022-03-24 21:02:54	-1.705	0.413
10	86816	193DF380C665C05*	50.82	-1.204	2022-03-24 22:25:57	-8.977	0.652
13	49373	193DF380C665C05*	50.813	-1.198	2022-03-24 22:43:54	-17.659	0.301
114	14140	193DF380C665C05*	50.817	-1.202	2022-03-25 02:58:10	-6.564	0.300
114	14141	193DF380C665C05*	50.816	-1.206	2022-03-25 04:38:01	8.639	0.352
12	67657	193DF380C665C05*	50.815	-1.201	2022-03-25 07:06:49	-12.396	0.094
12	67658	193DF380C665C05*	50.815	-1.205	2022-03-25 08:47:55	3.369	0.240
10	86822	193DF380C665C05*	50.813	-1.201	2022-03-25 09:00:42	-18.368	0.155

Location Errors greater than 5 km are marked in red text.

Ratio of Successful Solutions $= \dfrac{\text{number of Doppler solutions within 5 km with } 1° < CTA < 21°}{\text{number of satellite passes over test duration with } 1° < CTA < 21°}$

$= \dfrac{13}{13}$

$= 100\%$

*NOTE: Hex ID is provided with location - the Hex ID with default values is 193DF380C6FFBFF.

Configuration 7

Test Start: 15:55
Test End: 08:31
15 Hex ID: 193DF380C665C05

Actual location of the test beacon: 50.814333
(Daedalus Airfield, Lee-on-the-Solent, Central) -1.2017389

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	TCA	CTA (deg)	Location Error (km)
114	14418	193DF380C665C05*	50.818	-1.199	2022-04-13 15:29:43	-11.852	0.454
12	67931	193DF380C665C05*	50.817	-1.196	2022-04-13 16:35:48	19.508	0.503
12	67932	193DF380C665C05*	50.82	-1.197	2022-04-13 18:15:11	6.407	0.716
13	49655	193DF380C665C05*	50.817	-1.199	2022-04-13 19:09:45	14.733	0.357
12	67933	193DF380C665C05*	50.818	-1.203	2022-04-13 19:55:59	-9.096	0.420
10	87097	193DF380C665C05*	50.817	-1.199	2022-04-13 20:06:51	12.126	0.357
10	87098	193DF380C665C05*	50.815	-1.204	2022-04-13 21:47:05	-2.675	0.175
13	49657	193DF380C665C05*	50.815	-1.12	2022-04-13 22:29:55	-15.495	5.741
10	87099	193DF380C665C05*	50.821	-1.199	2022-04-13 23:28:46	-18.74	0.769
114	14424	193DF380C665C05*	50.814	-1.192	2022-04-14 01:59:37	-15.906	0.686
114	14426	193DF380C665C05*	50.821	-1.236	2022-04-14 05:19:34	14.292	2.516
12	67939	193DF380C665C05*	50.808	-1.2	2022-04-14 06:30:46	-18.555	0.711

Location Errors greater than 5 km are marked in red text.

$$\text{Ratio of Successful Solutions} = \frac{\text{number of Doppler solutions within 5 km with } 1° < CTA < 21°}{\text{number of satellite passes over test duration with } 1° < CTA < 21°}$$

$$= \frac{11}{12}$$

$$= 91.67\%$$

*NOTE: Hex ID is provided with location - the Hex ID with default values is 193DF380C6FFBFF.

Configuration 8

Test Start: 14:55
Test End: 09:19
15 Hex ID: 193DF380C665C05

Actual location of the test beacon: 50.814333
(Daedalus Airfield, Lee-on-the-Solent, Central) -1.2017389

Satellite ID	Satellite Pass Number	15 Hex ID Provided by LUT	Doppler Latitude	Doppler Longitude	TCA	CTA (deg)	Location Error (km)
114	14190	193DF380C665C05*	50.818	-1.199	2022-03-28 14:55:51	-6.534	0.454
12	67705	193DF380C665C05*	50.831	-1.195	2022-03-28 16:24:10	20.533	1.915
12	67706	193DF380C665C05*	50.818	-1.197	2022-03-28 18:03:25	7.777	0.529
13	49428	193DF380C665C05*	50.818	-1.195	2022-03-28 19:40:25	10.568	0.628
10	86871	193DF380C665C05*	50.817	-1.199	2022-03-28 19:57:38	13.246	0.357
13	49429	193DF380C665C05*	50.82	-1.201	2022-03-28 21:20:13	-4.416	0.635
10	86872	193DF380C665C05*	50.814	-1.212	2022-03-28 21:37:44	-1.361	0.720
13	49430	193DF380C665C05*	50.813	-1.202	2022-03-28 23:01:30	-20.409	0.146
10	86873	193DF380C665C05*	50.818	-1.205	2022-03-28 23:19:18	-17.393	0.469
114	14197	193DF380C665C05*	50.812	-1.179	2022-03-29 03:06:37	-5.228	1.618
114	14198	193DF380C665C05*	50.816	-1.204	2022-03-29 04:46:21	9.817	0.245
12	67713	193DF380C665C05*	50.818	-1.178	2022-03-29 06:18:43	-20.066	1.718
12	67707	193DF380C665C05*	50.819	-1.199	2022-03-28 19:44:05	-7.584	0.557

Location Errors greater than 5 km are marked in red text.

Ratio of Successful Solutions $= \dfrac{\text{number of Doppler solutions within 5 km with } 1° < CTA < 21°}{\text{number of satellite passes over test duration with } 1° < CTA < 21°}$

$= \dfrac{14}{14}$

$= 100\%$

*NOTE: Hex ID is provided with location - the Hex ID with default values is 193DF380C6FFBFF.

Summary

The EUT complies with clause A.2.5 of Cospas-Sarsat T.007.

2.10 OPERATING LIFETIME AT MINIMUM TEMPERATURE

2.10.1 Specification

Cospas-Sarsat T.007, Clause A.2.3

2.10.2 Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000004 - Modification State 1 – Battery Current Measurements
EPIRB3 Pro S/N: TA000021 - Modification State 2 – Operating Lifetime at Minimum Temperature

TA000004 was initially used for the battery current measurements. The EUT was returned to the Manufacturer for repair; during the repair the TCXO was changed. On return to TUV SUD it was re assigned the serial number TA000021. The Manufacturer advised that the TCXO current consumption is 3 mA at 3.3 V (approximatley 1 mA from battery) and the unit to unit variation is minimal.

*Battery current comparison measurements between modification states can be found in annex A.

2.10.3 Date of Test

09 March 2022, 10 March 2022 & 11 March 2022 – Battery Current Measurements
26 April 2022 – Operating Lifetime at Minimum Temperature

2.10.4 Test Equipment Used

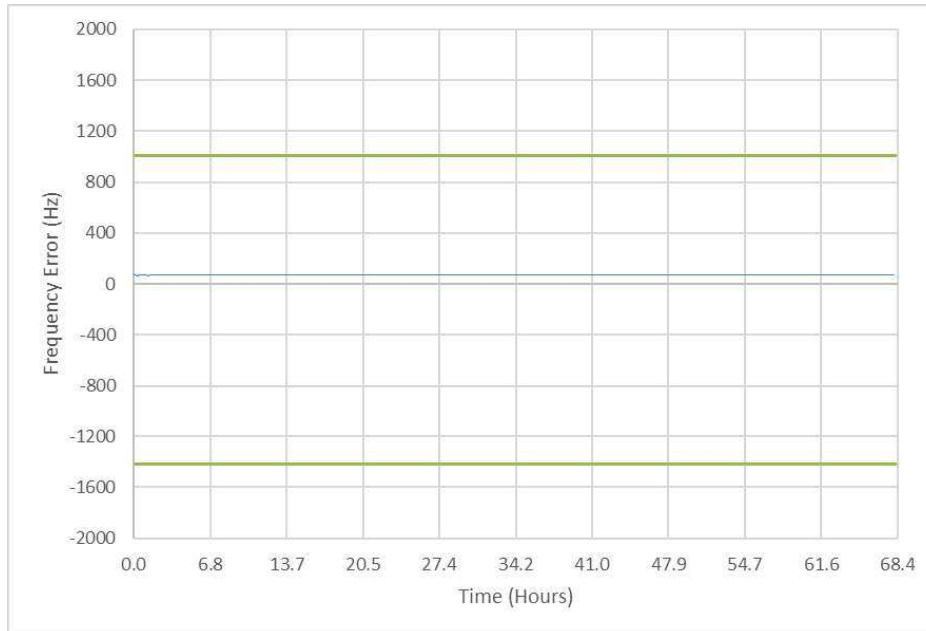The major items of test equipment used for the above tests are identified in Section 4.1.

2.10.5 Laboratory Environmental Conditions

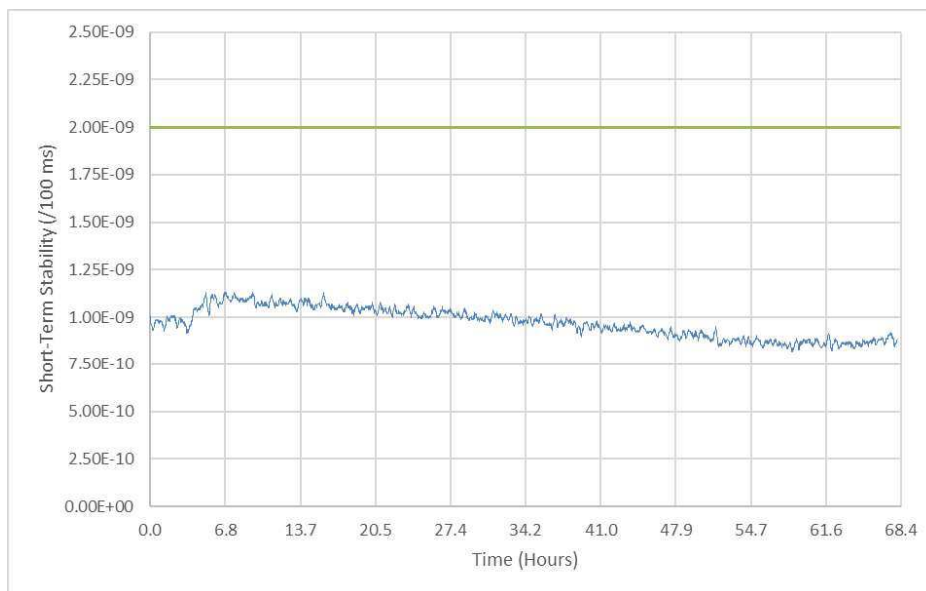Ambient Temperature 24.7 – 25.8°C
Relative Humidity 25.5 – 29.5%

