PUBLIC ENTERPRISE TESTING CENTER «OMEGA»

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Approved by

Director

PE TC "OMEGA"

_____ Belikov N.I.

29 August, 2012

TEST REPORT No. 11/12
Issue 2

on

Emergency Position Indicating Radio Beacon (EPIRB)

Models	**Tron 60S** **Tron 60GPS**
Manufacturer	**Jotron AS, Norway**

Sevastopol
2012

PUBLIC ENTERPRISE
TESTING CENTER «OMEGA»

P.O.B. No.37, Sevastopol, 99053, Ukraine
Phone: +380 692 240 373
Fax: +380 692 469 679
E-mail: : stcomega@stc-omega.biz

ACCREDITATION

COSPAS-SARSAT Secretariat
Reference No. CS497/F530 21/09/1994

USCG
Letter of acceptance for testing EPIRBs
#16714/161.011/Omega dated February 7, 2008

FCC
Letter of acceptance #181479 dated August 19, 2008
last renewed August 18, 2011

National Accreditation Agency of Ukraine
Certificate of accreditation for compliance DSTU ISO 17025:2006 No. 2H339
valid until 17.05.2014

BABT
Csertificate of Recognition testing laboratory
No.LAB/033 dated 30.06.2011
valid until 30.06.2013

IC
Registration of 3/10m OATS #8780A-1 dated January 18, 2010

Basis	Contract No. 10-512/20-286	
Equipment under test	Emergency Position Indicating Radio Beacon (EPIRB) 406 MHz COSPAS-SARSAT	
Manufacturer	Jotron AS P.O. Box 54, NO-3280 Tjodalyng, Norway	
Applicant **Technical officer** **Name** **Title** **Phone** **E-mail**	Jotron AS P.O. Box 54, NO-3280 Tjodalyng, Norway Øyvind L. Eggen Systems Designer +47 33 13 97 00 oyvind.eggen@jotron.com	
Test commencement date	10.01.2011	
Test completion date	11.11.2011	
Test reports shall be delivered to:	Jotron AS PE TC “Omega”	copy 1 copy 2

CONTENTS

Report Issue History		
No	**Data of issue**	**Report reissue reason**
1	19.01.2012	The initial issue
2	29.08.2012	Reports for EUT s/n 00104 for previously conducted tests are included, namely: Initial Aliveness Test (A1.0); Spurious Emissions (A10.0); Self-test (A13.3).

1. EQUIPMENT UNDER TEST

Category	Emergency Position Indicating Radio Beacon (EPIRB) 406 MHz COSPAS–SARSAT
Type	EPIRB Float-free
Class	2 (operating temperature range -20 ºC to +55 ºC)
Model(s) name EPIRB [1] Release mechanism [2, 3]	 Tron60S Tron60GPS FB-60
EPIRB serial numbers Tron60S [4] Tron60GPS [5]	 00100, 00102 00101, 00104
Destination	Alarm message transmission of distressed accident vessels via COSPAS-SARSAT satellites system
Beacon SW version [6]	v1.04

[1] - models Tron60S and Tron60GPS are identical in schematic, PCB, design and software. The only diversity is the internal GPS receiver is installed in Tron60GPS and it is not in Tron60S.

[2] - According to the User's Manual the Tron60S/GPS is emergency equipment consisting of Tron 60S/GPS COSPAS–SARSAT EPIRB and one of following brackets:

- FB-60 – automatic float free bracket;
- MB-60 – manual bracket.

Automatic float free bracket FB-60 was underwent the tests when applicable.

[3] - Automatic float free bracket FB-60 was modified on 14.09.2011 and applicable tests were repeated.

[4] - Tron60S s/n 00102 is original fully packaged beacon, Tron60S s/n 00100 is equipped with 50 Ohm matching network as required in 4.3 of C/S T.007 Iss.4, Rev.5.

[5] - Tron60GPS s/n 00104 is original fully packaged beacon, Tron60GPS s/n 00101 is equipped with 50 Ohm matching network as required in 4.3 of C/S T.007 Iss.4, Rev.5.

[6] - the final version of beacon SW is indicated. Tested SW version is shown for every test accordingly.

History of software upgrades with brief description is following:

SW version	Fixed bug	Issued	Comments
v1.01			Initial version
v1.02	Bits 17-24 were inverted for all messages when acquired position within 50 sec after beacon has been activated.	04.04.2011	
v1.03	Modulation duty cycle of 121.5 MHz homer was 29-45% instead of required 33-55%.	14.06.2011	
v1.04	Rounding up to 4 seconds was implemented during position data encoding for User Location Protocol.	09.07.2011	User Location Protocol is not declared in Application for CS TA.

2. TEST PURPOSE

The purpose of tests is to confirm compliance of EPIRB models Tron60S and Tron60GPS with RTCM Standard 11000.2 (RTCM Paper 77-2002/SC110-STD, version 2.1) for 406 MHz satellite emergency position-indicating radiobeacons (EPIRBs).

3. TEST CONDITIONS AND METHODS

Procedures, conditions and methods of testing correspond to requirements and methods of RTCM Standard 11000.2 (2002).

4. TEST PLAN

Test plan was agreed by applicant with *Bundesamt für Seeschifffahrt und Hydrographie*.

No.	Test name	Requirements RTCM 11000.2	Methods RTCM 11000.2
1.	Initial aliveness test	A1.0	A1.0
2.	Dry heat cycle	Table 2-1 page 2-3	A3.0
3.	Damp heat cycle	2.3.2.1.1, 2.4.1	A4.0
4.	Vibration test	2.3.2.1.2	A5.0
5.	Bump test	2.3.2.1.2	A6.0
6.	Salt fog test	2.3.2.1.5	A7.0
7.	Drop test (on hard surface)	A8.1	A8.1
8.	Drop test (in water)	A8.2	A8.2
9.	Leakage and immersion test	2.4.1 paragraphs 1, 2	A9.0
10.	Spurious emissions test	2.2.3, 2.2.10	A10.0
11.	Thermal shock test	2.3.1.1, Table 2-1 page 2-4	A11.0
12.	COSPAS-SARSAT type approval tests	2.2.1, 2.2.2, 2.2.4.6, 2.2.5	A12.0
13.	Operational life test	Table 2-1 page 2-4	A13.1
14.	Strobe light self test	2.2.8	A13.2
15.	Self test	2.3.1.3, 2.2.6.2.1	A13.3
16.	Automatic release mechanism test	2.3.2.1	A14.0
17.	Stability and buoyancy test	2.3.1.6	A15.0
18.	Inadvertent activation test	2.3.2.1.6	A16.0
19.	Auxiliary radio-locating device transmitter test	2.2.9, 2.2.10	A17.0
20.	Humidity test	2.2.1.5, 2.4.1 paragraph 5	A18.0
21.	Orientation test	2.3.1.1 paragraph 2	A19.0

5. TEST SCHEDULE

No.	Test name	Dates of test	Notes
1.	Initial aliveness test	11.01.2011	
2.	Dry heat cycle	11.01 - 13.01.2011 19.10 - 20.10.2011	Note 1
3.	Damp heat cycle	13.01 - 14.01.2011	
4.	Vibration test	14.01.2011 15.10.2011	Note 1
5.	Bump test	18.01.2011 19.10.2011	Note 1
6.	Salt fog test	18.01 - 22.01.2011	
7.	Drop test (on hard surface)	24.01.2011	
8.	Drop test (in water)	24.01.2011	
9.	Leakage and immersion test	25.05 - 27.05.2011	
10.	Spurious emissions test	23.02 - 25.02.2011, 20.06 - 22.06.2011	Note 2
11.	Thermal shock test	26.02.2011 24.05.2011	Note 3
12.	COSPAS-SARSAT type approval tests	16.02 - 21.09.2011	Note 4
13.	Operational life test	17.09 - 19.09.2011	Note 5
14.	Strobe light self test	23.06 - 24.06.2011	
15.	Self test	23.02 - 25.02.2011	
16.	Automatic release mechanism test	19.10.2011	Note 1
17.	Stability and buoyancy test	21.06.2011	
18.	Inadvertent activation test	27.10.2011	Note 1
19.	Auxiliary radio-locating device transmitter test	20.06-21.06.2011	
20.	Humidity test	19.12.2011	
21.	Orientation test	21.12.2011	

Note 1. Automatic float free bracket FB-60 was modified on 14.09.2011 and applicable test was repeated. The final test result only is included in this test report.

Note 2. Test was repeated after software upgraded to version 1.03. The final test result only is included in this test report.

Note 3. Water sensor contacts were modified on 20.05.2011 and test was repeated. The final test result only is included in this test report.

Note 4. C/S type approval tests for EPIRB(s) models Tron60GPS and Tron60S were conducted and Test Reports 11/9 and 11/10 were issued accordingly. Certificate TAC 222 for models Tron60GPS and Tron60S was issued by CS Secretariat on January 2, 2012.

Note 5. Test was combined with A.2.3 C/S T007 as it has been agreed by applicant with *Bundesamt für Seeschifffahrt und Hydrographie.*

6. TEST RESULT

No.	Test name	Pass/No
1.	Initial aliveness test	Pass
2.	Dry heat cycle	Pass
3.	Damp heat cycle	Pass
4.	Vibration test	Pass
5.	Bump test	Pass
6.	Salt fog test	Pass
7.	Drop test (on hard surface)	Pass
8.	Drop test (in water)	Pass
9.	Leakage and immersion test	Pass
10.	Spurious emissions test	Pass
11.	Thermal shock test	Pass
12.	COSPAS-SARSAT type approval tests	Pass
13.	Operational life test	Pass
14.	Strobe light self test	Pass
15.	Self test	Pass
16.	Automatic release mechanism test	Pass
17.	Stability and buoyancy test	Pass
18.	Inadvertent activation test	Pass
19.	Auxiliary radio-locating device transmitter test	Pass
20.	Humidity test	Pass
21.	Orientation test	Pass

7. CONCLUSION

Name and Location of Beacon Test Facility: **PUBLIC ENTERPRISE TESTING CENTER «OMEGA»**
Vakulenchuka, 29
Sevastopol, 99053
Ukraine

Date of Submission for Testing: **10.01.2011**

Applicable Standard:

Document	Edition
RTCM 11000.2	Version 2.1 (2002)

I hereby confirm that the 406 MHz beacon models Tron60S/GPS described above has been successfully tested in accordance with the RTCM Standard 11000.2 and complies with the requirements RTCM Standard 11000.2 for 406 MHz satellite emergency position-indicating radiobeacons (EPIRBs) as demonstrated in the attached report.

Department manager V. Kovalenko

(Name, Position and Signature of Accepted Laboratory Representative)

8. SUMMARY OF TEST RESULTS

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
			Tmin (-20°C / -40°C)	Tamb (+20°C)	Tmax (+55°C)	
1. INITIAL ALIVENESS TEST (A1.0)						Annex 1
• Carrier Frequency	406.037 ± 0.001	MHz		406.0370 406.0370		Tron 60GPS Tron 60S
• Power Output	35 - 39	dBm		36.01 … 36.09 36.26 … 36.34		Tron 60GPS Tron 60S
• Digital message	Correct	√		√		
2. DRY HEAT CYCLE (A3.0)						Annex 2
• Aliveness Test (during 2 hour period)						Tron 60GPS
- Carrier Frequency	406.037 ± 0.001	MHz			406.0370	
- Power Output	35 - 39	dBm			35.44	
- Digital message	Correct	√			√	
• Aliveness test (at end of 2 hour period)						
- Carrier Frequency	406.037 ± 0.001	MHz			406.0370 406.0370	
- Power Output	35 - 39	dBm			35.54	
- Digital message	Correct	√			√	
3. DAMP HEAT CYCLE (A4.0)						Annex 3
• Aliveness Test (during 2 hour period)					√	Tron 60GPS
- Carrier Frequency	406.037 ± 0.001	MHz			406.0370	
- Power Output	35 - 39	dBm			35.39	
- Digital message	Correct	√			√	
• Aliveness Test (at end of 2 hour period)						
- Carrier Frequency	406.037 ± 0.001	MHz			406.0370	
- Power Output	35 - 39	dBm			35.30 … 35.31	
- Digital message	Correct	√			√	
4. VIBRATION TEST (A5.0)						Annex 4
• Exterior Mechanical Inspection	No damage	√		√		Tron 60GPS
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		35.26 … 35.34		
- Digital message	Correct	√		√		
• Activation	No activation during test	√		√		

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
5. BUMP TEST (A6.0)						Annex 5 Tron 60GPS
• Exterior Mechanical Inspection	No damage	√		√		
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		35.30		
- Digital message	Correct	√		√		
• Activation	No activation during test	√		√		
6. SALT FOG TEST (A7.0)						Annex 6 Tron 60GPS
• Exterior Mechanical Inspection	No damage	√		√		
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		36.10		
- Digital message	Correct	√		√		
7-A. DROP TEST (A8.1) On Hard Surface						Annex 7 Tron 60GPS
• Exterior Mechanical Inspection	No damage	√	√			
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz	406.0371			
- Power Output	35 - 39	dBm	36.09			
- Digital message	Correct	√	√			
• Activation	No activation during test	√	√			
7-B. DROP TEST (A8.2) In Water						Annex 8 Tron 60GPS
• Exterior Mechanical Inspection	No damage	√		√		
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		36.04		
- Digital message	Correct	√		√		
8. LEAKAGE AND IMMERSION TEST (A9.0)						Annex 9 Tron 60GPS
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		36.02		
- Digital message	Correct	√		√		
Exterior Inspection	No water	√		√		
9 SPURIOUS EMISSIONS TEST (A10.0)						Annex 10 Tron 60GPS
• 406 MHz	Figure 2-1	√	√	√	√	
• 121.5 MHz	Figure 2-6	√	√	√	√	

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
10. THERMAL SHOCK TEST (A11.1)						Annex 11 Tron 60GPS
• Self-activation in fresh water	5	minutes	0.29		0.12	
• Self-activation in salt water	5	minutes	0.24		0.08	
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370		406.0370	
- Power Output	35 - 39	dBm	36.04 ... 36.09		36.01 ... 36.02	
- Digital message	Correct	√	√		√	
• Frequency Stability						
- short term stability	≤0.002	ppm in 100 ms	0.000104 ... 0.000110		0.000086 ... 0.000093	
- medium term stability						
mean slope	≤0.001	ppm/ minute	-0.000815 ... -0.000651		-0.000366 ... -0.000307	
residual frequency variation	≤0.003	ppm	0.000327 ... 0.000428		0.000219 ... 0.000247	
11. COSPAS-SARSAT TYPE APPROVAL TESTS (A12.0)	C/S Certificate (attached test reports 11/9, 11/10)	√	√	√	√	C/S TAC No. 222 dated January 2, 2012
12. OPERATIONAL LIFE, STROBE LIGHT AND SELF TESTS (A13.0)						Annex 12
Operational Life (A13.1)						Tron 60GPS
• Frequency						
- Nominal Carrier	406.037 ± 0.001	MHz	406.0369			
- Short term stability	≤0.002	ppm in 100 ms	0.000124- 0. 000371			
• Medium-term stability						
- Mean slope	≤0.001	ppm/ minute	- 0.0000008 7 to 0.0000255			
- Residual variation	≤0.003	ppm	0. 00003- 0.000389			
• RF output power	35 - 39	dBm	36.76- 36.87			
• Strobe glash rate	20 - 30	/min	26-27			
• Auxiliary radio-locating Peak envelope output power	14 - 20	dBm	15.89- 16.60			
13. STROBE LIGHT TEST (A13.2)						Annex 13
• Flash rate	20 - 30	/min	26	27	27	Tron 60GPS
• Effective intensity	0.75	cd	1.82	2.12	2.10	
• Pulse duration	10^{-6} to 10^{-2}	s	10^{-1}	10^{-1}	10^{-1}	Note 1
14. SELF TEST (A13.3)						Annex 14
• RF pulse duration	0.444 sec or 0.525 sec	√	√	√	√	Tron 60GPS
• Frame synchronization pattern	011010000	√	√	√	√	
• Number of RF bursts	1-burst	√	√	√	√	

Note 1. Pulse duration is considered PASS upon e-mail from USCG (CG-5214) dated August 22, 2011: Therefore, we can accept an EPIRB with a strobe LED light that meets the IEC 61097-2 Ed 3.0 standard with an "ON time" of up to 100 ms (para. A2.10), in advance of acceptance of the draft RTCM standard which will be harmonized with the IEC standard.

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
15. AUTOMATIC RELEASE MECHANISM TEST (A14.0)						Annex 15 Tron 60GPS
• Normal mounted orientation	Release and float free before 4 meters; automatic activation	√		√		
• Rolling 90° starboard		√		√		
• Rolling 90° port		√		√		
• Rolling 90° bow down		√		√		
• Rolling 90° stern down		√		√		
• Upside down		√		√		
16. STABILITY AND BUOYANCY TEST (A15.0)						Annex 16 Tron 60GPS
• Time to upright	2	s		1.3		
• Reserve Buoyancy	5	%		41		
• Float upright; Antenna base	> 4	cm		6.5		
17. INADVERTENT ACTIVATION TEST (A16.0)						Annex 17
• Activation/Release	EUT should not release from bracket or automatically activate	√		√		Tron 60GPS
18. AUXILIARY RADIO-LOCATING DEVICE TRANSMITTER TEST (A17.0)						Annex 18 Tron 60GPS
• Carrier Frequency	121.5 ± 0.006	MHz	121.4985	121.4985	121.4985	
• PERP	14 - 20	dBm		15.18-15.68		
• Modulation						
- Frequency	700 Hz within range of 300 – 1600 Hz	Hz	389 – 1323	389 – 1323	388 – 1323	
- Direction	Upward	√	√	√	√	
- Duty cycle	33 - 55	%	36.76 – 37.33	36.16 – 36.96	36.79 – 36.94	
- Factor	0.85 – 1.0		0.99	0.99	0.99	
- Sweep repetition rate	2 - 4	Hz	2.64	2.64	2.64	
- Frequency Coherence	at least 30% of the total power emitted should be contained within ± 30 Hz of the carrier frequency	%	55	51	49	
Frequency Shift	< ± 30 Hz	Hz	-5	3	3	
• Antenna						
- Pattern	Omnidirectional	√		√		
- Polarization	Vertical	√		√		
- VSWR	1.5:1	√		Not applicable		
19. HUMIDITY TEST (A18.0)	Successful					Annex 19 Tron 60GPS
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz			406.0370	
- Power Output	35 - 39	dBm			36.13 … 36.14	
- Digital message	Correct	√			√	

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS			COMMENTS
20. ORIENTATION TEST (A19.0)						Annex 20 Tron 60GPS
VERTICAL						
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		35.87		
- Digital message	Correct	√		√		
UPSIDE DOWN						
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		35.88		
- Digital message	Correct	√		√		
HORIZONTAL						
• Aliveness Test:						
- Carrier Frequency	406.037 ± 0.001	MHz		406.0370		
- Power Output	35 - 39	dBm		35.88		
- Digital message	Correct	√		√		

Senior Engineer A.V. Baydachniy

ANNEX 1.
INITIAL ALIVENESS TEST

Equipment Under Test (EUT): 1) No.1 EPIRB Tron 60GPS
2) No.2 EPIRB Tron 60S
3) No.3 EPIRB Tron 60GPS
4) No 4 EPIRB Tron 60S

Software release: 1.01

EUT Serial No.: No.1 S/N 00101
No.2 S/N 00100
No.3 S/N 00104
No.4 S/N 00102

Test Date: 11.01.2011

Test Conditions:

– Atmospheric pressure: 762 mm/Hg
– Relative air humidity: 53 %
– EPIRB is ON during the test

Figure 1.1 – View of the EUT No.1

Figure 1.2 – View of the EUT No.2

Figure 1.3 – View of the EUT No.3

Figure 1.4 – View of the EUT No.4

Figure 1.5 – View of the test setup for the conductive Initial Alive-ness Test for EUT's No.1 and No.2.

Test duration 0 h 30 m	Bursts received 37	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406036.993	406036.994	406036.994
Power, Wt	3.16	7.94	3.95	3.95	4.04
Slope(E-9)	-1.00	1.00	-0.006	-0.006	0.222
Residual variations (E-9)	0.00	3.00	0.151	0.200	0.394
Short term variations (E-9)	0.00	2.00	0.094	0.119	0.141
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499426				
Power, mW	59.9				
Message					
Digital message	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C				

Figure 1.6 - EPIRB Tron 60GPS S/N 00101

Test duration 0 h 30 m	Bursts received 37	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406036.982	406036.990	406036.991
Power, Wt	3.16	7.94	4.26	4.26	4.32
Slope(E-9)	-1.00	1.00	-0.028	0.043	0.068
Residual variations (E-9)	0.00	3.00	0.135	0.233	0.528
Short term variations (E-9)	0.00	2.00	0.132	0.138	0.142
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499348				
Power, mW	35.3				
Message					
Digital message	:FFFE2F 4C96A000C8000C6C1BC09 0				

Figure 1.7 - EPIRB Tron 60S S/N 00100

Test duration 0 h 30 m	Bursts received 37	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406036.969	406036.989	406036.994
Power, Wt	3.16	7.94	3.99	3.99	4.06
Slope(E-9)	-1.00	1.00	-0.010	-0.010	0.353
Residual variations (E-9)	0.00	3.00	0.240	0.318	0.626
Short term variations (E-9)	0.00	2.00	0.149	0.189	0.224
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499448				
Power, mW	37.0				
Message					
Digital message	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C				

Figure 1.8 - EPIRB Tron 60GPS S/N 00104

Test duration 0 h 30 m	Bursts received 37	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406036.981	406036.981	406036.982
Power, Wt	3.16	7.94	4.23	4.24	4.31
Slope(E-9)	-1.00	1.00	-0.036	-0.033	0.073
Residual variations (E-9)	0.00	3.00	0.141	0.153	0.538
Short term variations (E-9)	0.00	2.00	0.102	0.127	0.131
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499259				
Power, mW	35.3				
Message					
Digital message	:FFFE2F 4C96A000C8000C6C1BC09 0				

Figure 1.9 - EPIRB Tron 60S S/N 00102

FINAL RESULTS OF INITIAL ALIVENESS TEST (A1.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
- Carrier Frequency	406.037 ± 0.001	MHz	No.1 406.0370 No.2 406.0370 No.3 406.0370 No.4 406.0370	PASS PASS PASS PASS
- Power Output	35 - 39	dBm	No.1 35.97-36.06 No.2 36.29-36.35 No.3 36.01-36.09 No.4 36.26-36.34	PASS PASS PASS PASS
- Digital message	Correct	√	No.1 √ No.2 √ No.3 √ No.4 √	PASS PASS PASS PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2011
2	Spectrum analyzer	HP8593E	3831U02306	07.2011
3	Biconical Antenna	BBUK 9139	9114-214	09.2011
4	Semi-anechoic chamber	«Don»	1	11.2011
5	High-frequency generator	Г4-176	5290	03.2011
6	Power Amplifier	Empower 2021	1023d\c0503	08.2011

ANNEX 2.
DRY HEAT TEST

Equipment Under Test (EUT): 1) No.1 EPIRB Tron 60GPS
2) No.2 EPIRB Tron 60GPS with release mechanism
Software release: 1.04
EUT Serial No.: No.1 S/N 00101
No.2 S/N 00104
Test Date: 19.10 - 20.10.2011
Test Conditions:
– Atmospheric pressure: 760 mm/Hg.
– Relative air humidity: 51 %.
– Maximum temperature in the chamber +70 °C
– Operating temperature in the chamber +55 °C

– Test duration is 13 hours.
– Measurement duration is 2 x15 minutes.
– Step No. 1 Condition: EPIRB is OFF; temperature is +70 °C in the chamber with EUT, duration 10 hours;
No. 2 The chamber cooling to +55 °C within 30 minutes;
No. 3 Condition: EPIRB is ON; temperature is +55 °C in the chamber with EUT, duration 2 hours;
No. 4 Aliveness test of EPIRB during of the 2 hour period;
No. 5 Aliveness test of EPIRB at the end of the 2 hour period

Figure 2.1 – View of the EPIRB Tron 60GPS S/N 00101 before dry heat cycle

Figure 2.2 - View of the EPIRB Tron 60GPS S/N 00101 before dry heat cycle

Figure 2.3 - View of the EPIRB Tron 60GPS S/N 00104 before dry heat cycle

Figure 2.4 - View of the EPIRB Tron 60GPS S/N 00104 before dry heat cycle

Test duration 0 h 1 m		Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406036.998	406036.998	406036.998
Power, Wt		3.16	7.94	3.35	3.35	3.35
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499258					
Power, mW	57.7					
Message						
Digital message	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C					

Figure 2.5 – Detailed measurement results of EPIRB Tron 60GPS S/N 00101
during of the 2 hour period in the +55 °C chamber

Test duration 0 h 1 m		Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406036.989	406036.989	406036.989
Power, Wt		3.16	7.94	3.50	3.50	3.50
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499268					
Power, mW	57.1					
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 2.6 – Detailed measurement results of EPIRB Tron 60GPS S/N 00104
during of the 2 hour period in the +55 °C chamber

Test duration 0 h 1 m		Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.007	406037.007	406037.007
Power, Wt		3.16	7.94	3.46	3.46	3.46
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499241					
Power, mW	57.7					
Message						
Digital message	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C					

Figure 2.7 – Detailed measurement results of EPIRB Tron 60GPS S/N 00101
at the end of the 2 hour period in the +55 °C chamber

Test duration 0 h 1 m		Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.008	406037.008	406037.008
Power, Wt		3.16	7.94	3.58	3.58	3.58
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499221					
Power, mW	56.9					
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 2.8 – Detailed measurement results of EPIRB Tron 60GPS S/N 00104
at the end of the 2 hour period in the +55 °C chamber

FINAL RESULTS OF DRY HEAT CYCLE (A3.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
Aliveness test (during of 2 hour period):				
- Carrier Frequency	406.037 ± 0.001	MHz	No.1 406.0370 No.2 406.0370	PASS PASS
- Power Output	35 - 39	dBm	No.1 35.25 No.2 35.44	PASS PASS
- Digital message	Correct	√	No.1 √ No.2 √	PASS PASS
Aliveness test (at end of 2 hour period):				
- Carrier Frequency	406.037 ± 0.001	MHz	No.1 406.0370 No.2 406.0370	PASS PASS
- Power Output	35 - 39	dBm	No.1 35.39 No.2 35.54	PASS PASS
- Digital message	Correct	√	No.1 √ No.2 √	PASS PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KPK-400V	15	08.2012
2	Temperature meter	Center-309	50310908	05.2012
3	Beacon tester	BT-611	1005	06.2012
4	Biconical Antenna	BBUK 9139	9114-214	09.2011
5	Spectrum analyzer	HP8593E	3831U02306	07.2011

ANNEX 3.
DAMP HEAT TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.01
Sample No. 00104
Test Date: 13.01-14.01.2011
Test Conditions:

– Atmospheric pressure: 758 mm/Hg.
– Operating relative air humidity in the chamber: 93 %.
– Operating temperature in the chamber: +40 °C
– Test equipment:
  - Climatic chamber KPK-400V No 15
  - Temperature meter Center-309 No 100074/1
  - Beacon tester BT-611 No 1005
– Test duration is 20 hours.
– Measurement duration is 2 x15 minutes.
– Step
  No. 1 Condition: EPIRB is OFF; temperature is +40 °C and 93 % relative humidity (no condensation) in the chamber with EUT duration 10 hours;
  No. 2 Condition: EPIRB is ON; ambient temperature is +40 °C and 93 % relative humidity in the chamber with EUT duration 2 hours;
  No. 3 Aliveness test of EPIRB during of the 2 hour period in the +40 °C and 93 % relative humidity chamber;
  No. 4 Aliveness test of EPIRB at the end of the 2 hour period in the +40 °C and 93 % relative humidity chamber

Figure 3.1 – View of the EPIRB Tron 60GPS before damp heat cycle

Figure 3.2 – View of the EPIRB Tron 60GPS before damp heat cycle

Figure 3.3 – View of the EPIRB Tron 60GPS before damp heat cycle in chamber

Figure 3.4 – Results of EPIRB Tron 60GPS at the end of the 2 hour period in the +40 °C and 93 % relative humidity chamber

Test duration 0 h 3 m		Bursts received 5	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.008	406037.009	406037.009
Power, Wt		3.16	7.94	3.46	3.46	3.46
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499472					
Power, mW	56.7					
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 3.5 - Detailed measurement results of EPIRB Tron 60GPS during of the 2 hour period in the +40 °C and 93 % relative humidity chamber

Test duration 0 h 3 m		Bursts received 5	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.021	406037.021	406037.021
Power, Wt		3.16	7.94	3.39	3.40	3.40
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499293					
Power, mW	56.2					
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 3.6 – Detailed measurement results of EPIRB Tron 60GPS at the end of the 2 hour period in the +40 °C and 93 % relative humidity chamber

FINAL RESULTS OF DAMP HEAT CYCLE (A4.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
Aliveness test (during of the 2 hour period)				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	35.39	PASS
- Data Message	Correct		√	PASS
Aliveness test (at end of 2 hour period):				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	35.30-35.31	PASS
- Data Message	Correct		√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KPK-400V	15	08.2011
2	Temperature meter	Center-309	50310908	05.2011
3	Beacon tester	BT-611	1005	06.2011

ANNEX 4.
VIBRATION TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.01
Sample No. 00104
Test Date: 15.10.2011
Test Conditions:
– Atmospheric pressure: 760 mm/Hg.
– Relative air humidity: 59 %.
– EPIRB set up in stand-by mode during the test.