2.10.6 Test Results

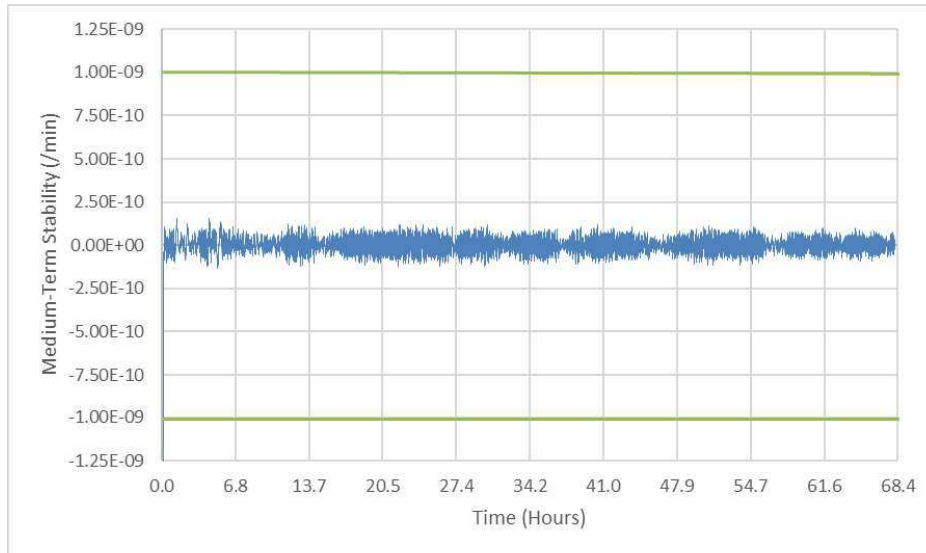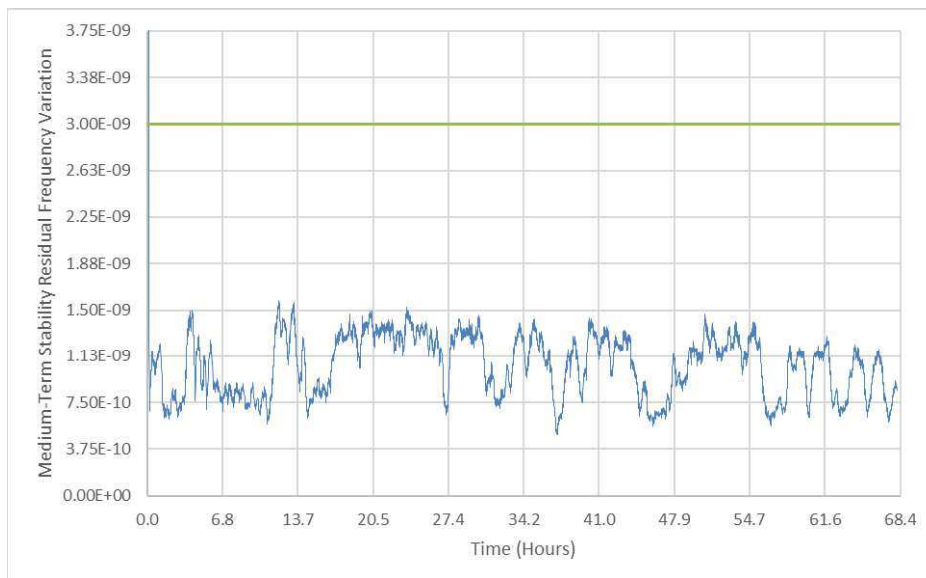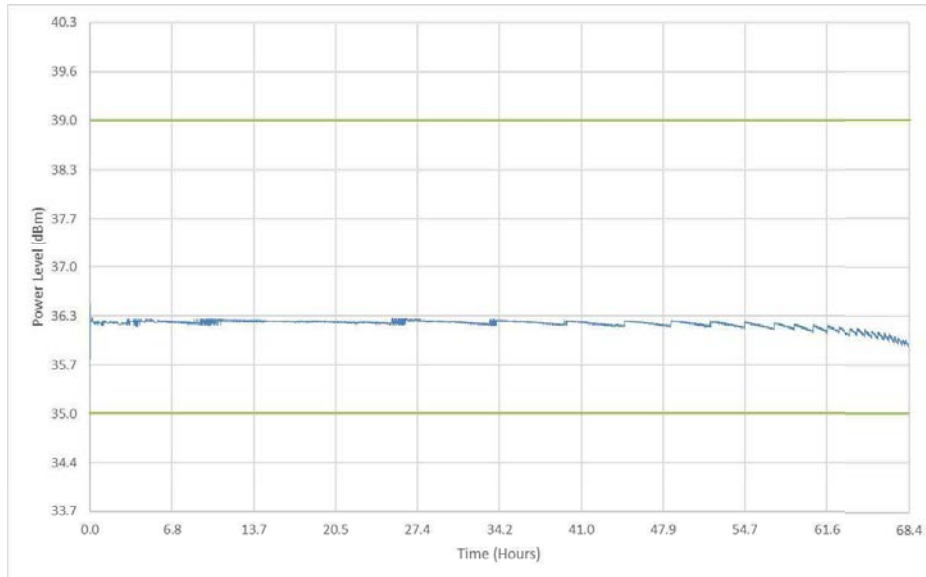## Nominal Frequency

Short Term Stability

Medium Term Stability, Mean Slope

Medium Term Stability, Residual Frequency Variation

Output Power

Digital Message - Navigation data supplied at the start of the test

Message		FFFE2F8C9DFE7018CCF024AD44F84ECA2A3C	
Hex ID		193BFCE03199E04	
Position		51°22'36" N 1°49'52" W	
Parameter	Bit	Data Bits	Decoded Value
Bit synchronization	1-15	111111111111111	111111111111111
Frame synchronization	16-24	000101111	000101111
Format Flag	25	1	1
Protocol Flag	26	0	0
Country Code	27-36	0011001001	Albania (Republic of)
Protocol Code	37-40	1101	RLS Location Protocol
Beacon Type	41-42	11	Location Test Protocol
RLS TAC	43-52	1111100111	999
RLS ID Serial Number	53-66	00000001100011	99
N/S	67	0	North
Latitude Degrees	68-75	01100111	51.5
E/W	76	1	West
Longitude Degrees	77-85	000000100	2
BCH Code (21 Bit)	86-106	100101011010100010011	100101011010100010011
Calculated BCH Code (21 Bit)	-	100101011010100010011	100101011010100010011
Encoded Position Data Source	107	1	Internal navigation device
121.5 MHz Radio Locating Device	108	1	Yes
Capability to process RLM Type-1:	109	1	Acknowledgement Type-1 accepted by this beacon
Capability to process manually generated RLM	110	0	Manually generated RLM not accepted by this beacon
Feedback on RLM Type-1:	111	0	Acknowledgement Type-1 not (yet) received by this beacon
Feedback on RLM Type-2	112	0	RLM Type-2 not (yet) received by this beacon
RLS Provider Identification:	113-114	01	GALILEO Return Link Service Provider
Delta Latitude +/-	115	0	-
Delta Latitude Minutes	116-119	0111	7
Delta Latitude Seconds	120-123	0110	24
Delta Longitude +/-	124	0	-
Delta Longitude Minutes	125-128	1010	10
Delta Longitude Seconds	129-132	0010	8
BCH Code (12 Bit)	133-144	101000111100	101000111100
Calculated BCH Code (12 Bit)	-	101000111100	101000111100

Digital Message – Default Navigation data after 4 hours

| Parameter	Bit	Data Bits	Decoded Value
Message		FFFE2F8C9DFE7018DFEFF8129DF861F0FABE	
Hex ID		193BFCE031BFDFF	
Position		None - Default Values	
Parameter	Bit	Data Bits	Decoded Value
Bit synchronization	1-15	111111111111111	111111111111111
Frame synchronization	16-24	000101111	000101111
Format Flag	25	1	1
Protocol Flag	26	0	0
Country Code	27-36	0011001001	Albania (Republic of)
Protocol Code	37-40	1101	RLS Location Protocol
Beacon Type	41-42	11	Location Test Protocol
RLS TAC	43-52	1111100111	999
RLS ID Serial Number	53-66	00000001100011	99
N/S	67	0	Default
Latitude Degrees	68-75	11111111	Default
E/W	76	0	Default
Longitude Degrees	77-85	111111111	Default
BCH Code (21 Bit)	86-106	000000100101001110111	000000100101001110111
Calculated BCH Code (21 Bit)	-	000000100101001110111	000000100101001110111
Encoded Position Data Source	107	1	Internal navigation device
121.5 MHz Radio Locating Device	108	1	Yes
Capability to process RLM Type-1:	109	1	Acknowledgement Type-1 accepted by this beacon
Capability to process manually generated RLM	110	0	Manually generated RLM not accepted by this beacon
Feedback on RLM Type-1:	111	0	Acknowledgement Type-1 not (yet) received by this beacon
Feedback on RLM Type-2	112	0	RLM Type-2 not (yet) received by this beacon
RLS Provider Identification:	113-114	01	GALILEO Return Link Service Provider
Delta Latitude +/-	115	1	Default
Delta Latitude Minutes	116-119	0000	Default
Delta Latitude Seconds	120-123	1111	Default
Delta Longitude +/-	124	1	Default
Delta Longitude Minutes	125-128	0000	Default
Delta Longitude Seconds	129-132	1111	Default
BCH Code (12 Bit)	133-144	101010111110	101010111110
Calculated BCH Code (12 Bit)	-	101010111110	101010111110

Test Data (0 min - 30 min)

| #	Nominal Frequency (Hz)	Short Term Stability (/100 ms)	Medium Term Stability – Slope (/min)	Medium Term Stability – Residual Frequency Variation (no units)	Output Power (dBm)	Time (h)
1	-	-	-	-	35.76	0.000
2	-	-	-	-	36.49	0.014
3	-	-	-	-	36.33	0.029
4	-	-	-	-	36.31	0.043
5	-	-	-	-	36.28	0.056
6	-	-	-	-	36.28	0.070
7	-	-	-	-	36.26	0.083
8	-	-	-	-	36.25	0.098
9	-	-	-	-	36.29	0.111
10	-	-	-	-	36.28	0.125
11	-	-	-	-	36.27	0.138
12	-	-	-	-	36.26	0.153
13	-	-	-	-	36.33	0.167
14	-	-	-	-	36.32	0.180
15	-	-	-	-	36.31	0.194
16	-	-	-	-	36.3	0.207
17	-	-	-	-	36.29	0.222
18	406.0311	1.01E-09	-6.65E-09	6.32E-09	36.3	0.235
19	406.0311	9.85E-10	-6.30E-09	7.52E-09	36.27	0.249
20	406.0311	9.76E-10	-5.69E-09	8.39E-09	36.25	0.264
21	406.0311	9.72E-10	-5.04E-09	8.97E-09	36.27	0.278
22	406.0311	9.74E-10	-4.37E-09	9.03E-09	36.25	0.292
23	406.0311	9.67E-10	-3.69E-09	8.87E-09	36.23	0.306
24	406.0311	9.63E-10	-2.96E-09	8.16E-09	36.24	0.319
25	406.0311	9.68E-10	-2.26E-09	6.98E-09	36.22	0.333
26	406.0311	9.62E-10	-1.63E-09	5.48E-09	36.26	0.347
27	406.0311	9.60E-10	-1.12E-09	3.82E-09	36.24	0.360
28	406.0311	9.58E-10	-8.18E-10	2.94E-09	36.22	0.374
29	406.0311	9.57E-10	-5.75E-10	2.20E-09	36.27	0.389
30	406.0311	9.53E-10	-3.74E-10	1.69E-09	36.24	0.402
31	406.0311	9.49E-10	-2.13E-10	1.24E-09	36.22	0.416
32	406.0311	9.42E-10	-8.18E-11	7.92E-10	36.27	0.430
33	406.0311	9.33E-10	-3.81E-11	6.75E-10	36.25	0.443
34	406.0311	9.32E-10	-7.10E-11	7.25E-10	36.23	0.456
35	406.0311	9.38E-10	-8.39E-11	7.28E-10	36.22	0.471
36	406.0311	9.33E-10	-4.90E-11	7.33E-10	36.26	0.484
37	406.0311	9.36E-10	1.78E-11	8.52E-10	36.27	0.498

Results outside of the specification are marked in red text.
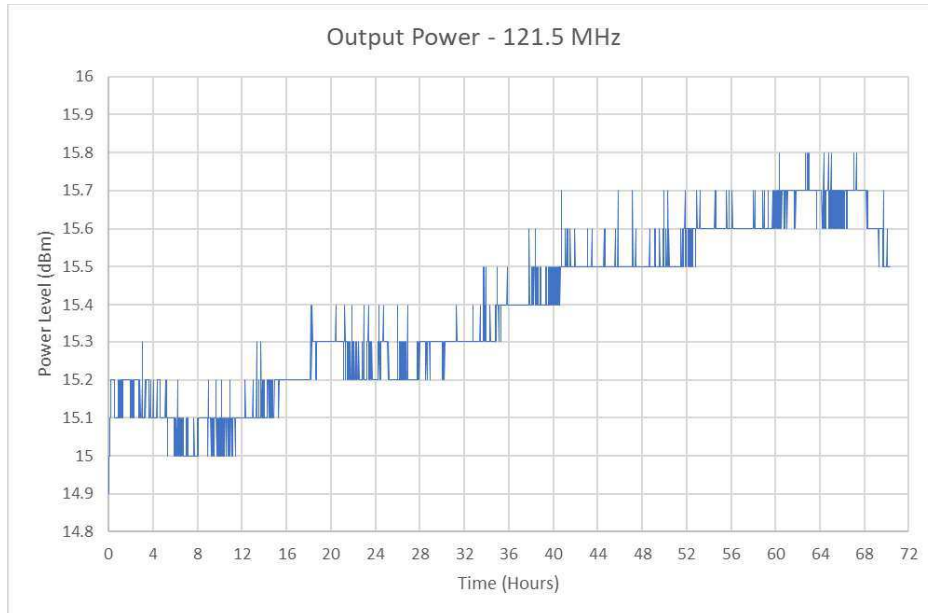
121MHz Homing Transmitter - Duty Cycle (Start of Test)
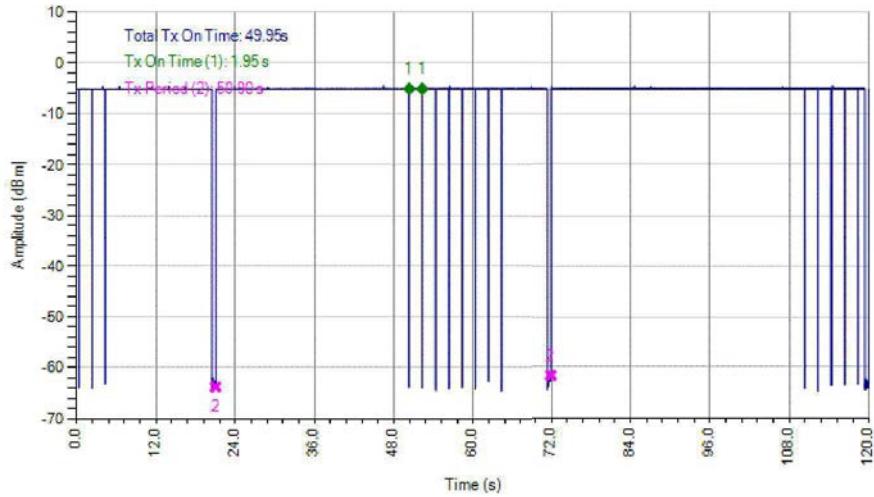
Duty Cycle = 49.951 / (49.951+0.952) = 98.13%