The EUT was secured to the vibration table through its normal attachments for use in service conditions. The EUT was mounted in the same position (with respect to the direction of gravity) for all vibration tests and was subjected to sinusoidal motion in each of its three orthogonal axes according to the following profile:

1. **Frequency (Hz)** **Peak Amplitude (mm)**

4-10	2.5
10-15	0.8
15-25	0.4
25-33	0.2

2. The frequency changed linearly with time between 4 Hz and 33 Hz such that a complete cycle (4 Hz - 33 Hz - 4 Hz) took approximately 5 minutes.
3. The EUT was vibrated in each direction for a period of at least 30 minutes.
4. Upon completion of the vibration test, an exterior mechanical inspection was performed and the aliveness test was conducted.
5. Activation of the EUT during the vibration tests was checked.

– Test duration: 180 minutes.
– Measurement duration: 3 x 15 minutes.
– Step No. 1 Condition: vertical axis vibration of the EUT; duration 30 minutes
No. 2 Aliveness Test
No. 3 Exterior Mechanical Inspection
No. 4 Condition: lateral axis vibration of the EUT; duration 30 minutes
No. 5 Aliveness Test
No. 6 Exterior Mechanical Inspection
No. 7 Condition: longitudinal axis vibration of the EUT; duration 30 minutes
No. 8 Aliveness Test
No. 9 Exterior Mechanical Inspection

Figure 4.1 – View of the EPIRB Tron 60GPS before the vertical vibration test

Figure 4.2 – View of the EPIRB Tron 60GPS horizontal (X) vibration test

Figure 4.3 – View of the EPIRB Tron 60GPS horizontal (Y) vibration test

Test duration 0 h 1 m	Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.009	406037.009	406037.009
Power, Wt	3.16	7.94	3.42	3.42	3.42
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499503				
Power, mW	55.5				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 4.4 – Aliveness Test: Carrier Frequency & Power Output (upon completion of the vertical axis vibration test)

Test duration 0 h 1 m	Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.006	406037.006	406037.006
Power, Wt	3.16	7.94	3.38	3.38	3.38
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499502				
Power, mW	55.9				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 4.5 – Aliveness Test: Carrier Frequency & Power Output
(upon completion of the horizontal (X) axis vibration test)

Test duration 0 h 1 m	Bursts received 3	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.006	406037.006	406037.006
Power, Wt	3.16	7.94	3.36	3.36	3.36
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499397				
Power, mW	55.0				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 4.6 – Aliveness Test: Carrier Frequency & Power Output
(upon completion of the horizontal (Y) axis vibration test)

FINAL RESULTS OF VIBRATION TEST (A5.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Exterior Mechanical Inspection	No damage	√	√	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	35.34 35.29 35.26	PASS
- Data Message	Correct		√	PASS
• Activation	No activation during test	√	No activation during test	PASS

TEST EQUIPMENT

No	Name	Type, model	Ser. No	Calibration Due date
1	Vibration table	G 0227	496	06.2012
2	Digital vibration meter	V-1103A	1013/2	09.2012
3	Beacon tester	BT-611	1005	06.2012

ANNEX 5.
BUMP TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.01
Sample No. 00104
Test Date: 19.10.2011
Test Conditions:
– Atmospheric pressure: 761 mm/Hg.
– Relative air humidity: 59 %.
– EPIRB is READY during the test.
– EUT set up in normal operating position.

– The EUT was secured to the bump testing equipment through its normal attachments for use in service conditions, using no additional straps or other holding means.
The EUT was subjected to the bump test according to the following profile:

Peak Acceleration:	98 m/s^2
Pulse Duration:	16 ms
Waveshape:	Half-cycle Sinewave
Test Axis:	Vertical
Number of Bumps:	4000

- Upon completion of the bump test, an exterior mechanical inspection was performed and the aliveness test was conducted.
- Activation of the EUT during the bump tests was checked.

– Test duration: 150 minutes.
– Measurement duration: 15 minutes.
– Step No. 1 Results of the EUT (EPIRB) Aliveness Test (before the Bump Test)
No. 2 Condition: vertical axis acceleration of the EUT; 4000 bumps
No. 3 Aliveness Test
No. 4 Exterior Mechanical Inspection

Figure 5.1 – Test Set-up

Figure 5.2 – Diagram of the bump testing equipment control channel.

Test duration 0 h 0 m		Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.014	406037.014	406037.014
Power, Wt		3.16	7.94	3.39	3.39	3.39
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499724					
Power, mW	55.1					
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 5.3 – Aliveness Test: Carrier Frequency & Power Output (upon completion of the Bump Test)

FINAL RESULTS OF THE BUMP TEST (A6.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Exterior Mechanical Inspection	No damage	√	√	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	35.30	PASS
- Digital message	Correct	√	√	PASS
• Activation	No activation during test	√	√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2012
2	Shock table	Tirashock 4110	41/88	07.2012

ANNEX 6.
SALT FOG TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.01
Sample No. 00104
Test Date: 18.01-22.01.2011
Test Conditions:

– Relative air humidity: 56-57 %.
– Atmospheric pressure: 759-762 mm/Hg.
– EPIRB is OFF during the test.
– EUT set up in performance position.
– Test equipment:
  - Salt fog chamber DS090-X No 20807004 having a volume 0.34 m^3
  - Beacon tester BT-611 No 1005
– Preparation of salt solution: Resistance distilled, demineralized, deionized use water not introduce contaminants is 555 kOhms/cm. Salt solution concentration is 5.2%. Salt solution containing (on dry basis) 0.02% sodium iodide and 0.07 % total impurities. Salt solution pH is 6.9. Preheat temperature compressed air (before atomizing) is 46.3 °C. Air pressure is 83.5 kPa. Reference MIL-STD-810D (19 July 1983) method 509.2 item II-2.2 on the preparation of 5% salt solution.
– Preparation of salt fog: from a 5% salt (sodium chloride) solution. Salt fog fallout such that each receptacle collects is 2.4 ml of solution per hour for each 80 cm^3 of horizontal collecting area (10 cm diameter) in an average test at 16 hours. Salt fog pH is 7.0. Reference MIL-STD-810D (19 July 1983) method 509.2 item II-1 on the preparation of the apparatus for generating salt fog.
– Test duration is 99.25 hours.
– Measurement duration is 15 minutes.
– Step
  No. 1 Condition: temperature +35 °C in the chamber with EUT duration 2 hours; no salt fog;
  No. 2 Condition: temperature +35 °C in the salt fog chamber with EUT duration 48 hours; exposed to salt fog;
  No. 3 Condition: temperature is +20 °C in the chamber with EUT duration 24 hours; no salt fog;
  No. 4 Condition: temperature is +35 °C in the salt fog chamber with EUT duration 12 hours; exposed to salt fog;
  No. 5 Condition: temperature is +20 °C in the chamber with EUT; no salt fog; duration 12 hours;
  No. 6 Corrosion, peeling paint, and other signs of deterioration are inspected;
  No. 7 Salt deposits and water stains is wash off with clean warm water not exceeding a temperature +38 °C; EPIRB is not removed from the release mechanism for cleaning;
  No. 8 Aliveness test of EUT upon completion of the salt fog test.

Figure 6.1 – Views of the EUT in salt fog chamber

Figure 6.2 – View of the EUT in salt fog chamber

Figure 6.3 – View exterior inspection of the EUT upon completion of the salt fog test

Test duration 0 h 1 m		Bursts received 3		BCH error 0		Self-Test 0	
406 MHz Transmitter Parameters		**Limits**			**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.044	406037.044	406037.044
Power, Wt		3.16	7.94	4.07	4.07	4.07
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz	121499766					
Power, mW	54.9					
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 6.4 - Detailed measurement results of EUT after of the salt fog test

FINAL RESULTS OF SALT FOG TEST (A7.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Exterior Mechanical Inspection	No damage	√	√	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	36.10	PASS
- Digital message	Correct	√	√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2011
2	Salt Fog Chamber	DS090-X	20807004	05.2012

ANNEX 7.
DROP TEST
(on hard surface)

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.01
Sample No. 000104
Test Date: 24.01.2011
Test Conditions:
– Ambient temperature at test site: +15 °C
– Relative air humidity: 63 %
– Atmospheric pressure: 754 mm/Hg
– EPIRB is OFF before test
– Test duration: 0.5 hours
– Measurement duration: 15 minutes
– EUT is dropped one time.

Figure 7.4 – Total view of test site of the drop from a height of 1 m above the test surface

Figure 7.5 – Thickness of wood test surface

Figure 7.6 – Demensions of the wood test surface

Figure 7.7 – View the orientation of the Tron 60GPS before of the drop test

Test duration 0 h 1 m	Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.101	406037.101	406037.101
Power, Wt	3.16	7.94	4.06	4.06	4.06
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499885				
Power, mW	55.0				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 7.9 - Results of the EUT Aliveness Test (after the Drop Tests)

FINAL RESULTS OF DROP TEST on Hard Surface (A8.1 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Exterior Mechanical Inspection	No damage	√	√	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0371	PASS
- Power Output	35 - 39	dBm	36.09	PASS
- Digital message	Correct	√	√	PASS
• Activation	No activation during test	√	√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2011
2	Climatic Chamber	NZ-350	24625a	08.2012
3	Wooden drop installation	-	101231	05.2013

ANNEX 8.
DROP TEST
(in water)

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.01
Sample No. 00104
Test Date: 24.01.2011
Test Conditions:
– Ambient temperature at open area test site: +2 °C
– Relative air humidity: 65 %
– Atmospheric pressure: 754 mm/Hg
– Test duration is 2 hours
– Measurement duration is 15 minutes upon completion of three drops
– EUT was dropped three times. Each drop was initiated from a different orientation as follows: antenna vertical up; antenna vertical down; antenna horizontal.

Figure 8.1 – View EPIRB Tron 60GPS before of the drop test in water

Figure 8.2 – Total view of test site of the drop test in water of EPIRB Tron 60GPS from a height of 20 m

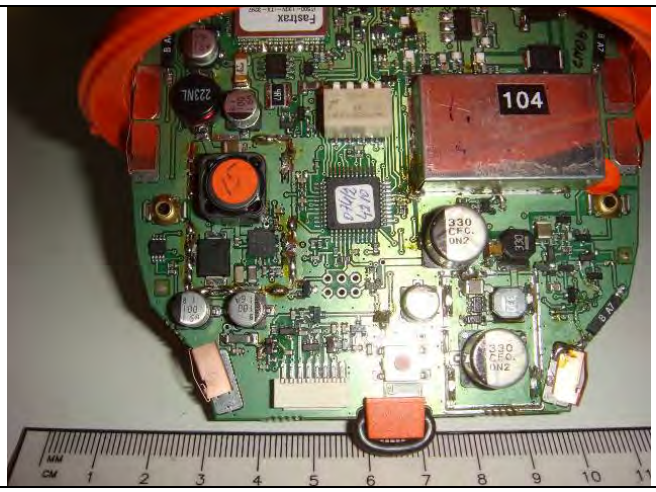
Figure 8.3 – View EPIRB Tron 60GPS dropping in water with antenna horizontal

Figure 8.4 – View EPIRB Tron 60GPS dropping in water with antenna vertical up

Figure 8.5 – View EPIRB Tron 60GPS dropping in water with antenna vertical down

Figure 8.6 – Detailed examination of EPIRB Tron 60GPS upon completion of the drop test. There is no water inside.

Figure 8.7 – Detailed examination of EUT upon completion of the drop test. There is no water inside.



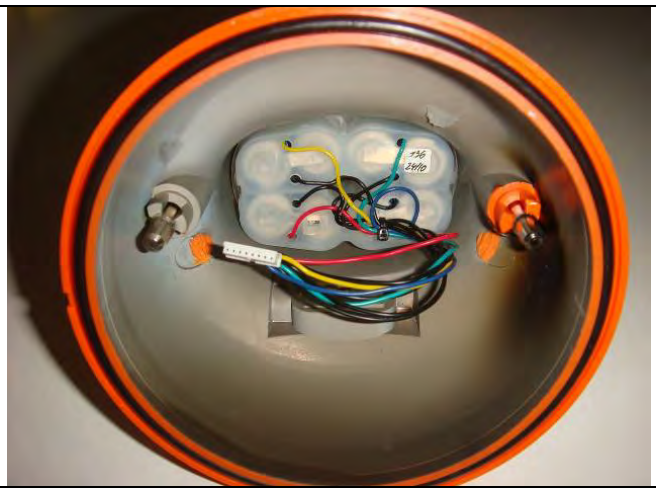


Figure 8.8 – Detailed examination of EPIRB Tron 60GPS upon completion of the drop test. There is no water inside.

Test duration 0 h 1 m	Bursts received 3	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.029	406037.029	406037.029
Power, Wt	3.16	7.94	4.02	4.02	4.02
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499534				
Power, mW	53.7				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 8.9 – Results of the EPIRB Tron 60GPS Aliveness Test (after the Drop Tests)

FINAL RESULTS OF DROP TEST in Water (A8.2 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Exterior Mechanical Inspection	No damage	√	√	PASS
• Interier Inspection	No water ingress	√	√	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	36.04	PASS
- Digital message	Correct	√	√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2011
2	Free fall installation	SAPB-20	101377	05.2013

ANNEX 9.
LEAKAGE AND IMMERSION TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.01
Sample No. 00104
Test Date: 25.05-27.05.2011
Test Conditions:
– Atmospheric pressure: 756-758 mm/Hg.
– Relative air humidity: 46-64 %.
– EPIRB is OFF during the test.
– Test duration: 50 hours.
– Measurement duration: 15 minutes.

The leakage and immersion tests were performed in the following sequence.

1. The equipment was placed in an atmosphere of +65 °C ± 3 °C for one hour.

2. Then EUT was immediately immersed in water at +20 °C ± 3 °C to a depth of 100 mm ± 5 mm, measured from the highest point of the equipment to the surface of the water, for a period of 48 hours.

3. The EUT was immersed into the pressure vessel which had been filled with water. Then pressure was increased to + 981 mbar (relative to atmospheric pressure) and maintained for 5 minutes.

4. The EUT was removed from the water and wiped dry.

5. At the end of the test period:
- the equipment was subjected to a performance check,
- the equipment was opened and inspected for damage and visible ingress of water viewed with the unaided eye.

Figure 9.1 – View of immersion test site (Manometer of immersion test site indicates 1 bar)

Figure 9.2 – The PCB after immersion test. There is no water ingress.

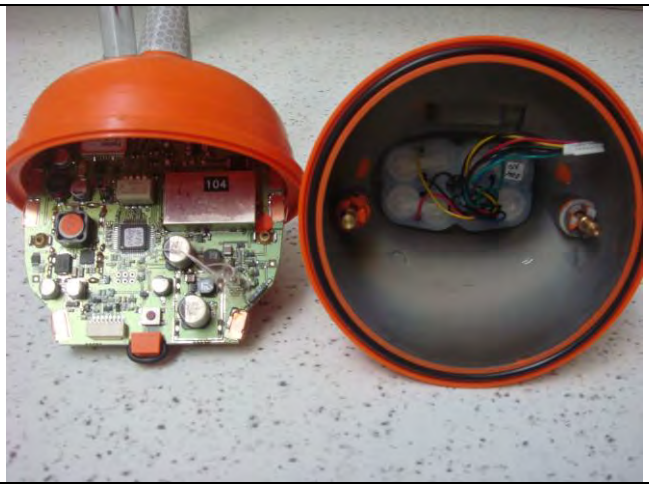


Figure 9.2 – The PCB (back view) after immersion test. There is no water ingress.

Test duration 0 h 3 m		Bursts received 5	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters		**Limits**		**Measured**		
		min	**max**	**min**	**current**	**max**
Frequency, kHz		406036.000	406038.000	406037.000	406037.000	406037.000
Power, Wt		3.16	7.94	4.00	4.00	4.00
121.5 MHz Transmitter Parameters						
Carrier Frequency, Hz		121499434				
Power, mW		53.7				
Message						
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C					

Figure 9.3 - Results of the EPIRB Tron 60GPS Aliveness Test (after the Leakage & Immersion Test)

FINAL RESULTS OF THE LEAKAGE AND IMMERSION TEST (A9.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.0021	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	36.02	PASS
- Digital message		√	√	PASS
• Interior Inspection	No water	√	√	PASS

TEST EQUIPMENT

No	Name	Type, model	Ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2011
2	Set of immersion	-	102070	08.2011

ANNEX 10.
SPURIOUS EMISSIONS TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.03
Sample No. 00101, 00104
Test Date: 20.06-22.06.2011
Test Conditions:
– Atmospheric pressure: 751..756 mm/Hg
– Relative air humidity: 45.7..49.2 %
– Temperature Minimum: -20 °C
Maximum: +55 °C
Ambient: +26 °C

– EPIRB is ON during the test

Figure 10.1 – View of the test setup for the Spurious Emissions Test

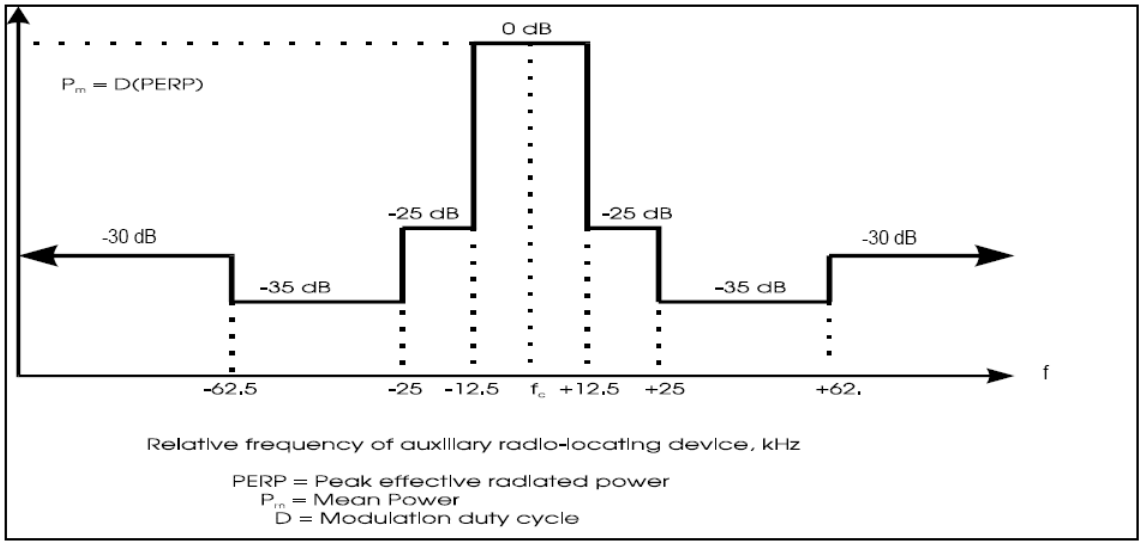


Figure 10.2 – Required Spurious Emissions for 121.5 MHz

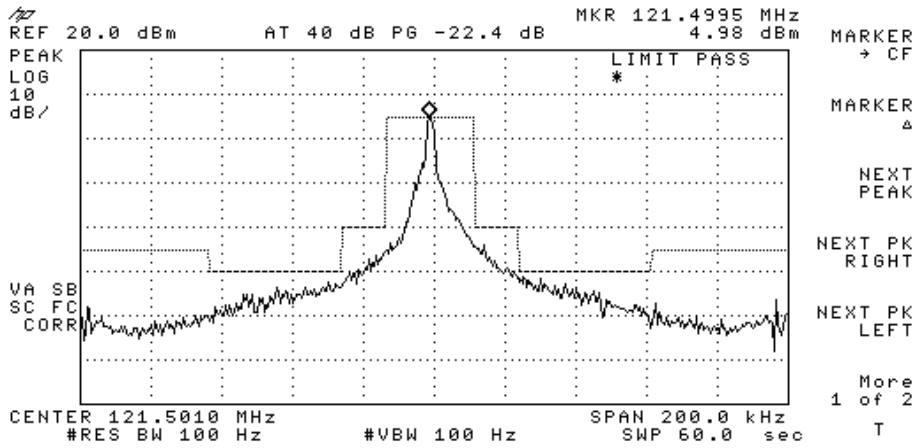


Figure 10.3 – EPIRB Tron 60GPS s/n 00101 Spurious Emissions for 121.5 MHz at Minimum Temperature

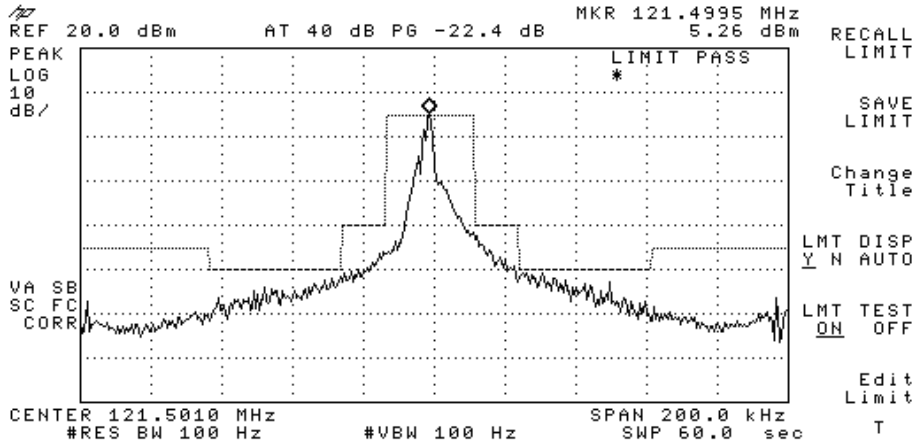


Figure 10.4 – EPIRB Tron 60GPS s/n 00101 Spurious Emissions for 121.5 MHz at Ambient Temperature

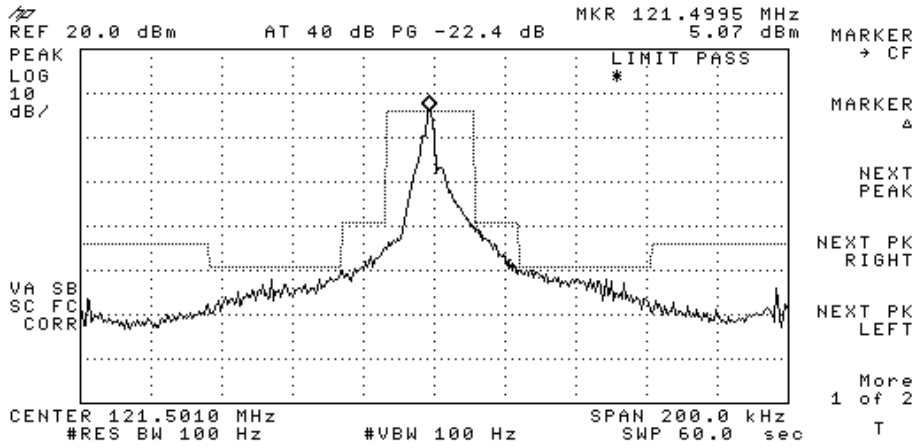


Figure 10.5 – EPIRB Tron 60GPS s/n 00101 Spurious Emissions for 121.5 MHz at Maximum Temperature

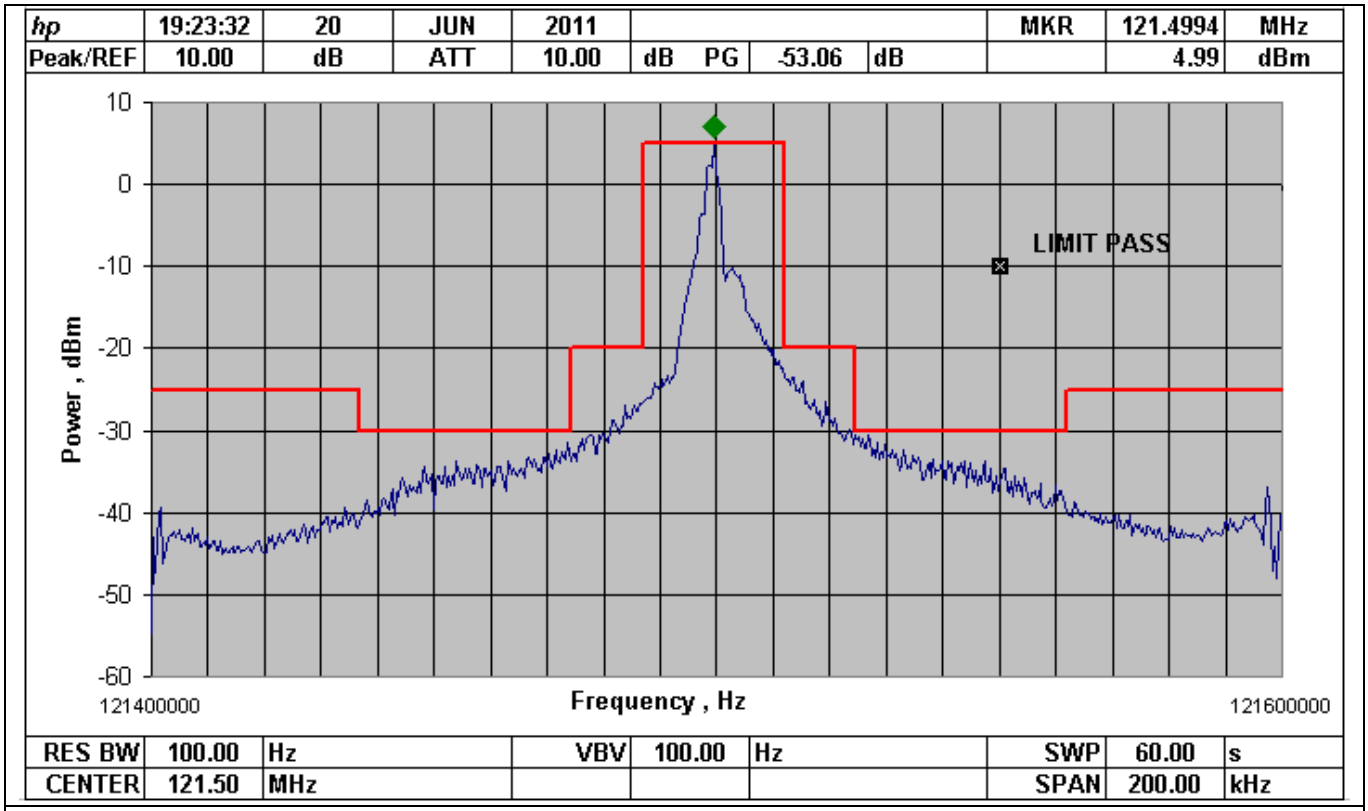


Figure 10.6 – EPIRB Tron 60GPS s/n 00104 Spurious Emissions for 121.5 MHz at Minimum Temperature