121MHz Homing Transmitter - Duty Cycle (End of Test)
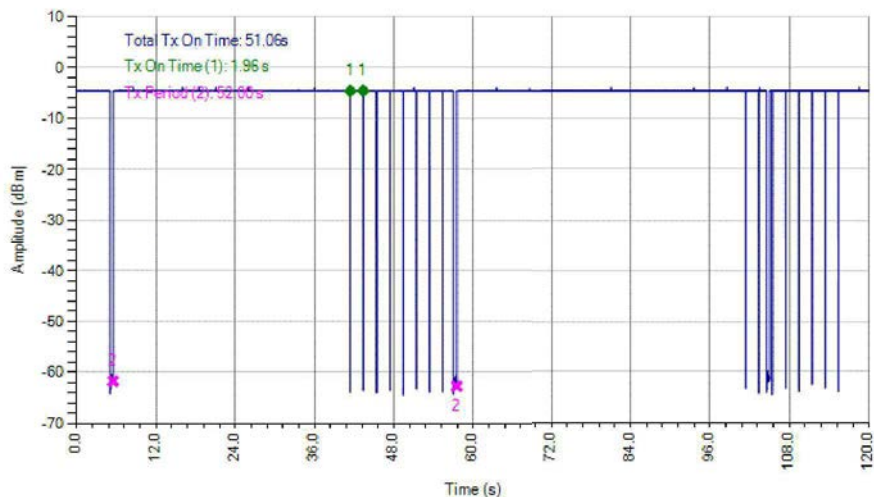
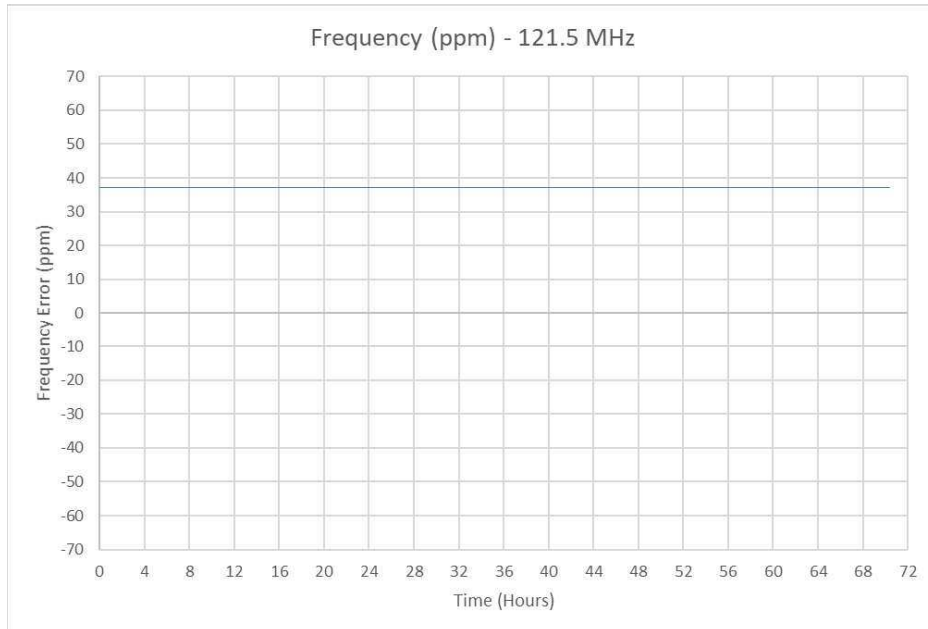Duty Cycle = 51.064 / (51.064+0.938) = 98.2%

121MHz Homing Transmitter Power

121MHz Homing Transmitter Frequency

AIS Bursts – Start of Test
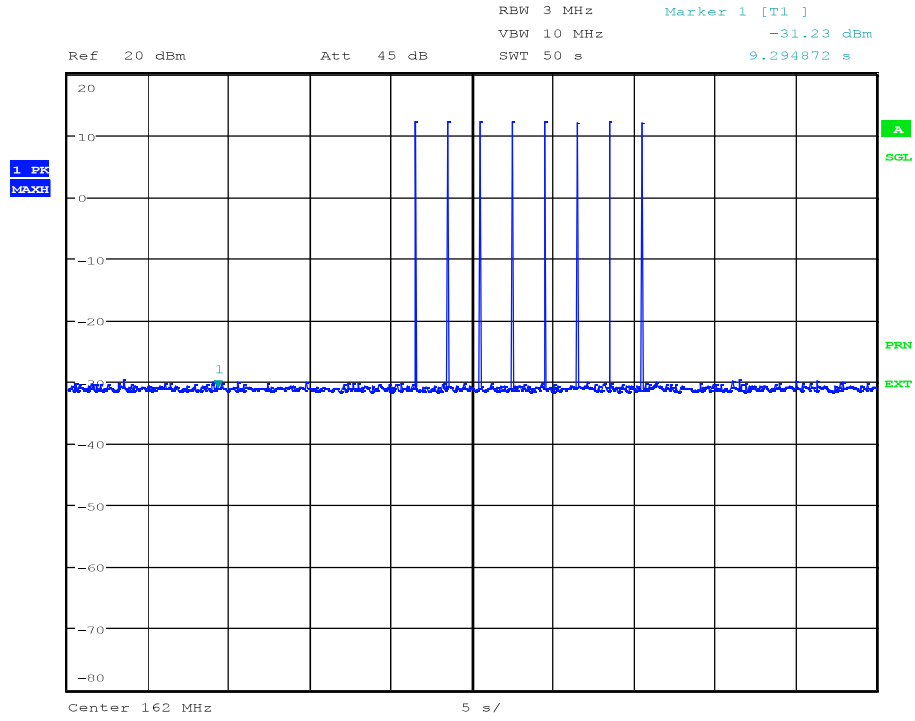
Date: 26.APR.2022   11:18:56

AIS Bursts – End of Test

```
                                        RBW  3 MHz
                                        VBW 10 MHz
Ref   20 dBm          Att  45 dB        SWT 50 s
```



```
Center 162 MHz                    5 s/
```
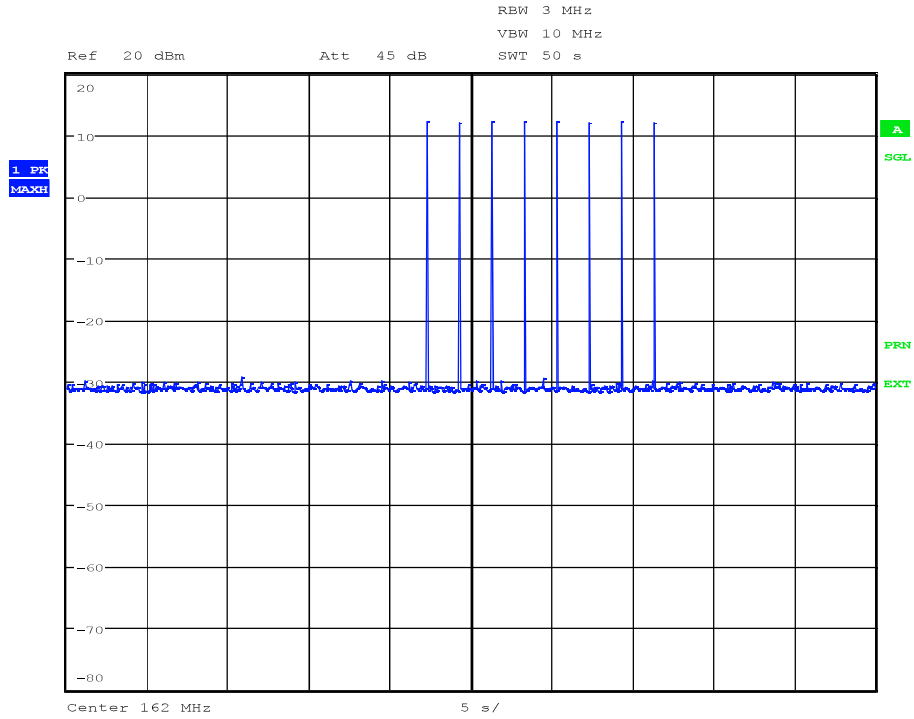
Date: 28.APR.2022 11:24:15

NOTE: The AIS was monitored with a Class A receiver over the complete duration of the Operating at Lifetime Minimum Temperature Test.

Operating Current Measurements and Analysis

System Configurations and Operating Modes

System Configuration/Operating Mode Matrix (SCOMM):

System Configuration → Operational Mode ↓	A, Non RLS No Ancillaries	B, RLS No Ancillaries	C, RLS in Free Float Case	D, RLS in Manual Bracket
1, Standby	A1	B1	C1	D1
2, ON at EUT Average	A2	B2	C2	D2
3, ON at EUT (GNSS Search)	A3	B3	C3	D3
4, ON at EUT (GNSS Sleep)	A4	B4	C4	D4
5, ON at EUT Water Contacts Average	A5	B5	N/A	N/A
6, ON at EUT Water Contacts (GNSS Search)	A6	B6	N/A	N/A
7, ON at EUT Water Contacts (GNSS Sleep)	A7	B7	N/A	N/A
8, Self-Test	A8	B8	C8	D8
9, GNSS Self-Test (Timeout)	A9	B9	C9	D9
10, GNSS Self-Test (Burst)	A10	B10	C10	D10
11, Self-Test Held	A11	B11	C11	D11
12, NFC Interrogation	A12	B12	C12	D12
13, ON at EUT (GNSS fix, waiting RLM acknowledgement)	N/A	B13	C13	D13
14, ON at EUT (GNSS fix, RLM acknowledgement received)	N/A	B14	C14	D14

SCOMM Results as per C/S T.007 Table F-E.1:

Beacon Operating Mode	Mode: Manually selectable or Automatic	Measurement interval, sec	Average Current, mA	Peak Current, mA
A1	Manual	598.3	0.000017	0.000018
B1	Manual	598.3	0.00001741	0.000018
C1	Manual	598.3	0.00001737	0.000018
D1	Manual	598.3	0.00001764	0.000018
A2	Manual	2397	39.51	1426
B2	Manual	2397	38	1276
C2	Manual	2397	39.7	1363
D2	Manual	2397	38.16	1311
A3	Manual	200	43.53	1382
B3	Manual	200	43.67	1255
C3	Manual	200	43.42	1349
D3	Manual	200	43.66	1311
A4	Automatic*	200	33.3	1385
B4	Automatic*	200	32.99	1256
C4	Automatic*	200	33.49	1344
D4	Automatic*	200	33.84	1297
A5	Automatic*	2397	39.86	1416
B5	Automatic*	2397	39.58	1293
A6	Automatic*	200	42.8	1413
B6	Automatic*	200	43.73	1260
A7	Automatic*	200	33.35	1394
B7	Automatic*	200	31.93	1268
A8	Manual	16	67.34	1427
B8	Manual	16	71.1	1347
C8	Manual	16	70	1331
D8	Manual	16	70.54	1271
A9	Manual	114.1	26.74	30.32
B9	Manual	114.1	25.53	29.05
C9	Manual	114.1	25.6	29.12
D9	Manual	114.1	25.53	28.95
A10	Manual	73.7**	32.13	1376
B10	Manual	73.7**	28.57	1337
C10	Manual	73.7**	28.96	1326
D10	Manual	73.7**	28.47	1224
A11	Manual	30	0	0
B11	Manual	30	0	0
C11	Manual	30	0	0
D11	Manual	30	0	0

Beacon Operating Mode	Mode: Manually selectable or Automatic	Measurement interval, sec	Average Current, mA	Peak Current, mA
A12	Manual	298.4	0.00001673	0.000017
B12	Manual	298.4	0.00001783	0.000018
C12	Manual	298.4	0.00001757	0.000018
D12	Manual	298.4	0.00001722	0.000018
B13	Manual	200	40.18	1278
C13	Manual	200	43.11	1383
D13	Manual	200	42.23	1296
B14	Automatic*	200	33.77	1274
C14	Automatic*	200	31.06	1370
D14	Automatic*	200	33.58	1287

The sampling interval was a nominal 100 ms for all measurements.

* NOTES, * GNSS sleep denoted as Automatic; in RLS protocol, upon beacon activation the beacon enters GNSS search mode for 30 minutes, if a valid RLM message is received then this time is reduced to 18 minutes. For non RLS protocols the GNSS will remain active for only 18 minutes. After the initial active time, the beacon automatically enters GNSS sleep mode, and cycles over a period of 5 minutes. During which the GNSS receiver is active for 60 – 91 seconds and inactive for the remaining period. RLM acknowledgement received denoted as automatic as this depends on when the GNSS receives an acknowledgment.
**The GNSS Self-Test Burst measurement window was chosen by using the longest duration seen and applying it to the other measurements. This was done so that the different configurations could be analysed equally and show a more accurate average current.