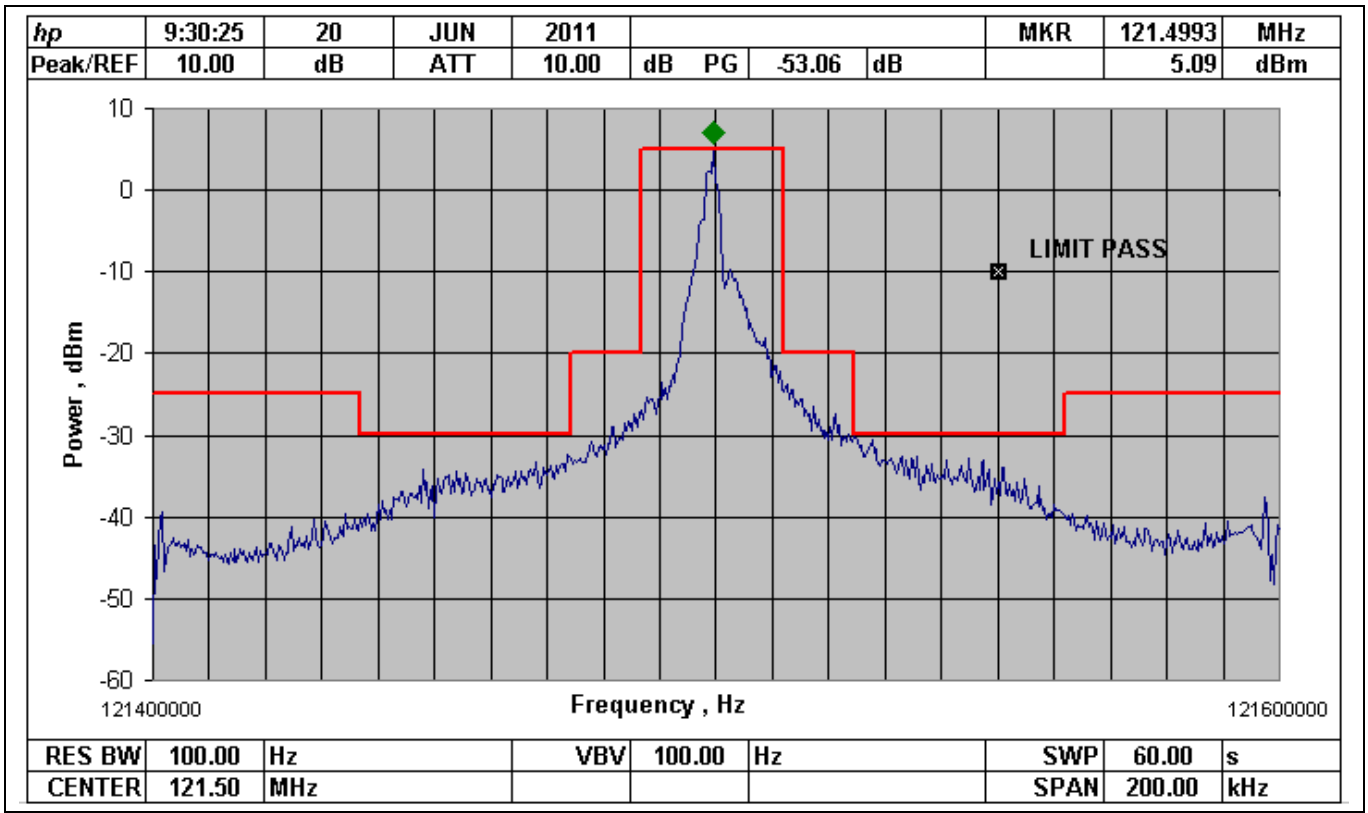


Figure 10.7 – EPIRB Tron 60GPS s/n 00104 Spurious Emissions for 121.5 MHz at Ambient Temperature

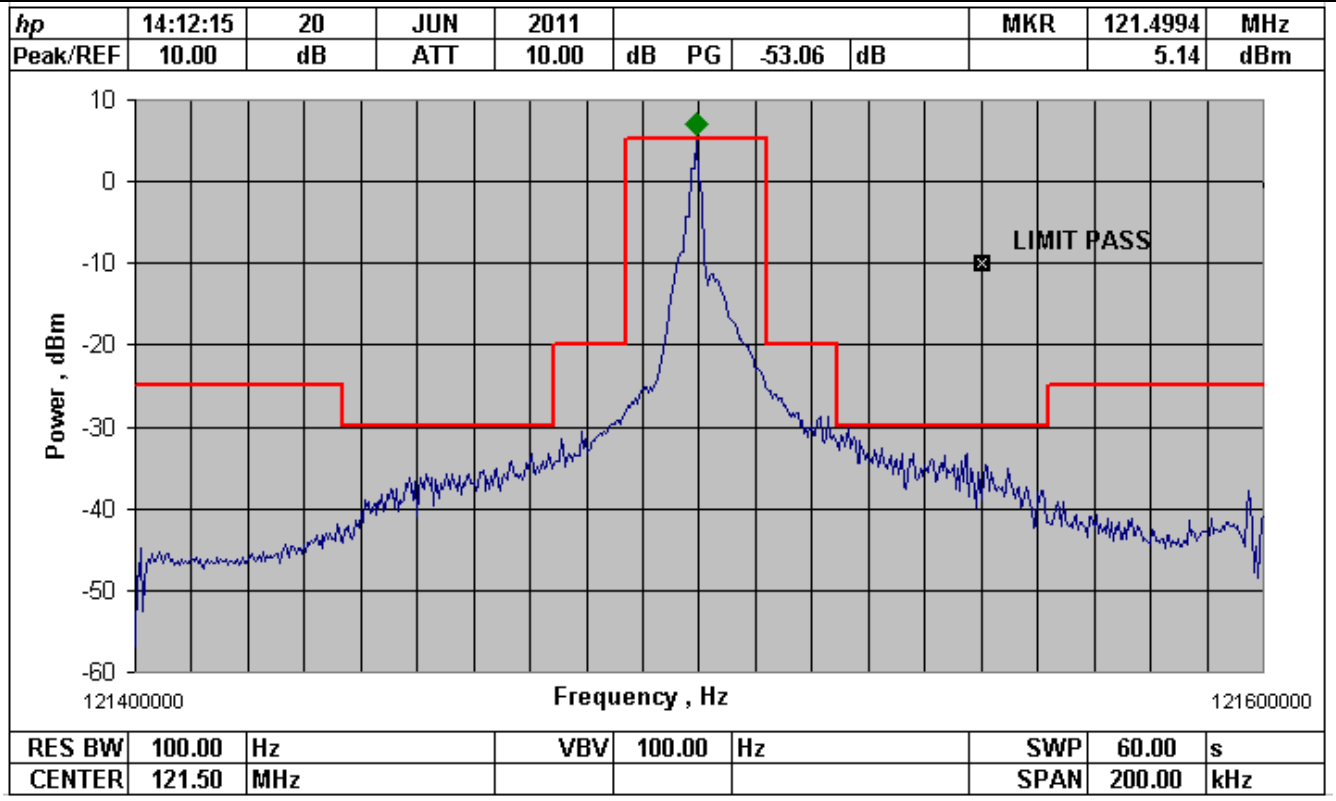


Figure 10.8 – EPIRB Tron 60GPS s/n 00104 Spurious Emissions for 121.5 MHz at Maximum Temperature

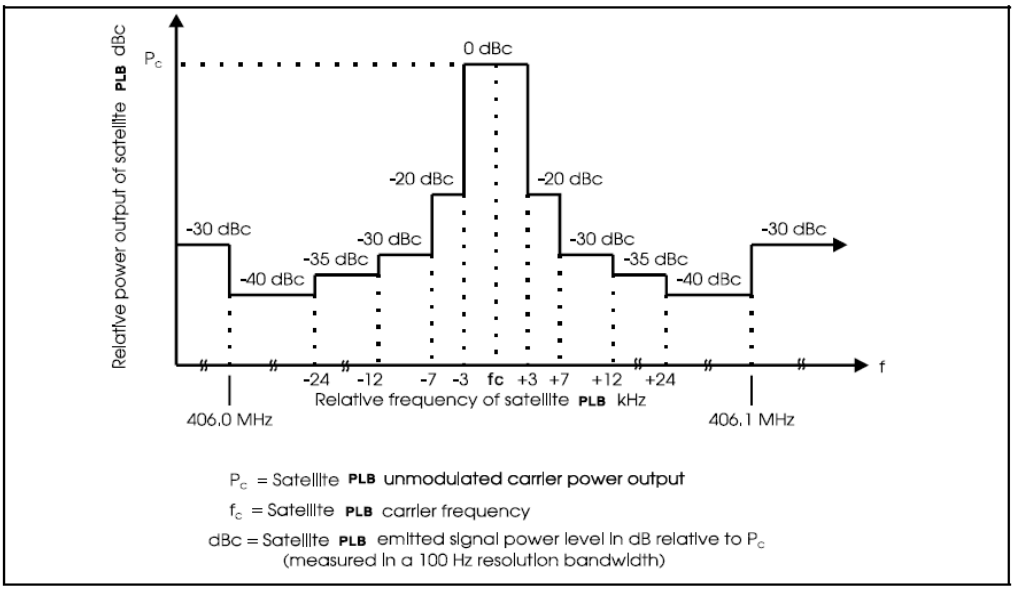


Figure 10.9 – Required Spurious Emissions for 406 MHz

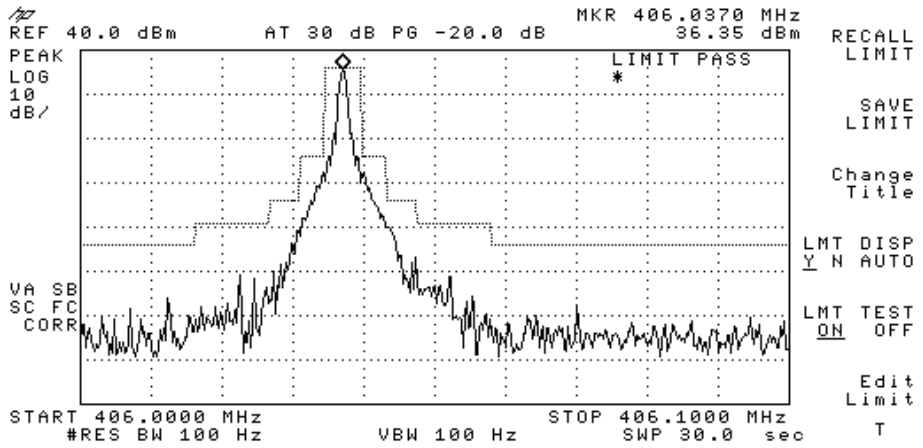


Figure 10.10 - EPIRB Tron 60GPS s/n 00101 Spurious Emissions for 406 MHz at Minimum Temperature

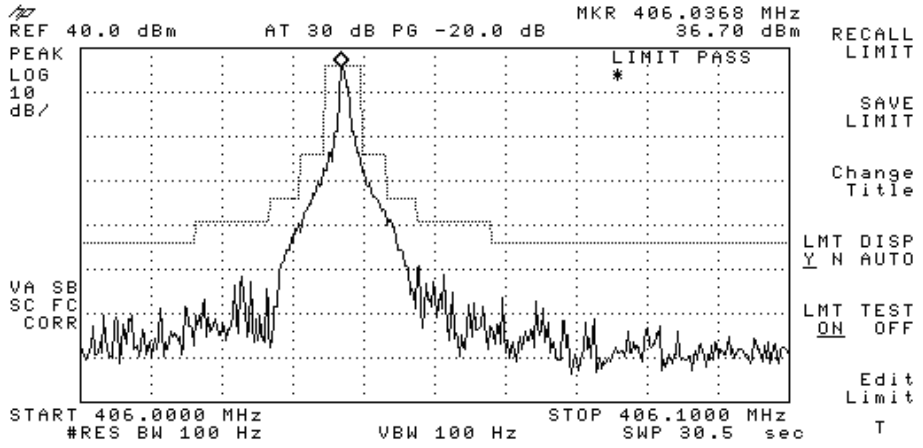


Figure 10.11 – EPIRB Tron 60GPS s/n 00101 Spurious Emissions for 406 MHz at Ambient Temperature

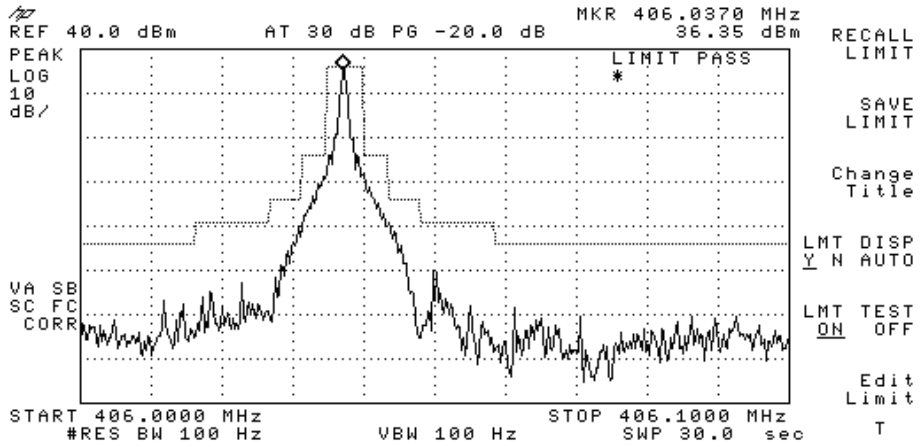


Figure 10.12 - EPIRB Tron 60GPS s/n 00101 Spurious Emissions for 406 MHz at Maximum Temperature

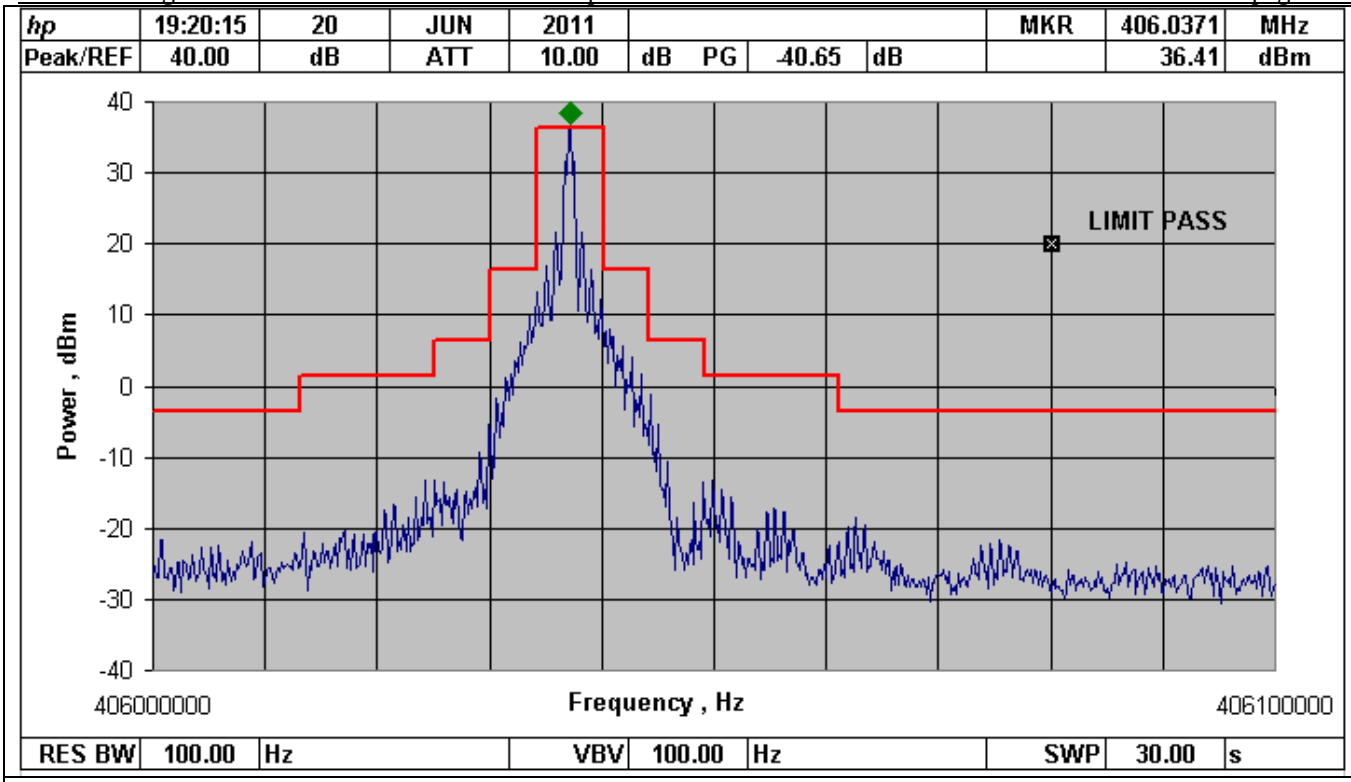


Figure 10.13 - EPIRB Tron 60GPS s/n 00104 Spurious Emissions for 406 MHz at Minimum Temperature

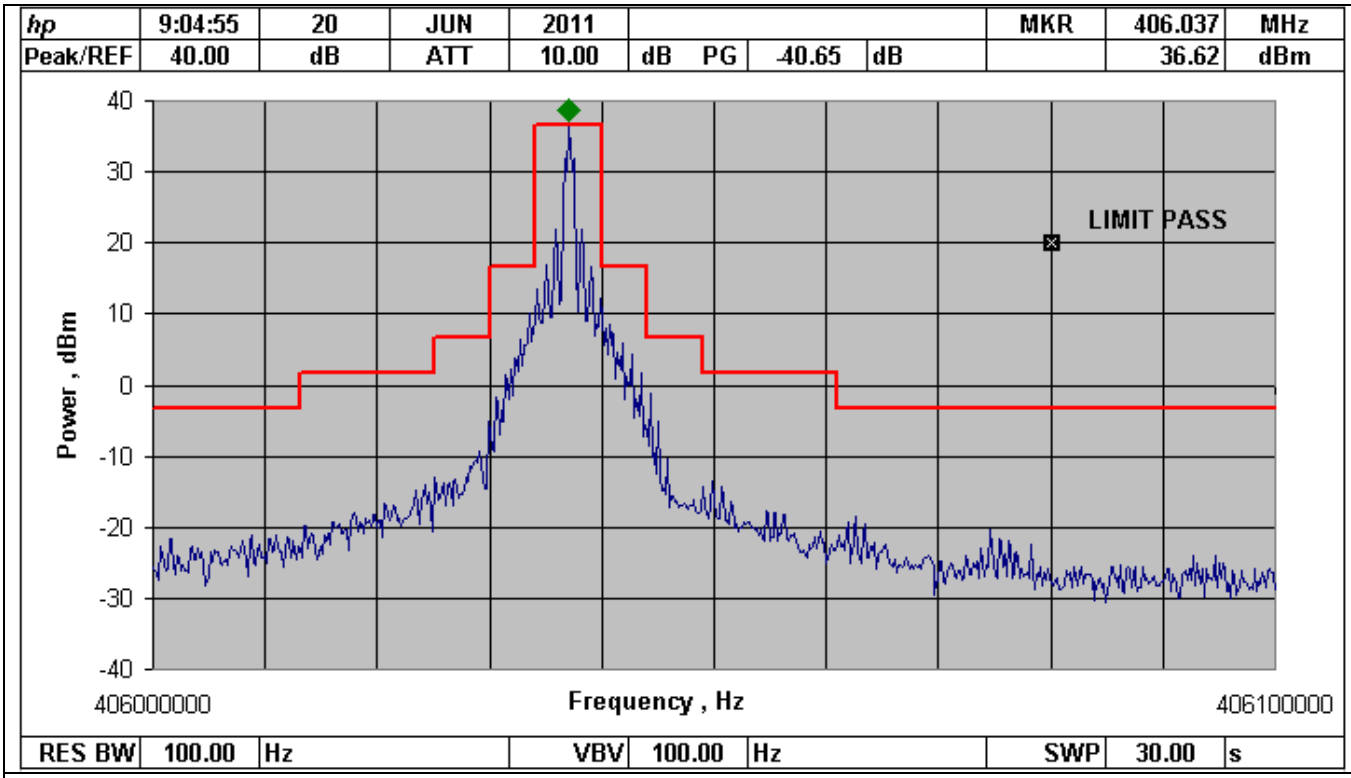


Figure 10.14 – EPIRB Tron 60GPS s/n 00104 Spurious Emissions for 406 MHz at Ambient Temperature

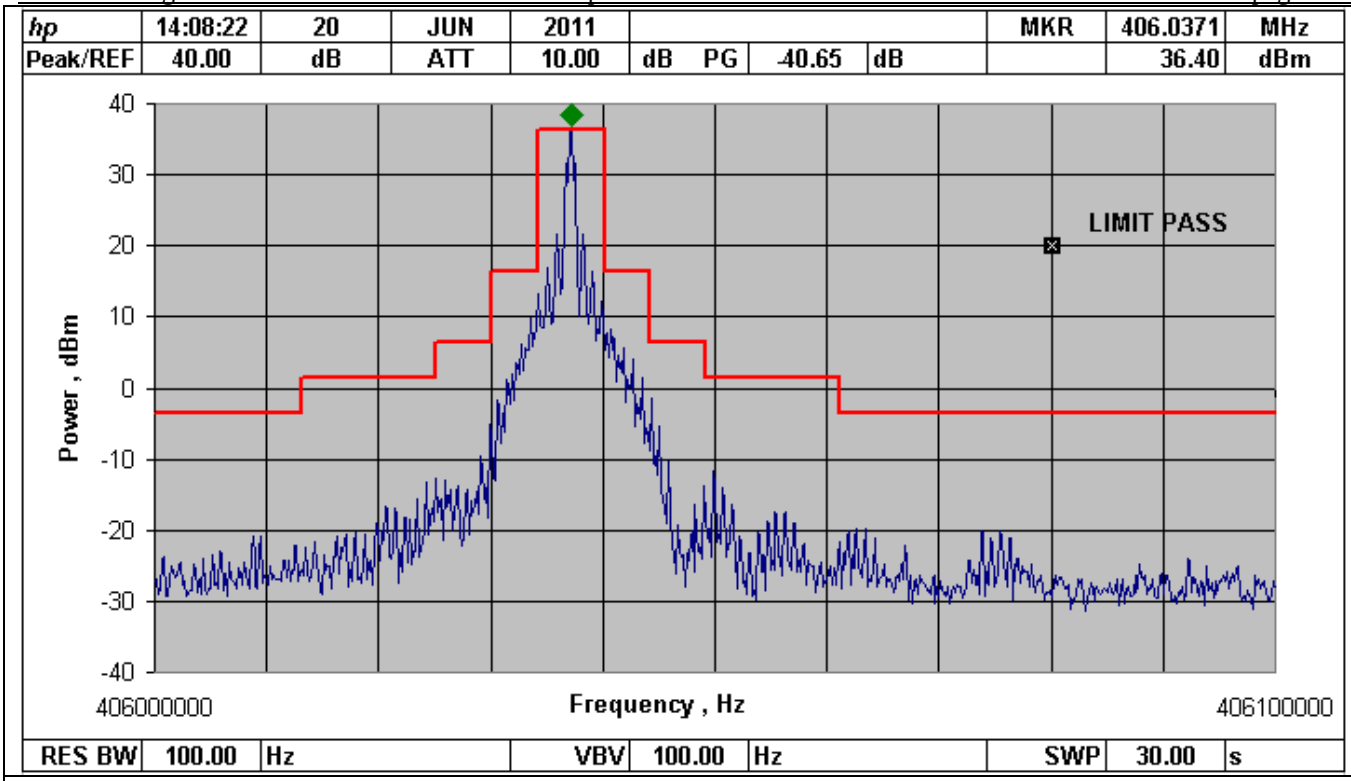


Figure 10.15 - EPIRB Tron 60GPS s/n 00104 Spurious Emissions for 406 MHz at Maximum Temperature

FINAL RESULTS OF SPURIOUS EMISSIONS TEST (A10.0 RTCM 11000.2 Version 2.1) EPIRB Tron 60GPS:

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Spurious Emissions 121.5 MHz at ambient temperature	Fig. 10.2	dBm	Fig. 10.4, Fig. 10.7	PASS
Spurious Emissions 121.5 MHz at minimum temperature	Fig. 10.2	dBm	Fig. 10.3, Fig. 10.6	PASS
Spurious Emissions 121.5 MHz at maximum temperature	Fig. 10.2	dBm	Fig. 10.5, Fig. 10.8	PASS
Spurious Emissions 406 MHz at ambient temperature	Fig. 10.9	dBm	Fig.10.11, Fig.10.14	PASS
Spurious Emissions 406 MHz at minimum temperature	Fig. 10.9	dBm	Fig.10.10, Fig.10.13	PASS
Spurious Emissions 406 MHz at maximum temperature	Fig. 10.9	dBm	Fig.10.12, Fig.10.15	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	S/N	Calibration Due date
1	Spectrum analyzer	HP8593E	3831U02306	07.2011
2	Climatic chamber	KPK-400V	15	08.2011
3	Semi-anechoic chamber	«Don»	1	11.2011
4	Biconical Antenna	BBUK 9139	9114-214	09.2011

ANNEX 11.
THERMAL SHOCK TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.01
Sample No. 00104
Test Date: 24.05.2011
Test Conditions:
– Atmospheric pressure: 753-576 mm/Hg.
– Relative air humidity: 56-63 %.
– Test duration is 18 hours.
– Measurement duration is 2 x15 minutes.
– Step
No. 1 EPIRB is OFF;
No. 2 Condition: fresh water temperature is of +2 °C; EUT self-activation in fresh water;
No. 3 EPIRB removed from water, deactivated; soaked at temperature -30 °C for 3 hours;
No. 4 Condition: salt water (5 % NaCl) temperature is +1 °C; EUT self-activation in salt water;
No. 5 After 20 minutes following test was conducted: aliveness test, short-term frequency stability and medium-term frequency stability;
No. 6 EPIRB is OFF; soaked at temperature +70 °C for 3 hours;
No. 7 Condition: fresh water temperature is of +30 °C; EUT self-activation in fresh water;
No. 8 EPIRB removed from water, deactivated; soaked at temperature +70 °C for 3 hours;
No. 9 Condition: salt water (5 % NaCl) temperature is +30 °C; EUT self-activation in salt water;
No. 10 After 20 minutes following test was conducted: aliveness test, short-term frequency stability and medium-term frequency stability;

Figure 11.1 –EPIRB Tron 60GPS in water

Test duration 0 h 20 m	Bursts received 26	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.004	406037.004	406037.010
Power, Wt	3.16	7.94	4.02	4.02	4.06
Slope(E-9)	-1.00	1.00	-0.815	-0.651	-0.651
Residual variations (E-9)	0.00	3.00	0.327	0.327	0.428
Short term variations (E-9)	0.00	2.00	0.104	0.110	0.110
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499459				
Power, mW	53.9				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 11.2 – Detailed measurement results of EPIRB Tron 60GPS
upon completion of low-temperature thermal shock test