Worst Case System Configurations / Operating Modes

"Lifetime in service" drains (highest average current):
        Standby: B12 – NFC Interrogation, RLS Protocol, No Ancillaries
        Self-test: B8 – Self-Test, RLS Protocol, No Ancillaries
        GNSS Self-test (Timeout):   A9 – GNSS Self-Test, Standard Location Protocol,
                No Ancillaries
        GNSS Self-test (Burst):   A10 – GNSS Self-Test, Standard Location Protocol,
                No Ancillaries

Operating mode used for battery conditioning calculations (equal or lower average current than mode used for conditioning)
        B7 – ON at EUT Water Contacts, RLS Protocol, No Ancillaries

Operating mode used for actual battery conditioning (equal or higher average current than mode used for calculations):
        B2 – ON at EUT, RLS Protocol, No Ancillaries, GNSS in normal operating duty cycle

Conditions during battery conditioning:
        Temperature: Ambient
        GNSS Signals: None applied

Note: Battery conditioning is a flexible term used to mean either pre-test discharge and/or extension time as appropriate, see Battery Conditioning Results, below.

Operating mode during lifetime test (highest average current):
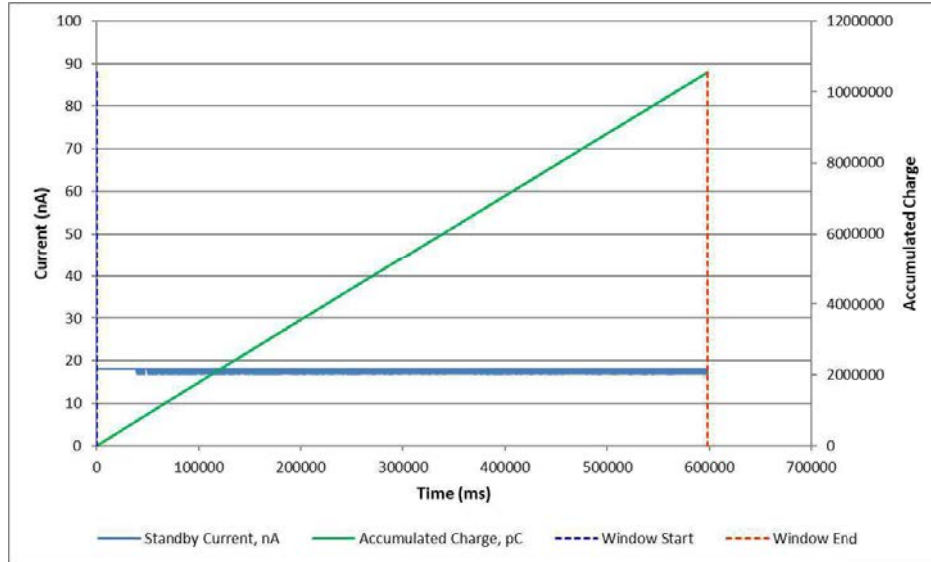   B6 – ON at EUT Water Contacts, RLS Protocol, No Ancillaries, GNSS in normal operating duty cycle
Conditions during lifetime test:
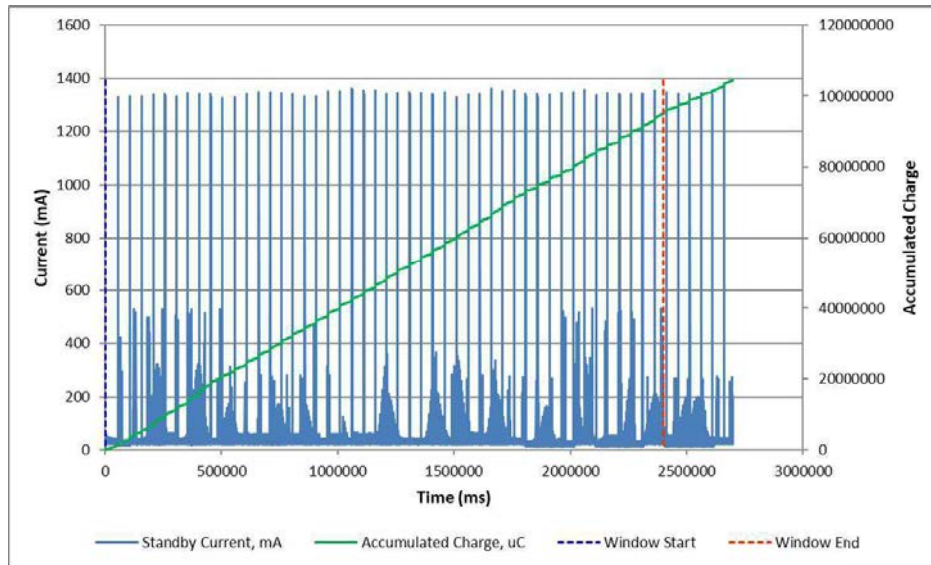   GNSS Signals: External Data Applied at the start of the test. Once a fix had been
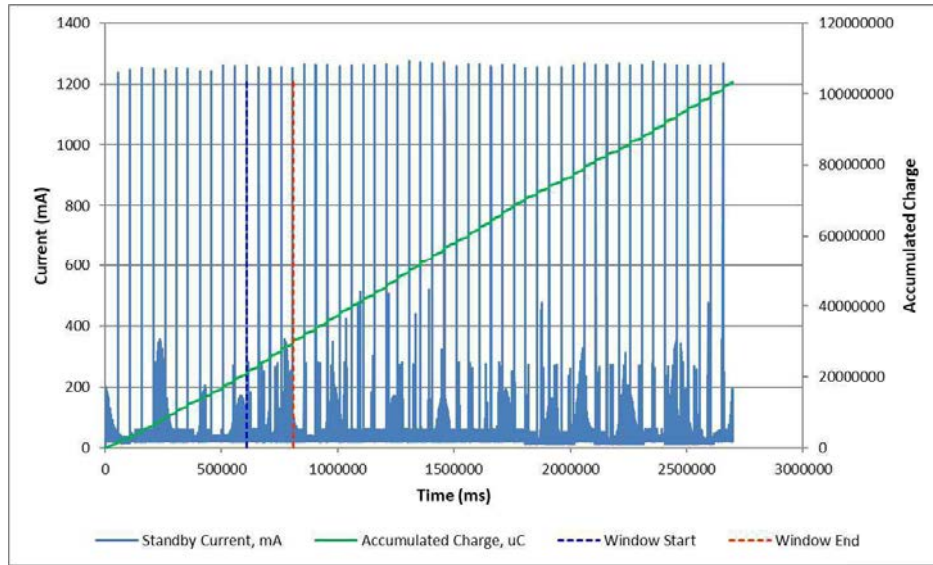   obtained, the navigation data was removed.
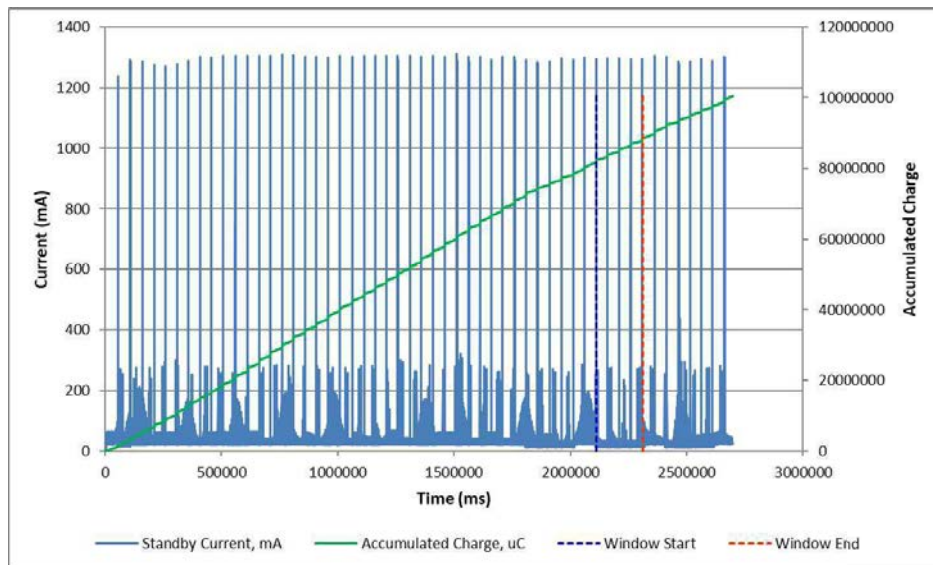
Current Measurement Plots

Worst Case Standby: D1

Worst Case On at EUT Average: C2

Worst Case On at EUT (GNSS Search): B3

Worst Case On at EUT (GNSS Sleep): D4
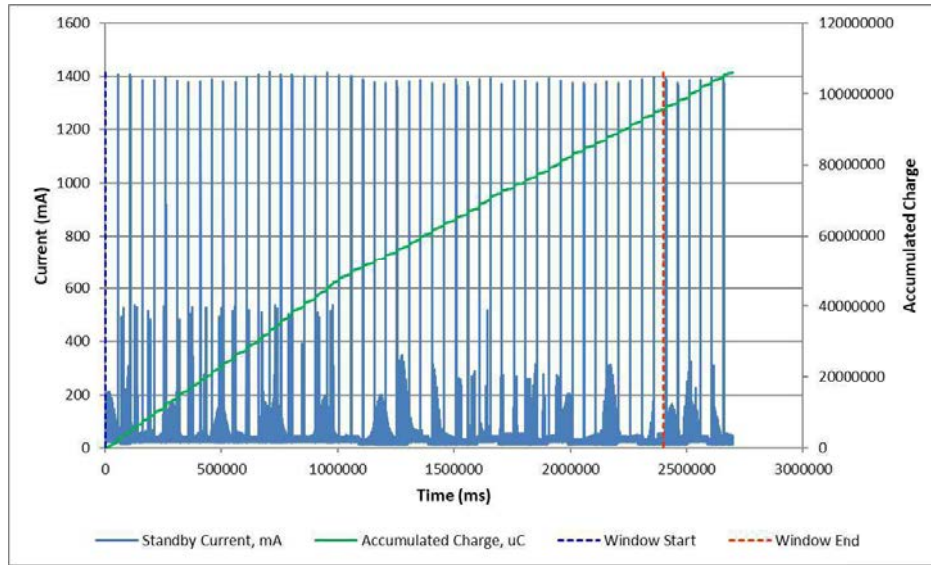
Worst Case On at EUT Water Contacts Average: A5
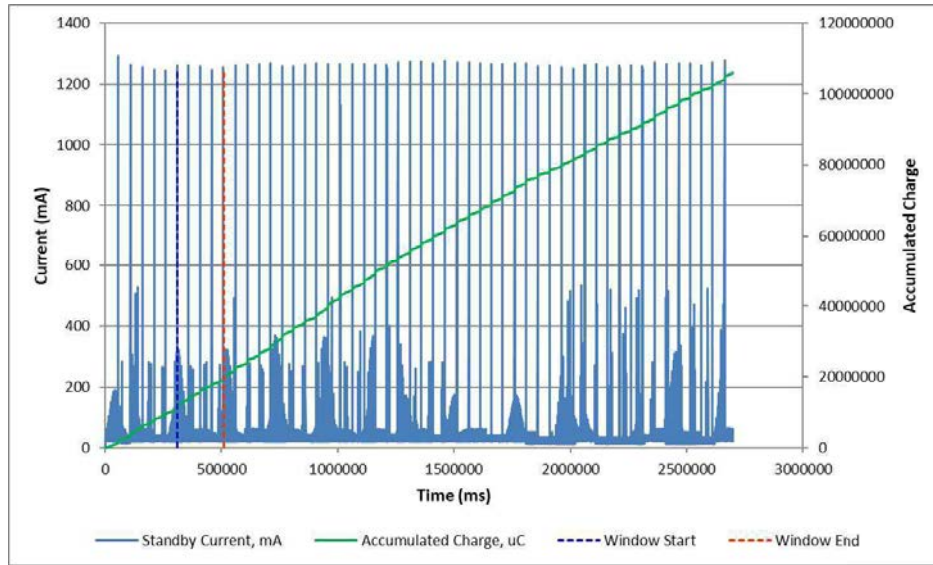
Worst Case On at EUT Water Contacts (GNSS Search): B6
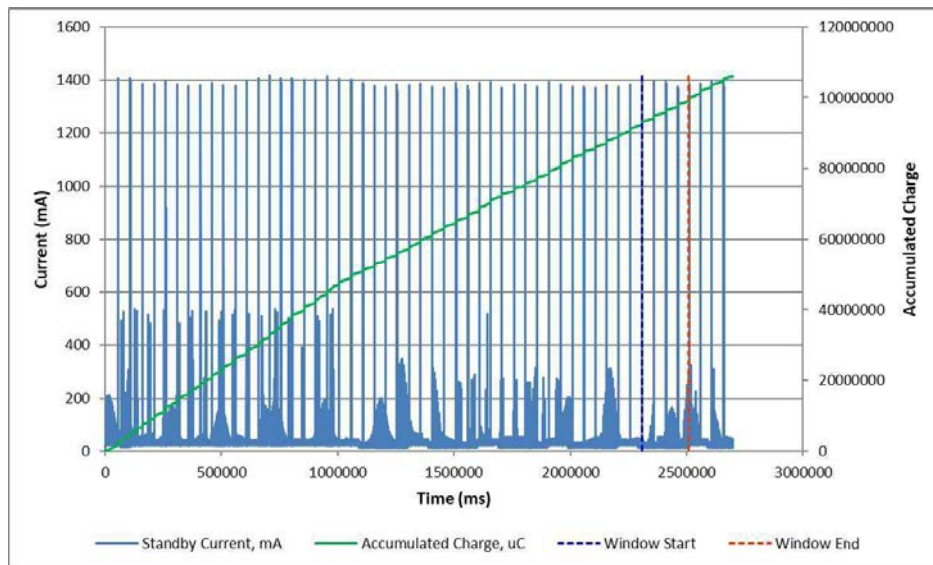
Worst Case On at EUT Water Contacts (GNSS Sleep): A7
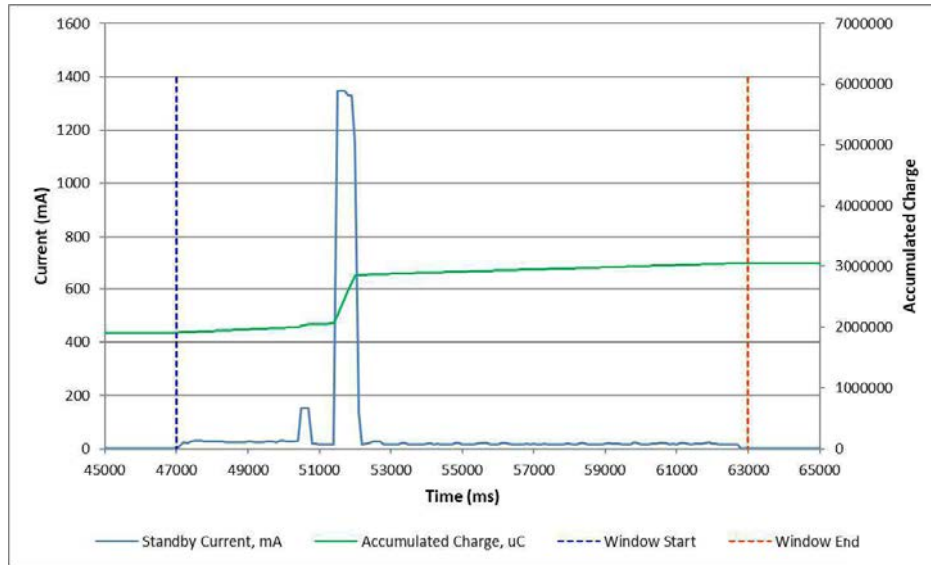
Worst Case Self-test: B8

Worst Case GNSS Self-test (Timeout): A9

Worst Case GNSS Self-test (Burst): A10

Self-test Held: A11

Worst Case NFC Interrogation: B12

Worst Case On at EUT (GNSS fix, waiting RLM acknowledgement): C13

Worst Case On at EUT (GNSS fix, RLM acknowledgement received): B14

Battery Conditioning Calculations

As per C/S T.007 Table F-E.2:

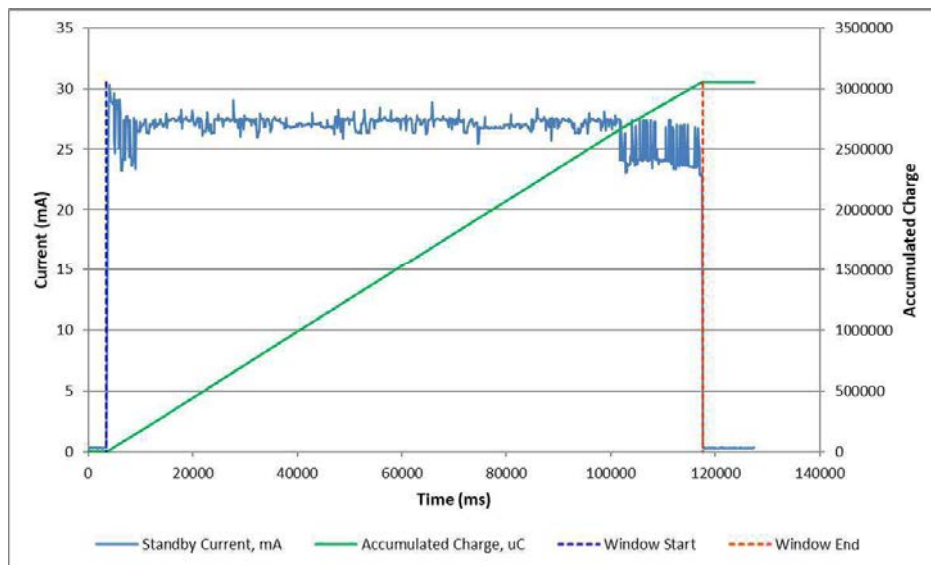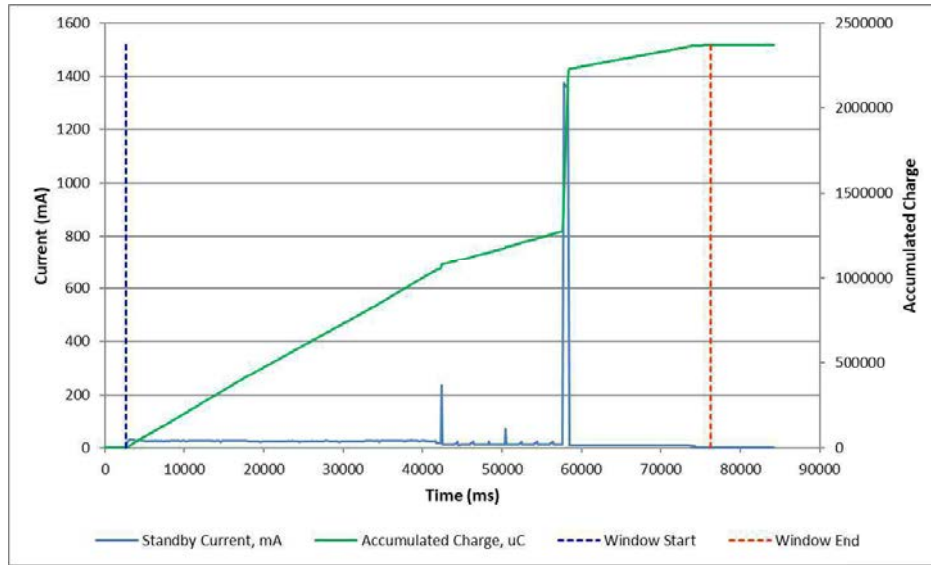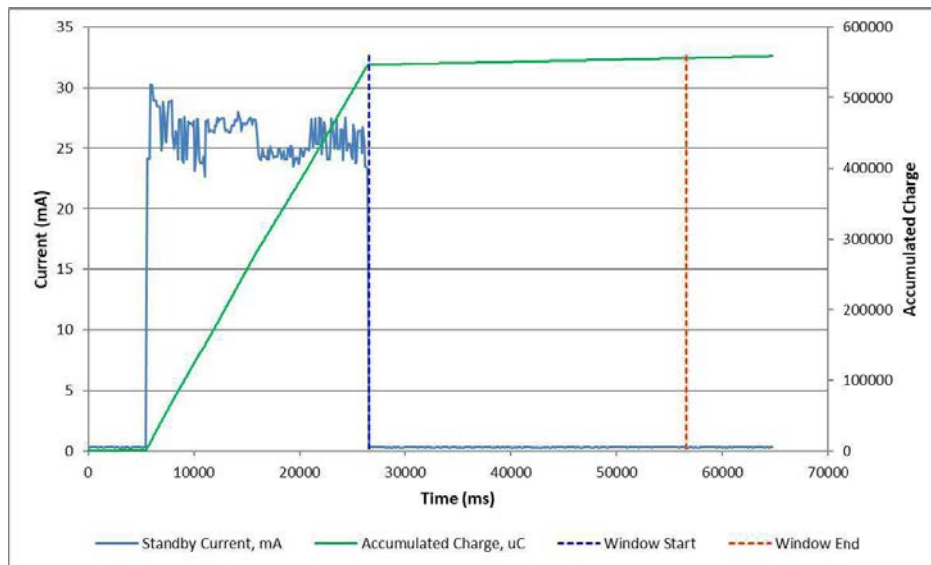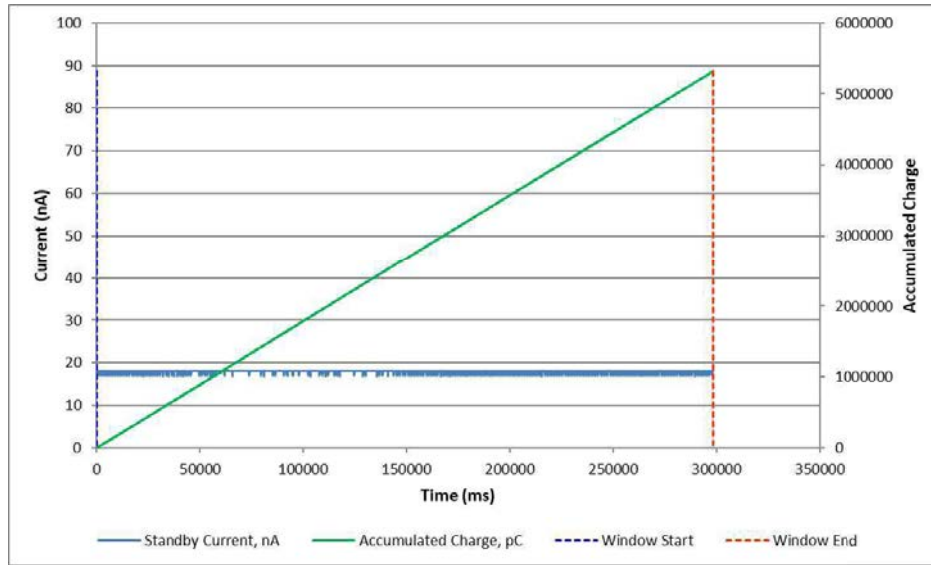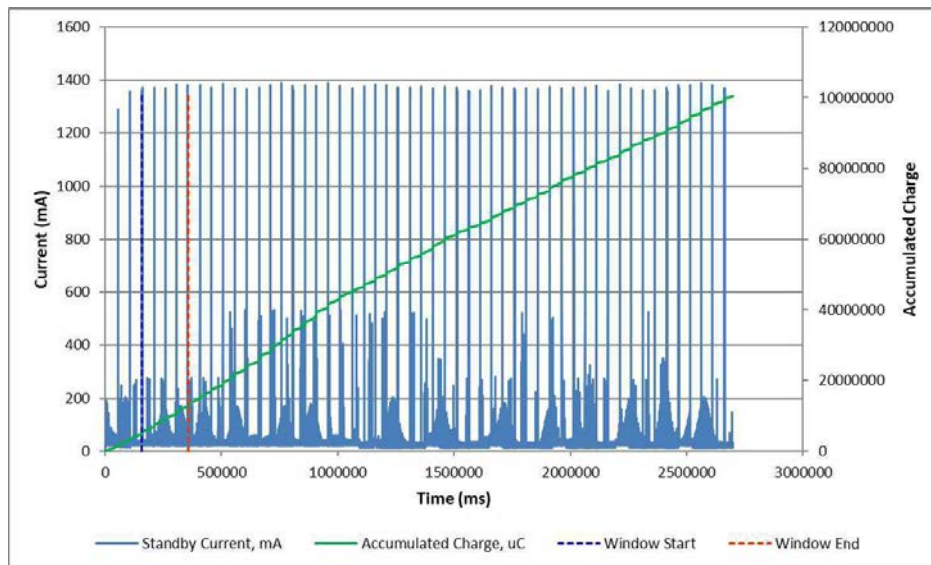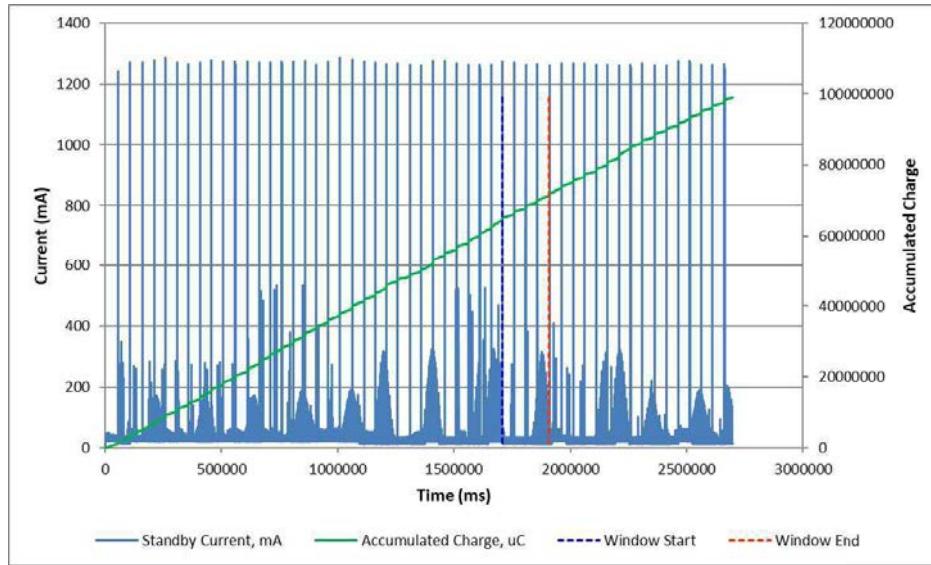| Characteristic	Designation	Units	Value	Comments
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	T_{CS} or TCS	Years	2	
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	T_{BR} or TBR	Years	10.5	
Battery pack electrical configuration	-	-	3 series packs of 2 cells in series	
Cell model and cell chemistry	-	-	Li/FeS2	
Nominal cell capacity	-	Ah	3.5	
Nominal battery pack capacity	C_{BN}	Ah	3.5	
Annual battery cell capacity loss (self-discharge) due to aging, as specified by cell manufacturer at ambient temperature	L_{SDC}	%	0.36	
Calculated battery pack capacity loss due to self-discharge: $L_{CBN} = C_{BN} - [C_{BN} *(1 - L_{SDC}/100)^{TBR+TCS}]$	L_{CBN}	Ah	0.1543	
Number of self-tests per year	N_{ST}	-	12	Manufacturer Declared Value
Average battery current during a self-test	I_{ST}	mA	71.1	
Maximum duration of a self-test	T_{ST}	s	16	Manufacturer Declared Value
Calculated battery pack capacity loss due to self-tests during battery replacement period: $L_{ST} = I_{ST} * T_{ST} * T_{BR} * (N_{ST}/3600)$	L_{ST}	mAh	39.82	
Maximum Number of GNSS self-tests between battery replacements	N_{GST}	-	60	Manufacturer Declared Value
Average battery current during a GNSS self-test of maximum duration	$I_{GST}1$	mA	26.74	GNSS Timeout (No nav data present)
Maximum duration of a GNSS self-test	$T_{GST}1$	s	114.1	TUV measured value
Average battery current during a GNSS self-test of maximum duration	$I_{GST}2$	mA	32.13	GNSS Burst (Nav data applied)
Maximum duration of a GNSS self-test	T_{GST2}	s	140	Manufacturer Declared Worst Case Value
Calculated battery pack capacity loss due to GNSS self-tests during battery replacement period: $L_{GST} = I_{GST2} * T_{GST2} * (N_{GST}/3600)$	L_{GST}	mAh	74.97	This was calculated using the following values: IGST2 = 32.13 TGST2 = 140 NGST = 60
Average stand-by battery pack current	I_{SB}	mA	0.00001783	
Other Capacity Losses	L_{OTH}	mAh	0	
Battery pack capacity loss due to constant operation of circuitry prior to beacon activation: $L_{ISB} = I_{SB} * T_{BR} * 8760$	L_{ISB}	mAh	1.6400	
Calculated value of the battery pack pre-test discharge $L_{CDC} = L_{CBN} + 1.65((L_{ST} + L_{GST} + L_{ISB})/1000) + (L_{OTH}/1000)$	L_{CDC}	Ah	0.3464	