Test duration 0 h 20 m	Bursts received 26	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406037.001	406037.001	406037.003
Power, Wt	3.16	7.94	3.99	4.00	4.00
Slope(E-9)	-1.00	1.00	-0.366	-0.317	-0.307
Residual variations (E-9)	0.00	3.00	0.219	0.228	0.247
Short term variations (E-9)	0.00	2.00	0.086	0.089	0.093
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499621				
Power, mW	53.4				
Message					
Digital message	:FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 11.3 – Detailed measurement results of EPIRB Tron 60GPS
upon completion of high-temperature thermal shock test

FINAL RESULTS OF THERMAL SHOCK TEST (A11.0 RTCM 11000.2 Version 2.1):
RESULTS OF LOW-TEMPERATURE THERMAL SHOCK TEST (A11.1 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Self-activation in fresh water	5	minutes	0.29	PASS
• Self-activation in salt water	5	minutes	0.24	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	36.0	PASS
- Digital message	Correct	√	√	PASS
• Frequency Stability				
- short term stability	≤0.002	ppm in 100 ms	0.0001	PASS
- medium term stability				
mean slope	-0.001 to 0.001	ppm/ minute	-0.0008 to -0.0007	PASS
residual frequency variation	≤0.003	parts/ million	0.0003 to 0.0004	PASS

RESULTS OF HIGH-TEMPERATURE THERMAL SHOCK TEST (A11.2 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Self-activation in fresh water	5	minutes	0.12	PASS
• Self-activation in salt water	5	minutes	0.08	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	36.0	PASS
- Digital message	Correct	√	√	PASS
• Frequency Stability				
- short term stability	≤0.002	ppm in 100 ms	0.0001	PASS
- medium term stability				
mean slope	-0.001 to 0.001	ppm/ minute	-0.0004 to -0.0003	PASS
residual frequency variation	≤0.003	ppm	0.0002	PASS

TEST EQUIPMENT

No	Name	Type, model	Ser. No	Calibration Due date
1	Climatic Chamber	SNOL 58/350	102353	05.2012
2	Climatic Chamber	KPK-400V	15	08.2011
3	Thermometer	TGL11998	11998	04.2012
4	Beacon tester	BT-611	1005	06.2011

ANNEX 12.
OPERATIONAL LIFE TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.04
Sample No. 00101
Test Date: 17.09 - 19.09.2011
Test Conditions:
– Atmospheric pressure: 756…758 mm/Hg
– Relative air humidity: 53…57 %
– Ambient temperature: 15…16 ºC
– Test temperature: -20 °C

Test Method:

The operational life test was combined with the COSPAS-SARSAT Type Approval operating lifetime test in accordance to C/S T.007 A.2.3 as it was agreed by applicant with *Bundesamt für Seeschifffahrt und Hydrographie*.

Fresh battery was pre-discharged for 0.548 A·h (96 mA over 5 h 42 min) at room ambient temperature. It was stated to be equivalent to the loss of battery capacity due to self-testing, stand-by loads as well as battery-pack self-discharge during the useful life of the battery pack.

EPIRB with pre-discharged battery pack installed into release mechanism was placed in a chamber of normal room temperature. Then the temperature was reduced to and maintained at -30°C ± 3°C for 10 hours.

Then chamber was heated to -20ºC over 20 min.

EPIRB was activated 30 minutes after the end of stowage temperature period and kept been working continuously for 49 hours in maximum current draw mode. Temperature of the chamber was maintained as -20ºC for the whole of the period of 49 hours.

EPIRB was subjected to the test as specified in C/S T.007 A.2.3 at intervals 6 hours. At the end of 49 hours a performance test was performed.

Matching network was used during measurements. RF losses 0.6 dB at 406 MHz inserted by matching network is accounted in presented results.

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Figure 12.1 – The test site view of the Operational life test

RESULTS OF OPERATIONAL LIFE TEST (A13.1 RTCM 11000.2 Version 2.1)
The Initial Measurement (at the start of the test)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000124	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	0.0000255	PASS
Residual Variation	≤0.003	ppm	0.000315	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.84	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	16.00	PASS

The 1-st measurement (after 12 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000371	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	0.0000055	PASS
Residual Variation	≤0.003	ppm	0.0003	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.87	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.97	PASS

The 2-nd measurement (after 18 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000307	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	0.0000097	PASS
Residual Variation	≤0.003	ppm	0.000374	PASS
Strobe Light Flash Rate	20-30	/min	26	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.87	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.96	PASS

The 3-d measurement (after 24 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000362	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	-0.00000087	PASS
Residual Variation	≤0.003	ppm	0.000328	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.84	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.96	PASS

The 4th measurement (after 30 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000293	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	0.00000083	PASS
Residual Variation	≤0.003	ppm	0.000377	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.76	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.94	PASS

The 5th measurement (after 36 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000329	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	0.00000067	PASS
Residual Variation	≤0.003	ppm	0.000389	PASS
Strobe Light Flash Rate	20-30	/min	26	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.84	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.93	PASS

The 6th measurement (after 42 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000353	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	0.0000006	PASS
Residual Variation	≤0.003	ppm	0.000346	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.86	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.93	PASS

The 7th measurement (after 48 hours)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000314	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	-0.000021	PASS
Residual Variation	≤0.003	ppm	0.000367	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.86	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.93	PASS

The last measurement (after 49 hours cycle)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Nominal Carrier Frequency	406.037 ± 0.001	MHz	406.036994	PASS
Short-term frequency stability (in 100 ms)	≤0.002	ppm	0.000291	PASS
Medium-term frequency stability				
Mean Slope	≤0.001	ppm 1/ min	-0.0000177	PASS
Residual Variation	≤0.003	ppm	0.000327	PASS
Strobe Light Flash Rate	20-30	/min	27	PASS
RF Output power (406 MHz)	37 ± 2	dBm	36.76	PASS
Auxiliary radio-locating device Peak Effective Radiated Power (121.5 MHz)	14-20	dBm	15.89	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic Chamber	NZ-350	24625a	08.2012
2	Temperature meter	Center-309	50310908	05.2012
3	Beacon tester	BT-611	1005	06.2012
4	Battery Analyzer	UBA5	10225	01.2012

ANNEX 13.
STROBE LIGHT TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.03
Sample No. 00104
Test Date: 23.06 – 24.06.2011
Test Conditions:
– Atmospheric pressure: 749 mm/Hg.
– Relative air humidity: 53 %.
– EPIRB is ON during the test
– EPIRB homing transmitter operating status is OFF
– EUT in the performance position without automatic realize mechanism

The EUT was turned OFF and thermally soaked for 3 hours at the required operating temperature. Then the EUT was turned ON and the strobe light flash rate and effective luminous intensity were measured at 49 points over the upper hemisphere of the satellite EPIRB.
The strobe light test was performed at the ambient temperature, at the minimum operating temperature and at the maximum operating temperature.

– Test duration: 18 hours.
– Measurement duration: 360 minutes.
– Step
No. 1 Condition: EUT was turned OFF and thermally soaked at the temperature 20 °C for 3 hours
No. 2 Condition: EUT was turned ON and the strobe light flash rate and effective intensity were verified at 20 °C. Duration 60 minutes
No. 3 Condition: EUT was turned OFF and thermally soaked at the temperature -20 °C for 3 hours
No. 4 Condition: EUT was turned ON and the strobe light flash rate and effective intensity were verified at -20 °C. Duration 60 minutes
No. 5 Condition: EUT was turned OFF and thermally soaked at the temperature +55 °C for 3 hours.
No. 6 Condition: EUT was turned ON and the strobe light flash rate and effective intensity were verified at +55 °C. Duration 60 minutes

Figure 13.1 – Low-duty cycle light test. The EPIRB Tron 60GPS stays in the climatic chamber. General view of test equipment for low-duty cycle light test

Effective luminous intensity at -20°C

	Elevation								
Azimuth	10°	20°	30°	40°	50°	60°	70°	80°	90°
0°	0.90	1.52	1.71	2.10	2.38	1.33	2.95	3.05	3.29
45°	0.67	1.29	1.57	1.86					
90°	0.76	1.33	1.57	1.90	2.19	2.38	2.52	2.76	
135°	0.76	1.29	1.62	2.00					
180°	0.81	1.38	1.57	1.90	2.29	2.48	2.67	2.76	
225°	0.86	1.38	1.62	2.00					
270°	0.76	1.33	1.67	2.00	2.33	2.48	2.57	2.86	
315°	0.71	1.52	1.62	2.00					

Effective luminous intensity at 20°C

	Elevation								
Azimuth	10°	20°	30°	40°	50°	60°	70°	80°	90°
0°	1.14	1.52	1.81	2.29	2.67	3.00	3.33	3.62	3.52
45°	0.76	1.43	1.76	2.19					
90°	0.76	1.33	1.71	2.19	2.48	2.86	3.24	3.71	
135°	0.86	1.43	1.71	2.29					
180°	0.86	1.57	1.76	2.29	2.57	2.95	3.19	3.52	
225°	0.90	1.57	1.86	2.29					
270°	0.90	1.62	1.81	2.19	2.62	2.86	3.05	3.43	
315°	0.86	1.62	1.81	2.29					

Effective luminous intensity at 55°C

Azimuth	Elevation								
	10°	20°	30°	40°	50°	60°	70°	80°	90°
0°	1.24	1.71	1.90	2.38	2.76	3.05	3.33	3.43	3.52
45°	0.90	1.43	1.86	2.29					
90°	0.81	1.43	1.81	2.24	2.57	2.86	3.05	3.33	
135°	0.76	1.48	1.81	2.29					
180°	0.76	1.43	1.76	2.10	2.52	2.81	3.05	3.33	
225°	0.76	1.43	1.71	2.10					
270°	0.81	1.52	1.81	2.19	2.57	2.86	3.05	3.38	
315°	0.95	1.62	1.81	2.29					

Summary test result

No.	Temperature	Luminous intensity		Conclusion
		Arithmetic mean	Criteria	
1	Minimal temperature -20 °C	1.82	> 0.67	Passed
2	Normal temperature 20 °C	2.12	> 0.76	Passed
3	Maximal temperature 55 °C	2.10	> 0.76	Passed

FINAL RESULTS OF STROBE LIGHT TEST (A13.2 RTCM 11000.2 Version 2.1)

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNIT S	TEST RESULTS			COMMENTS (PASS/FAIL)
			Tmin (- 20 °C)	Tamb (+ 19 °C)	Tmax (+ 55 °C)	
• Flash rate	20-30	/min	26	27	27	PASS
• Effective intensity mean	0.75	Cd	1.82	2.12	2.10	PASS
• Pulse duration	10^{-6} to 10^{-1}	s	10^{-1}	10^{-1}	10^{-1}	PASS

Note 1. Pulse duration is considered PASS upon e-mail from USCG (CG-5214) dated August 22, 2011: Therefore, we can accept an EPIRB with a strobe LED light that meets the IEC 61097-2 Ed 3.0 standard with an "ON time" of up to 100 ms (para. A2.10), in advance of acceptance of the draft RTCM standard which will be harmonized with the IEC standard.

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Graphic luxmeter	LG-05	17	01.2012
2	Climatic chamber	KTK-400	280707	02.2012
3	Rotation and inclination device	RD-360/90	01	05.2013

ANNEX 14.
SELF TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.01
Sample No. 00101, 00104
Test Date: 23.02-25.02.2011
Test Conditions:
– Atmospheric pressure: 754 – 757 mm/Hg
– Relative air humidity: 46 – 48 %
– Temperature Minimum: -20 °C
Maximum: +55 °C
Ambient: +20 °C

Test Method:
The self-test was performed at the minimum operating temperature, at the normal temperature, and at the maximum operating temperature. Before test at each temperature the EUT was turned OFF and thermally-soaked for 3 hours at the required operating temperature. The EUT then was activated and the aliveness test performed. Upon completion of the aliveness test, the EUT was turned OFF. After a period of at least 5 minutes, the EUT was turned on in self-test mode in accordance with the manufacturer's operating instructions. The EUT was inspected to indicate successful completion of the self-test and the following parameters were verified:

1. The 406 MHz RF output pulse duration
2. The frame synchronization pattern
3. Quantity of bursts transmitted
4. The content of the message

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	Limits		Measured		
	min	max	min	current	max
Frequency, kHz	406036.000	406038.000	0.000	406037.011	0.000
Power, Wt	3.16	7.94	0.00	4.05	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				
15-HEX ID	:1925E847E0FFBFF				

Figure 14.1 - Detailed measurement results of EPIRB Tron 60GPS S/N 00101 ambient temperature

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	Limits		Measured		
	min	max	min	current	max
Frequency, kHz	406036.000	406038.000	0.000	406037.004	0.000
Power, Wt	3.16	7.94	0.00	3.77	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				
15-HEX ID	:1925E847E0FFBFF				

Figure 14.2 - Detailed measurement results of EPIRB Tron 60GPS S/N 00101 maximum temperature

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	Limits		Measured		
	min	max	min	current	max
Frequency, kHz	406036.000	406038.000	0.000	406037.017	0.000
Power, Wt	3.16	7.94	0.00	3.78	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				
15-HEX ID	:1925E847E0FFBFF				

Figure 14.3 - Detailed measurement results of EPIRB Tron 60GPS S/N 00101 minimum temperature

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	Limits		Measured		
	min	max	min	current	max
Frequency, kHz	406036.000	406038.000	0.000	406037.006	0.000
Power, Wt	3.16	7.94	0.00	4.11	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				
15-HEX ID	:1925E847E0FFBFF				

Figure 14.4 - Detailed measurement results of EPIRB Tron 60GPS S/N 00104 ambient temperature