Battery Conditioning Results

A fresh battery was used for the test; it was discharged by connection to a resistive load for the pre-test discharge duration calculated as follows:

Pre-test discharge (L_{CDC}) [mAh]   =   346.4

Constant current [mA]   =   39.2

Pre-test discharge duration [h]   = $\dfrac{346.4}{39.2}$

Pre-test discharge duration [h]   =   8.83

The actual discharge performed on the battery equated to 439.89 mAh. This was to meet the requirements of RTCM 11000.5. The discharge defined in this standard is considered an over test to the requirements of Cospas Sarsat T.007.

Summary

The EUT complies with clause A.2.3 of Cospas-Sarsat T.007.

2.11   FREQUENCY STABILITY TEST WITH TEMPERATURE GRADIENT

2.11.1   Specification

Cospas-Sarsat T.007, Clause A.2.4

2.11.2   Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000005 - Modification State 1

2.11.3   Date of Test

29 March 2022

2.11.4   Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 4.1.

2.11.5   Laboratory Environmental Conditions
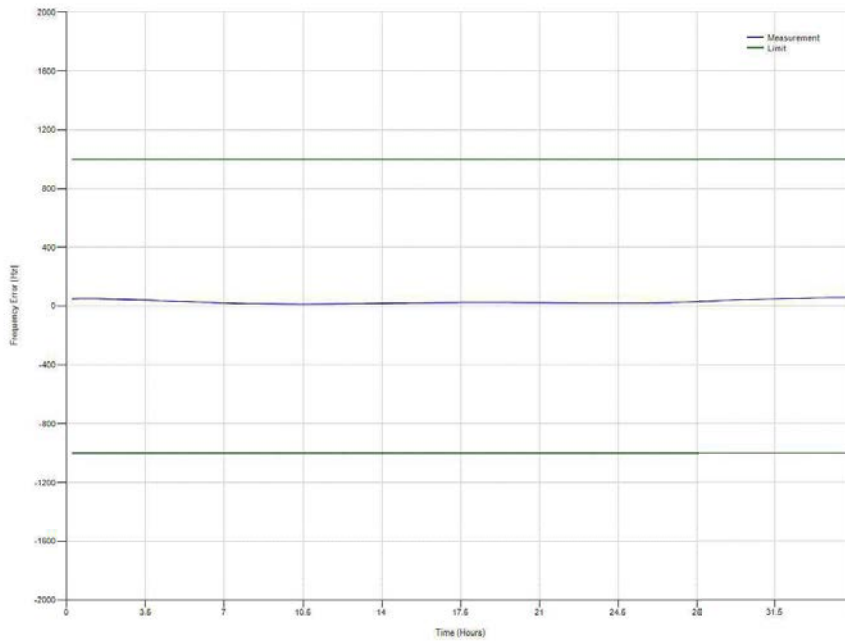
Ambient Temperature 24.8°C
Relative Humidity 36.0%
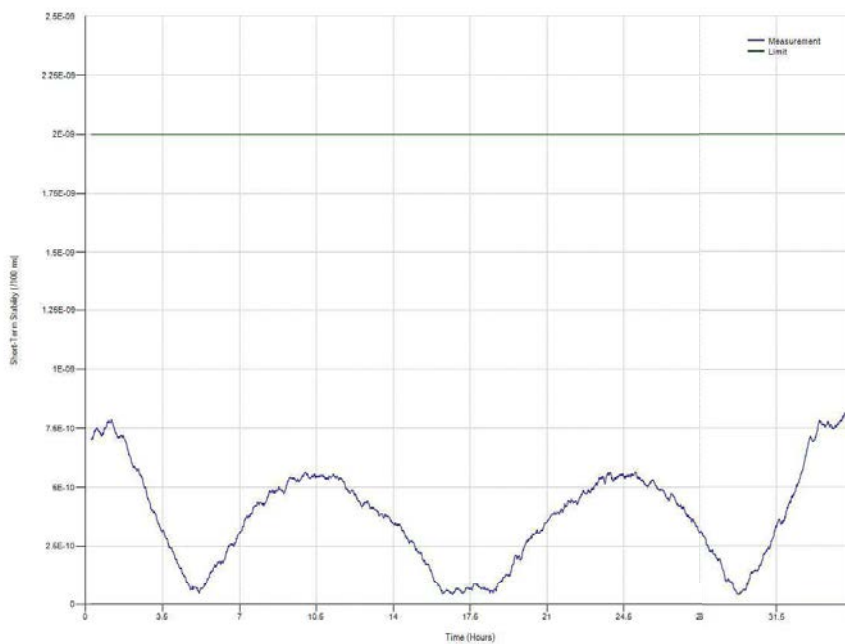
2.11.6   Test Results

Full Test

Nominal Frequency

Short Term Stability

Medium Term Stability, Mean Slope

Medium Term Stability, Residual Frequency Variation

Output Power

Burst 1
Decoded Beacon Message

Hexadecimal code: **FFFE2F8C9DFE7018DFEFF8129DF861F0FABE**

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.6.

Unique identifier:
193BFCE031BFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	111111111111111	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 list here
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-46	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-66	10011100000001100011	Last 6 digits MMSI	639075
67-75	011111111	Latitude	Default - no location (Default - no location)
76-85	0111111111	Longitude	Default - no location (Default - no location)
86-106	00000010010100111011 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	121.5 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	101010111110	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field

Interim TCXO Procedure - Complete Test

TCXO Part Number*: E6907
TCXO S/N*: 2114
* As advised by the Manufacturer

Table A-2: Point-By-Point Analysis

MTS Characteristic	Time (h)	Temp. (°C)	tot	osc	beacon_wc	MAX-OSC	beacon_max	Ageing factor	beacon_5 year	Limit	Result
Residual	6.27	6.2	1.310E-09	3.338E-10	1.267E-09	2.00E-09	2.367E-09	2.00E-10	2.567E-09	3.0E-09	Pass
Static Positive Mean Slope	33.30	-20.0	2.578E-10	7.053E-11	2.480E-10	7.00E-10	7.426E-10	1.00E-10	8.426E-10	1.0E-09	Pass
Static Negative Mean Slope	16.63	55.0	3.089E-11	7.631E-11	-6.978E-11	-7.00E-10	-7.035E-10	-1.00E-10	-8.035E-10	-1.0E-09	Pass
Gradient Positive Mean Slope	30.53	-7.0	2.409E-10	-2.546E-10	3.505E-10	1.70E-09	1.736E-09	1.00E-10	1.836E-09	2.0E-09	Pass
Gradient Negative Mean Slope	12.42	36.8	7.989E-11	3.950E-10	-3.868E-10	-1.70E-09	-1.743E-09	-1.00E-10	-1.843E-09	-2.0E-09	Pass

Summary

The EUT complies with clause A.2.4 of Cospas-Sarsat T.007.

2.12   NAVIGATION SYSTEM TEST

2.12.1   Specification

Cospas-Sarsat T.007, Clause A.2.7

2.12.2   Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000005 - Modification State 1 (RLS A.3.8.1, A.3.8.6 and A.3.8.3 Short)
EPIRB3 Pro S/N: TA000005 - Modification State 2 (RLS A.3.8.4 and A.3.8.3 Long)
EPIRB3 Pro S/N: TA000005 - Modification State 1 (SLP A.3.8.1, A.3.8.6 and A.3.8.3 Short)
EPIRB3 Pro S/N: TA000005 - Modification State 2 (SLP A.3.8.4 and A.3.8.3 Long)

EPIRB3 Pro S/N: TA000013 - Modification State 2 (RLS A.3.8.2)
EPIRB3 Pro S/N: TA000013 - Modification State 2 (SLP A.3.8.2)

2.12.3   Date of Test

08 March 2022, 09 March 2022, 13 March 2022, 14 March 2022, 16 March 2022, 08 April 2022 and 22 April 2022

2.12.4   Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 4.1.

2.12.5   Laboratory Environmental Conditions

Ambient Temperature 19.8 – 23.7°C
Relative Humidity 43.4 – 61.9%

2.12.6   Test Results

RLS Protocol

Position Data Default Values (C/S T.007 A.3.8.1):

No position data was provided for > 4 hours before the test started. The beacon was activated and operated for 30 minutes without providing data. Message content was checked for all bursts during this period.

36 Hex Message	Message Count
FFFE2F8C9DFE7018DFEFF8129DF861F0FABE	39

Position Acquisition Time and Position Accuracy (C/S T.007 A.3.8.2)

Locations:
A.3.8.2.1:   50° 52.1423' N   1° 14.6799' W   ①

A.3.8.2.2:   50° 48.8584' N   1° 12.1056' W   ①

The appropriate position was applied, the EUT activated and time to first message containing valid position data timed.

Configuration as per C/S T.007	C/S T.007 Section A.3.8.2.1		C/S T.007 Section A.3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Configuration 5	53	22.82	53	35.53
Configuration 7	55	22.82	56	35.53
Configuration 8	55	22.82	56	35.53

Positional accuracy was calculated using the Haversine Formula, The Earth's radius was taken as 6367 km.

① GPS Site Survey – Live Location

Encoded Position Data Update Interval (C/S T.007 A.3.8.3) – Short Test:

Location:	N 51° 22.583'	W 1° 49.833' ①	
Data Acquired at	12:18:57	FFFE2F8C9DFE7018CCF024AD44F84ECA2A3C	
Location:	N 50° 48.683'	W 1° 37.417' ①	
Data Updated at	12:23:58	FFFE2F8C9DFE7018CCD01C855BB856976D56	
Data Update Interval	5 min 01 s		

① Input from GPS simulator. Position 2 was applied after the EUT received position 1, this was verified on a beacon tester.

Encoded Position Data Update Interval (C/S T.007 A.3.8.3) – Long Test:

Locations: N 45.25752° W 73.5913° (Start location). N 45.73752° W 73.5913° (Location 2) N 45.73752° W 73.5513° (Location 3) N 45.25752° W 73.5513° (Location 4) ①		
Parameter	Update interval	Limit
0 h to 2 h – Minimum	05:02	≥ 05:00
0 h to 2 h – Maximum	08:22	≤ 30:00
2 h to 6 h – Minimum	04:09*	≥ 05:00
2 h to 6 h – Maximum	09:14	≤ 30:00
6 h to 48 h – Minimum	04:05*	≥ 05:00
6 h to 48 h – Maximum	09:18	≤ 60:00
Assessment	Result	Limit
Results indicate that data changes as per C/S T.001 4.5.5.4 (Y/N)	N	
Results indicate that data changes as per manufacturer's update scheme (Y/N)	Y	

① Input from GPS simulator
Locations cycled through 1 to 4 continuously with an update interval of 02:00. Scenario moves in 2.225 km steps between locations 1 to 2 and 3 to 4. Steps size 3.105 km between locations 2 to 3 and 4 to 1.

*NOTES: Refer to manufacturer document 921S-04094 Cospas-Sarsat Beacon Update rate.

Position Clearance After Deactivation (C/S T.007 A.3.8.4)

Following the Encoded Position Data Update Interval test, the beacon was deactivated and reactivated without providing navigation data. The Digital Message output was encoded with the default position data.

Position Data Input Update Interval (C/S T.007 A.3.8.5)

The EUT does not accept navigation data prior to activation so A.3.8.5 is not applicable.

Last Valid Position (C/S T.007 A.3.8.6)

Location: N 50° 52.142' W 1° 14.68' ①		
Data Acquired at	12:08:14	FFFE2F8C9DFE7018CCD0153323784FBEA8E5
GPS Signal Navigation Data Removed		
Last Message with Encoded Data	16:07:42	FFFE2F8C9DFE7018CCD0153323784FBEA8E5
Data Updated at	16:08:30	FFFE2F8C9DFE7018DFEFF8129DF861F0FABE
Last Valid Position Held	239 min 28 s	
Return to Default Position	✓	

① Input from GPS simulator

Standard Location Protocol

Position Data Default Values (C/S T.007 A.3.8.1):

No position data was provided for > 4 hours before the test started. The beacon was activated and operated for 30 minutes without providing data. Message content was checked for all bursts during this period.

36 Hex Message	Message Count
FFFE2F8C9EF9C0637FDFF83D15B783E0F66C	40

Position Acquisition Time and Position Accuracy (C/S T.007 A.3.8.2)

Locations:

A.3.8.2.1:   50° 52.1423' N   1° 14.6799' W   ①

A.3.8.2.2:   50° 48.8584' N   1° 12.1056' W   ①

The appropriate position was applied, the EUT activated and time to first message containing valid position data timed.

Configuration as per C/S T.007	C/S T.007 Section A.3.8.2.1		C/S T.007 Section A.3.8.2.2	
	Time to Acquire Position (sec)	Location Error in metres	Time to Acquire Position (sec)	Location Error in metres
Configuration 5	53	22.82	57	35.53
Configuration 7	55	22.82	56	35.53
Configuration 8	55	22.82	56	35.53

Positional accuracy was calculated using the Haversine Formula, The Earth's radius was taken as 6367 km.

① GPS Site Survey – Live Location

Encoded Position Data Update Interval (C/S T.007 A.3.8.3) – Short Test:

Location:	N 51° 22.583'	W 1° 49.833' ①	
Data Acquired at	15:03:03	FFFE2F8C9EF9C06333A03ECA66771DA4D4D0	
Location:	N 50° 48.683'	W 1° 37.417' ①	
Data Updated at	15:07:17	FFFE2F8C9EF9C06332E0311EC7778EA76951	
Data Update Interval	4 min 13 s*		

① Input from GPS simulator. Position 2 was applied after the EUT received position 1, this was verified on a beacon tester.

*NOTES: Refer to manufacturer document 921S-04094 Cospas-Sarsat Beacon Update rate.

Encoded Position Data Update Interval (C/S T.007 A.3.8.3) – Long Test:

Locations: N 45.25752° W 73.5913° (Start location). N 45.73752° W 73.5913° (Location 2) N 45.73752° W 73.5513° (Location 3) N 45.25752° W 73.5513° (Location 4) ①		
Parameter	Update interval	Limit
0 h to 2 h – Minimum	04:10*	≥ 05:00
0 h to 2 h – Maximum	05:05	≤ 30:00
2 h to 6 h – Minimum	04:10*	≥ 05:00
2 h to 6 h – Maximum	05:06	≤ 30:00
Assessment	Result	Limit
Results indicate that data changes as per C/S T.001 4.5.5.4 (Y/N)	N	
Results indicate that data changes as per manufacturer's update scheme (Y/N)	Y	

① Input from GPS simulator
Locations cycled through 1 to 4 continuously with an update interval of 02:00. Scenario moves in 2.225 km steps between locations 1 to 2 and 3 to 4. Steps size 3.105 km between locations 2 to 3 and 4 to 1.

*NOTES: Refer to manufacturer document 921S-04094 Cospas-Sarsat Beacon Update rate.

Position Clearance After Deactivation (C/S T.007 A.3.8.4)

Following the Encoded Position Data Update Interval test, the beacon was deactivated and reactivated without providing navigation data. The Digital Message output was encoded with the default position data.

Position Data Input Update Interval (C/S T.007 A.3.8.5)

The EUT does not accept navigation data prior to activation so A.3.8.5 is not applicable.

Last Valid Position (C/S T.007 A.3.8.6)

Location: N 50° 52.142' W 1° 14.68' ①		
Data Acquired at	10:49:33	FFFE2F8C9EF9C06332E02BC44E379C8051C4
GPS Signal Navigation Data Removed		
Last Message with Encoded Data	14:49:00	FFFE2F8C9EF9C06332E02BC44E379C8051C4
Data Updated at	14:49:49	FFFE2F8C9EF9C0637FDFF83D15B783E0F66C
Last Valid Position Held	239 min 27 s	
Return to Default Position	✓	

① Input from GPS simulator

Summary

The EUT fails to comply* with clause A.2.7 of Cospas-Sarsat T.007.

*A.3.8.3: the minimum update interval is outside of the limits stated in Cospas-Sarsat T.007 table F1. However, the update interval is compliant with T.001. Refer also to Manufacturer supplied document: 921S-04094 Issue 01.40 Cospas-Sarsat Beacon Update rate

2.13   BEACON ANTENNA TEST

2.13.1   Specification

Cospas-Sarsat T.007, Clause A.2.6

2.13.2   Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000013 - Modification State 0

2.13.3   Date of Test

13 January 2022 & 14 January 2022

2.13.4   Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 4.1.

2.13.5   Laboratory Environmental Conditions

Ambient Temperature 6.8 – 11.5°C
Relative Humidity 50.8 – 76.3%

2.13.6   Test Results

Configuration 1

Legend: ~~Strikeout~~   **Under-range**   **Over-range**   Vv-Vh < 10 dB

Azimuth Angle (Degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	40.8	4.7	41.1	5.1	41.9	5.8	41.5	5.5	35.3	-0.7
30	40.5	4.4	41.1	5.1	41.9	5.8	41.4	5.4	35.5	-0.6
60	40.6	4.5	41.5	5.5	42.1	6.0	41.1	5.0	34.9	-1.2
90	41.0	5.0	41.5	5.4	41.8	5.7	40.7	4.6	35.1	-1.0
120	40.8	4.7	41.6	5.6	42.1	6.0	41.0	5.0	34.9	-1.2
150	40.3	4.3	41.6	5.5	42.5	6.5	41.3	5.3	34.7	-1.3
180	40.3	4.3	41.7	5.7	42.7	6.6	41.4	5.4	34.8	-1.2
210	40.6	4.6	41.8	5.8	42.5	6.4	41.5	5.4	35.0	-1.1
240	41.0	4.9	41.7	5.7	42.3	6.2	41.2	5.1	35.0	-1.0
270	40.8	4.8	41.8	5.8	42.2	6.1	41.4	5.3	34.4	-1.6
300	40.2	4.1	41.7	5.6	42.3	6.3	41.6	5.5	35.0	-1.0
330	39.8	3.7	41.3	5.2	42.2	6.1	41.5	5.4	36.0	-0.1

Azimuth Angle (Degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh	Vv	Vh
0	108.8	81.7	108.8	63.9	108.9	76.7	107.4	81.1	99.7	78.2
30	108.6	83.6	108.8	76.8	108.9	79.8	107.3	82.8	99.7	84.9
60	108.7	84.4	109.2	82.4	109.0	83.3	106.9	87.0	99.0	87.5
90	109.1	85.0	109.2	81.7	108.7	83.9	106.5	88.2	99.1	88.6
120	108.9	82.8	109.3	79.5	109.1	83.1	106.9	87.3	98.9	88.3
150	108.4	82.4	109.3	78.2	109.5	81.0	107.2	85.0	98.9	85.3
180	108.4	82.7	109.4	69.6	109.6	76.1	107.3	83.0	99.1	81.2
210	108.7	84.2	109.5	71.1	109.5	79.2	107.4	82.6	99.4	73.7
240	109.1	86.0	109.4	76.7	109.3	82.4	107.1	86.0	99.4	79.5
270	108.9	84.7	109.5	79.8	109.2	83.9	107.3	86.7	98.7	82.7
300	108.3	82.9	109.4	79.7	109.3	84.3	107.5	85.7	99.4	80.6
330	107.8	82.3	109.0	79.9	109.2	82.5	107.4	84.2	100.3	76.9
Min (Vv-Vh)	23.1		26.9		24.8		18.3		10.5	

$EIRP_{LOSS} = Pt_{ambient} - Pt_{EOL} =$ 36.06 -   35.76   = 0.30 dB

$EIRP_{maxEOL} = Max[EIRP_{max}, (EIRP_{max} - EIRP_{LOSS})] =$ Max[42.7,   42.4   ]= 42.7 dBm

$EIRP_{minEOL} = Min[EIRP_{min}, (EIRP_{min} - EIRP_{LOSS})] =$ Min[34.4,   34.1   ]= 34.1 dBm

Configuration 4

Legend: ~~Strikeout~~   **Under-range**   **Over-range**   Vv-Vh < 10 dB

Azimuth Angle (Degrees)	Elevation Angle (degrees)									
	10		20		30		40		50	
	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi	EIRP dBm	Ant dBi
0	37.6	1.5	40.3	4.2	39.4	3.4	37.4	1.3	32.5	-3.6
90	37.6	1.5	40.2	4.2	39.5	3.4	37.5	1.4	32.7	-3.3
180	37.5	1.5	40.2	4.1	39.4	3.4	37.6	1.5	33.3	-2.8
270	37.6	1.6	40.3	4.2	39.4	3.3	37.5	1.4	32.8	-3.2

$EIRP_{LOSS} = Pt_{ambient} - Pt_{EOL} =$ 36.06 -   35.76   = 0.30 dB

$EIRP_{maxEOL} = Max[EIRP_{max}, (EIRP_{max} - EIRP_{LOSS})] =$ Max[40.3,   40.0   ]= 40.3dBm

$EIRP_{minEOL} = Min[EIRP_{min}, (EIRP_{min} - EIRP_{LOSS})] =$ Min[32.5,   32.2   ]= 32.2dBm

Summary

The EUT complies with clause A.2.6 of Cospas-Sarsat T.007.

2.14 BEACON CODING SOFTWARE

2.14.1 Specification

Cospas-Sarsat T.007, Clause A.2.8

Refer to Manufacturer document: 921S-04214- RLB-44_EPIRB3 Pro_EPIRB3 - Nav. System, Beacon and Msg. Coding_01.03

2.15 RLM RECEPTION VERIFICATION

2.15.1 Specification

Cospas-Sarsat T.007, Clause A.3.8.8

2.15.2 Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000011 - Modification State 1

2.15.3 Date of Test

25 March 2022 & 28 March 2022

2.15.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 4.1.

2.15.5 Laboratory Environmental Conditions

Ambient Temperature 9.9°C
Relative Humidity 75.8%

2.15.6 Test Results

RLS Indication Test

Requirement	Comments
Description of RLS indication as observed during the test	When requesting RLS, the EUT's LED will flash Magenta 5 times. If the EUT has a location fix, then the LED will flash Blue 5 times.
Description of RLM indication as observed during the test	Once RLM has been received, the EUT's LED will change from flashing Red to flashing Blue, this flashes every 2.5s.
Description of message encoding used to demonstrate that the RLS indication remain inactive at all times when the beacon is encoded with any protocol other than the RLS Location Protocol or RLS Location Test Protocol.	The EPRIB3 Pro is a RLS beacon which will also be used with Standard Location Protocol. A description of the message encoding is supplied in the manufacturer supplied beacon coding software.

Moffset – Configuration 8

Action	Timestamp (hh:mm:ss UTC)	Comments
Timestamp of the beacon activation	12:07:18	
Timestamp of the first message with RLS request	12:08:09	
Timestamp of RLS indication	12:08:10	
RLS request – 36 HEX with bit 111 set to 0 and a decode of this message[1]	-	FFFE2F8C9DFFD08FCCD012092FF84FBEA8E5
Timestamp of the internal GNSS activation	12:07:18	GNSS receiver activates at beacon start up.
Timestamp of UTC	12:07:32	
Timestamp of the navigation data sent to the beacon from the internal GNSS	12:07:57	
Timestamp of the beacon message with navigation data encoded	12:08:09	
Timestamp when the RLM was received	12:11:27	
Timestamp of the RLM indication	12:11:28	
Timestamp with the beacon message with bit 111 reverted to 1, beacon message content in 36-HEX and a decode of this message[2]	12:11:32	FFFE2F8C9DFFD08FCCD012092FFA4FBEA421
Timestamp when the beacon was de-activated	12:43:47	

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C9DFFD08FCCD012092FF84FBEA8E5**

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.6.

Unique identifier:
193BFFA11FBFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	111111111111111	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 list here
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-46	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-66	11110100001000111111	Last 6 digits MMSI	999999
67-75	001100110	Latitude	51.0 Degrees North (51.0)
76-85	1000000010	Longitude	1.0 Degrees West (-1.0)
86-106	010000010010010111111	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	121.5 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	001111101	Latitude offset	7.0 minutes 52.0 seconds (negative)
124-132	111101010	Longitude offset	14.0 minutes 40.0 seconds (positive)
133-144	100011100101	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field
		Composite location	50.869 -1.244

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C9DFFD08FCCD012092FFA4FBEA421**

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.6.

Unique identifier:
193BFFA11FBFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	111111111111111	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 list here
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-46	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-66	11110100001000111111	Last 6 digits MMSI	999999
67-75	001100110	Latitude	51.0 Degrees North (51.0)
76-85	1000000010	Longitude	1.0 Degrees West (-1.0)
86-106	010000010010010111111	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	121.5 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	1	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) 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	001111101	Latitude offset	7.0 minutes 52.0 seconds (negative)
124-132	111101010	Longitude offset	14.0 minutes 40.0 seconds (positive)
133-144	010000100001	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field
		Composite location	50.869 -1.244

Action	Timestamp (hh:mm:ss UTC)	Comments
Timestamp of the beacon activation	08:08:37	
Timestamp of the first message with RLS request	08:09:30	
Timestamp of RLS indication	08:09:31	
RLS request – 36 HEX with bit 111 set to 0 and a decode of this message[1]	-	FFFE2F8C9DFFD08FCCD012092FF84FBEA8E5
Timestamp of the internal GNSS activation	08:08:37	GNSS receiver activates at beacon start up.
Timestamp of UTC	08:08:47	
Timestamp of the navigation data sent to the beacon from the internal GNSS	08:09:00	
Timestamp when the navigation signal was denied	08:09:20	
Duration of GNSS receiver stayed active since turn on	00:30:05	GNSS Sleep at 08:38:42
Timestamp when navigation signal was allowed	10:01:15	
Timestamp when RLM was received	10:03:58	
Timestamp of the RLM indication	10:03:59	
Timestamp with the beacon message with bit 111 reverted to 1, beacon message content in 36-HEX format and a decode of this message[2]	10:04:05	FFFE2F8C9DFFD08FCCD012092FFA4FBEA421
Timestamp when the beacon was de-activated	10:37:11	

[1]Message Decode

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C9DFFD08FCCD012092FF84FBEA8E5**

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.6.

Unique identifier:
193BFFA11FBFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111 11111	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 list here
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-46	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-66	1111010000 1000111111	Last 6 digits MMSI	999999
67-75	001100110	Latitude	51.0 Degrees North (51.0)
76-85	1000000010	Longitude	1.0 Degrees West (-1.0)
86-106	0100000100 1001011111 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	121.5 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	001111101	Latitude offset	7.0 minutes 52.0 seconds (negative)
124-132	111101010	Longitude offset	14.0 minutes 40.0 seconds (positive)
133-144	1000111001 01	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field
		Composite location	50.869 -1.244

Decoded Beacon Message

Hexadecimal code: **FFFE2F8C9DFFD08FCCD012092FFA4FBEA421**

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.6.

Unique identifier:
193BFFA11FBFDFF

Binary Range	Binary Content	Field Name	Decoded Value
1-15	1111111111 11111	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 list here
37-40	1101	Protocol Code	RLS Location Protocol
41-42	11	Beacon type	RLS Test Location
43-46	1111	Identification type	RLS protocol coded with MMSI last 6 digits
47-66	1111010000 1000111111	Last 6 digits MMSI	999999
67-75	001100110	Latitude	51.0 Degrees North (51.0)
76-85	1000000010	Longitude	1.0 Degrees West (-1.0)
86-106	0100000100 1001011111 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	121.5 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	1	Beacon Feedback on receipt of RLM Type-1	RLM Type-1 (automatic) 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	001111101	Latitude offset	7.0 minutes 52.0 seconds (negative)
124-132	111101010	Longitude offset	14.0 minutes 40.0 seconds (positive)
133-144	0100001000 01	BCH-2 error correcting code	BCH-2 code in message matches the recalculated BCH-2 from the PDF-2 field
		Composite location	50.869 -1.244

Cospas-Sarsat T.007, Clause A.3.8.8.4 RLS GNSS Receiver Satellite Tracking refer to Manufacturer document: 921S-04239 Isue 01.00 EPIRB2+3 AIS - RLS GNSS Receiver Satellite Tracking.pdf.

Summary

The EUT complies with clause A.3.8.8 of Cospas-Sarsat T.007.

2.16   TESTING OF OPERATOR CONTROLS

2.16.1   Specification

Cospas-Sarsat T.007, Clause A.3.10

2.16.2   Equipment Under Test and Modification State

EPIRB3 Pro S/N: TA000005 - Modification State 1

2.16.3   Date of Test

04 April 2022

2.16.4   Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 4.1.

2.16.5   Environmental Conditions

Ambient Temperature 22.7°C
Relative Humidity 30.5%

2.14.6 Observations

Testing Self-Test Controls

The EUT has a common Self-Test and GNSS Self-Test control. In accordance with the manufacturer design, the 'TEST' button is held until a steady red LED is shown, then released when the red LED starts to flash to initiate a Self-Test procedure. Holding the 'TEST' button until the flashing red LED goes back to being steady, will initiate a GNSS Self-Test procedure.

In accordance with C/S T.007, section A.3.10, the EUT was tested as follows:

Test 1

The Self-Test button was held for X-1 seconds (where X is the time required to activate a GNSS Self-Test). In this case, time to activate a GNSS Self-Test is 6 seconds – therefore the 'TEST' button was released after 5 seconds:

The EUT performed a single Self-Test and then returned to its rest state.

Test 2

The Self-Test button was held continuously for 5 minutes longer than the maximum duration of the test. By design, the EUT performs a GNSS Self-Test if the 'TEST' switch is held down for 6 seconds:

When trying to perform a GNSS ST, if the switch is held down, the EUT self-terminates without performing a GNSS Self-Test and does not draw any residual current. See the battery current section for further information.

Testing Operational Controls

Test 1

The EUT was activated by its 'ON' button and was maintained in an operational mode for a period of 3 minutes longer than the manufacturer declared time to transmit the first 406 MHz distress message.

The EUT continued to transmit 406MHz distress messages within the repetition rate limits stated in C/S T.007. The maximum and minimum repetition rate times observed were 51.7 seconds and 50.9 seconds respectively.

Test 2

The EUT was activated by its 'TEST' button and then after approximately 2 seconds, the 'ON' button was also held in. The buttons were then maintained in this condition for a period of 3 minutes longer than the manufacturer declared time to transmit the first 406 MHz distress message.

If the 'TEST' button is held down, the EUT self-terminates, does not transmit a 406MHz distress message and doesn't draw any residual current. See the battery current section for more information.

Test 3

The EUT was activated by its 'ON' button and then after approximately 5 seconds, the 'TEST' button was also held in. The buttons were then maintained in this condition for a period of 3 minutes longer than the manufacturer declared time to transmit the first 406 MHz distress message.

The EUT continued to transmit 406MHz distress messages within the repetition rate limits stated in C/S T.007. The maximum and minimum repetition rate times observed were 51.7 seconds and 50.9 seconds respectively.

Test 4

The EUT was activated by its water contacts, the EUT's 'ON' button was then activated and maintained in an operational mode for a period of 3 minutes longer than the manufacturer declared time to transmit the first 406 MHz distress message.

The 'ON' button is also the method to deactivate the EUT so when it is held down, the EUT does not transmit a 406MHz distress message and deactivates.

Test 5

The EUT was activated by its water contacts, the 'TEST' button was then activated and after approximately 2 seconds, the 'ON' button was also held in. The buttons were then

maintained in this condition for a period of 3 minutes longer than the manufacturer declared time to transmit the first 406 MHz distress message.

The 'ON' button is also the method to deactivate the EUT so when it is held down, the EUT does not transmit a 406MHz distress message and deactivates.

Test 6

The EUT was activated by its water contacts, the 'ON' button was then activated and after approximately 5 seconds, the 'TEST' button was also held in. The buttons were then maintained in this condition for a period of 3 minutes longer than the manufacturer declared time to transmit the first 406 MHz distress message.

The 'ON' button is also the method to deactivate the EUT so when it is held down, the EUT does not transmit a 406MHz distress message and deactivates.

2.14.7   Conclusions

The EUT does not transmit more than one 406MHz burst in Self-Test or GNSS Self-Test mode as required by C/S T.001.
The EUT does not transmit more frequently than the repetition rate defined by C/S T.001.

SECTION 3

TEST DETAILS – EPIRB3

Emergency Beacons Limited Testing of the
Ocean Signal Limited
EPIRB3

TEST RESULTS TABLE

Parameters to be Measured	Range of Specification		Units	Test Results Tmin (-20°C)	Tamb (+21°C)	Tmax (+55°C)	Comments
1. Power Output							**Result: Pass**
Model: EPIRB3, S/N: TA000005, TUV Ref: TSR2 and Modification State 1							
Transmitter power output	(maximum)	35 - 39	dBm	N/T	36.09	N/T	
	(minimum)			N/T	36.03	N/T	
Power output rise time	(maximum)	< 5	ms	N/T	0.438	N/T	
	(minimum)			N/T	0.427	N/T	
Power output 1ms before burst	(maximum)	< -10	dBm	N/T	-24.62	N/T	
	(minimum)			N/T	-40.72	N/T	
2. Digital Message Coding							**Result: Pass**
Model: EPIRB3, S/N: TA000005, TUV Ref: TSR2 and Modification State 1							
Bit Sync	1 - 15	15 bits "1"	P / F	N/T	P	N/T	
Frame sync	16 – 24	"000101111"	P / F	N/T	P	N/T	
Format flag	25	1 bit	bit value	N/T	1	N/T	
Protocol flag	26	1 bit	bit value	N/T	0	N/T	
Identification / position data	27 - 85	59 bits	P / F	N/T	P	N/T	
BCH code	86 -106	21 bits	P / F	N/T	P	N/T	
Emerg. Code/nat. use/supplem. Data	107 - 112	6 bits	bit value	N/T	111000	N/T	
Additional data / BCH (if applicable)	112 - 144	32 bits	P / F	N/T	P	N/T	
Position Error (if applicable)		< 5	km	N/T	N/A	N/T	

Parameters to be Measured		Range of Specification	Units	Test Results			Comments
				Tmin (-20°C)	Tamb (+21°C)	Tmax (+55°C)	
3. Digital Message Generator							Result: Pass
Model: EPIRB3, S/N: TA000005, TUV Ref: TSR2 and Modification State 1							
Repetition rate, T_R:							
Average T_R		$48.5 \leq T_{Ravg} \leq 51.5$	seconds	N/T	50.316	N/T	
Minimum T_R		$47.5 \leq T_{Rmin} \leq 48.0$	seconds	N/T	47.522	N/T	
Maximum T_R		$52.0 \leq T_{Rmax} \leq 52.5$	seconds	N/T	52.114	N/T	
Standard deviation		0.5 - 2.0	seconds	N/T	1.456	N/T	
Bit rate							
Minimum fb		≥ 399.6	bits/sec	N/T	399.91	N/T	
Maximum fb		≤ 400.4	bits/sec	N/T	400.00	N/T	
Total transmission time							
Short message	(maximum) (minimum)	435.6 - 444.4	ms	N/A N/A	N/A N/A	N/A N/A	
Long message	(maximum) (minimum)	514.8 - 525.2	ms	N/T N/T	519.516 519.500	N/T N/T	
Unmodulated carrier							
Minimum T1		≥ 158.4	ms	N/T	160.305	N/T	
Maximum T1		≤ 161.6	ms	N/T	160.328	N/T	
First burst delay		≥ 47.5	seconds	N/T	55	N/T	