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	Limits		Measured		
	min	max	min	current	max
Frequency, kHz	406036.000	406038.000	0.000	406037.010	0.000
Power, Wt	3.16	7.94	0.00	3.84	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				
15-HEX ID	:1925E847E0FFBFF				

Figure 14.5 - Detailed measurement results of EPIRB Tron 60GPS S/N 00104 maximum temperature

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	Limits		Measured		
	min	max	min	current	max
Frequency, kHz	406036.000	406038.000	0.000	406037.015	0.000
Power, Wt	3.16	7.94	0.00	3.92	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				
15-HEX ID	:1925E847E0FFBFF				

Figure 14.6 - Detailed measurement results of EPIRB Tron 60GPS № S/N 00104 minimum temperature

RESULTS OF SELF TEST (A13.3 RTCM 11000.2 Version 2.1)

The measurement at the ambient temperature, EPIRB Tron 60GPS S/N 00101

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Initial Aliveness Test				
Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
Power Output	35-39	dBm	36.07	PASS
Digital message	Correct	√	√	PASS
Self Test				
RF Pulse Duration	≤0.444 ≤0.525	sec	0.5200	PASS
Frame Syncronization Pattern	0 1101 0000	-	011010000	PASS
Number of RF bursts	1	burst	1	PASS

The measurement at the maximum temperature, EPIRB Tron 60GPS S/N 00101

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Initial Aliveness Test				
Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
Power Output	35-39	dBm	35.76	PASS
Digital message	Correct	√	√	PASS
Self Test				
RF Pulse Duration	≤0.444 ≤0.525	sec	0.5200	PASS
Frame Syncronization Pattern	0 1101 0000	-	011010000	PASS
Number of RF bursts	1	burst	1	PASS

The measurement at the minimum temperature, EPIRB Tron 60GPS S/N 00101

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Initial Aliveness Test				
Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
Power Output	35-39	dBm	35.77	PASS
Digital message	Correct	√	√	PASS
Self Test				
RF Pulse Duration	≤0.444 ≤0.525	sec	0.5199	PASS
Frame Syncronization Pattern	0 1101 0000	-	011010000	PASS
Number of RF bursts	1	burst	1	PASS

The measurement at the ambient temperature, EPIRB Tron 60GPS S/N 00104

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Initial Aliveness Test				
Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
Power Output	35-39	dBm	36.14	PASS
Digital message	Correct	√	√	PASS
Self Test				
RF Pulse Duration	≤0.444 ≤0.525	sec	0.5200	PASS
Frame Syncronization Pattern	0 1101 0000	-	011010000	PASS
Number of RF bursts	1	burst	1	PASS

The measurement at the maximum temperature, EPIRB Tron 60GPS S/N 00104

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Initial Aliveness Test				
Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
Power Output	35-39	dBm	35.84	PASS
Digital message	Correct	√	√	PASS
Self Test				
RF Pulse Duration	≤0.444 ≤0.525	sec	0.5200	PASS
Frame Syncronization Pattern	0 1101 0000	-	011010000	PASS
Number of RF bursts	1	burst	1	PASS

The measurement at the minimum temperature, EPIRB Tron 60GPS S/N 00104

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAIL)
Initial Aliveness Test				
Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
Power Output	35-39	dBm	35.93	PASS
Digital message	Correct	√	√	PASS
Self Test				
RF Pulse Duration	≤0.444 ≤0.525	sec	0.5200	PASS
Frame Syncronization Pattern	0 1101 0000	-	011010000	PASS
Number of RF bursts	1	burst	1	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2011
2	Spectrum analyzer	HP8593E	3831U02306	07.2011
3	Temperature meter	Center-309	50310908	05.2012
4	Biconical Antenna	BBUK 9139	9114-214	09.2011
5	Semi-anechoic chamber	«Don»	1	11.2011
6	High-frequency generator	Г4-176	5290	03.2011
7	Power Amplifier	Empower 2021	1023d\c0503	08.2011
8	Climatic chamber	NZ-350	24625a	08.2012
9	Climatic chamber	КТК-400	280707	02.2012

ANNEX 15.
AUTOMATIC RELEASE MECHANISM TEST AND AUTOMATIC ACTIVATION TESTS

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.04
Sample No. 00104
Test Date: 19.10.2011
Test Conditions:
– Relative air humidity: 47%.
– Atmospheric pressure: 753 mm/Hg.
– EUT is OFF before test.
– Ambient temperature: +26 °C
– Low storage temperature: -30 °C
– High temperature: +70 °C
– Retention interval of EPIRB at chamber before immersion into water: 2 hours
– At ambient temperature Test was conducted with the EUT in 6 position, as described in the standard section A14.0 item 1 c) and 2, 3, 4, 5, 6.
– At minimum and maximum temperature test was conducted with the EUT in 1 performance position, as described in the manufacturer's instruction.

FINAL RESULTS OF COMPLIANCE AUTOMATIC RELEASE MECHANISM TEST AND AUTOMATIC ACTIVATION TESTS (A14.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS
EPIRB Tron 60GPS at ambient temperature +26 °C			PASSED	
Normal mounted orientation	Release and float free before 4 meters	m	2.45	Pressure 0.235 bar
	Automatic activation	√	√	
Rolling 90° starboard	Release and float free before 4 meters	m	2.30	
	Automatic activation	√	√	
Rolling 90° port	Release and float free before 4 meters	m	2.55	
	Automatic activation	√	√	
Rolling 90° bow down	Release and float free before 4 meters	m	2.65	
	Automatic activation	√	√	
Rolling 90° stern down	Release and float free before 4 meters	m	2.25	
	Automatic activation	√	√	
Upside down	Release and float free before 4 meters	m	2.30	
	Automatic activation	√	√	
EPIRB Tron 60GPS at low temperature -30 °C			PASSED	
Normal mounted orientation	Release and float free before 4 meters	m	2.85	Pressure 2,85 bar
	Automatic activation	√	√	
EPIRB Tron 60GPS at high temperature +70 °C			PASSED	
Normal mounted orientation	Release and float free before 4 meters	m	1.55	Pressure 1,55 bar
	Automatic activation	√	√	

Test is considered PASSED with criteria (according to A14.0 RTCM 11000.2 Version 2.1):

The EUT has been floated free before reaching a depth of 4 meters and automatically activated. Activation was verified by observing operation of the strobe light.

Figure 15.1 - Total view of hydrostatic tank

Figure 15.2 - View of EUT before activation test

a) normal mounting position (at temperature +26 °C)

Figure 15.3 – Immersion in normal position

Figure 15.4 – Emersion after released in normalposition

Figure 15.5 – View of automatic release mechanism in normal position at the moment of activation

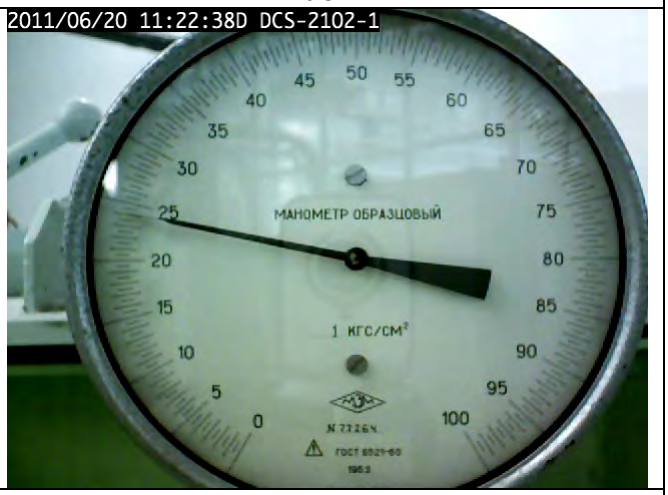

Figure 15.6 – Pressure meter at the moment of activation

b) rolling 90° to starboard (at temperature +26 °C)

Figure 15.7 – Immersion in rolling 90° starboard position

Figure 15.8 – Emersion after released in rolling 90° starboard position

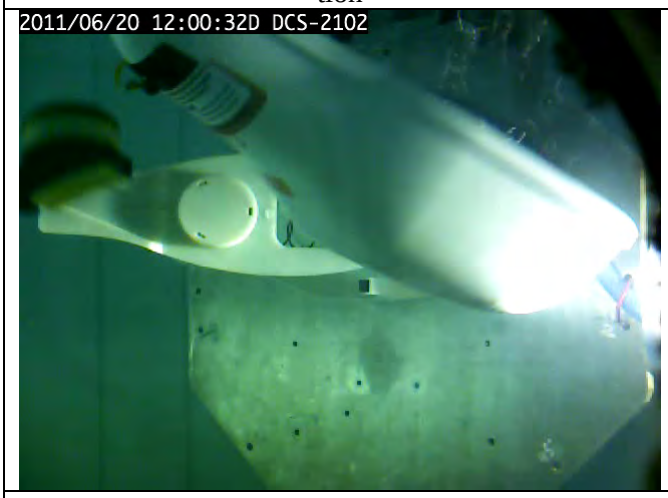

Figure 15.9 – View of automatic release mechanism in rolling 90° starboard position at the moment of activation

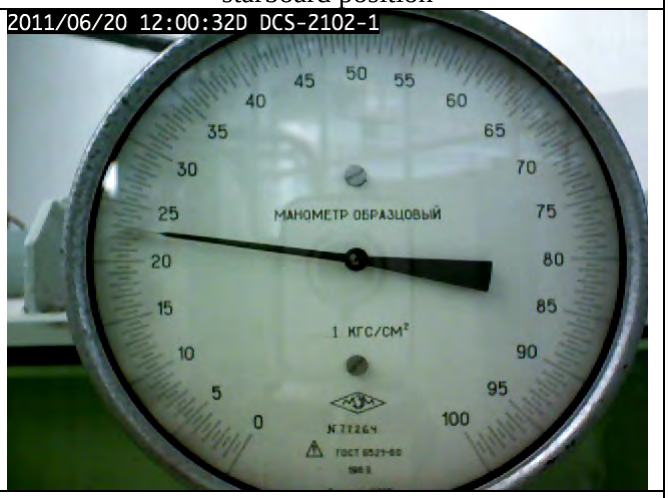

Figure 15.10 – Pressure meter at the moment of activation

c) rolling 90° to port (at temperature +26 °C)

Figure 15.11 – Immersion in rolling 90° port position

Figure 15.12 –Emersion after released in rolling 90° port position

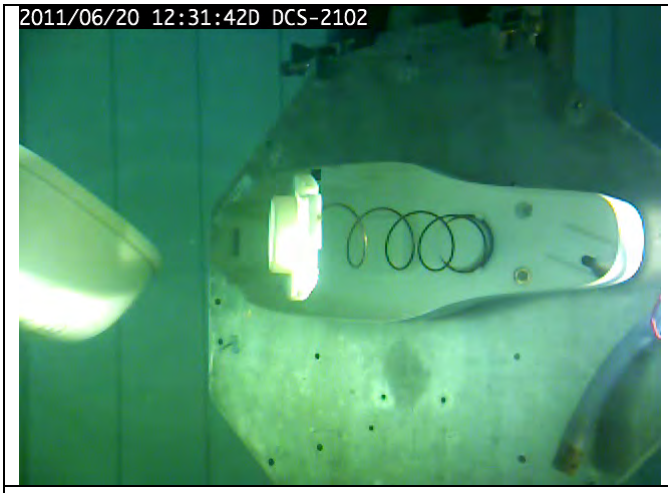

Figure 15.13 – View of automatic release mechanism in rolling 90° port position at the moment of activation

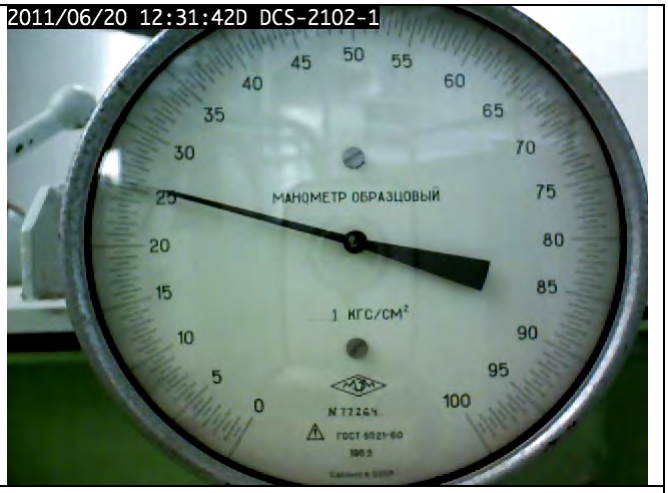

Figure 15.14 – Pressure meter at the moment of activation

d) rolling 90° bow down (at temperature +26 °C)

Figure 15.15 – Immersion in rolling 90° bow down position before activation test

Figure 15.16 – Emersion after released in rolling 90° bow down position

Figure 15.17 – View of automatic release mechanism in rolling 90° bow down position at the moment of activation

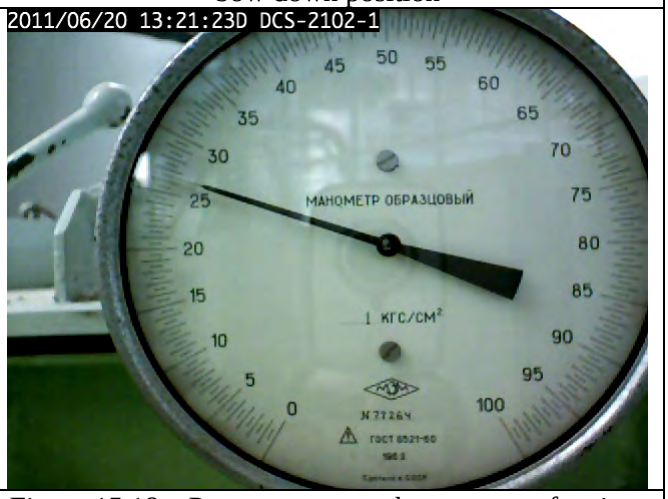

Figure 15.18 – Presure meter at the moment of activation

e) rolling 90° stern down (at temperature +26 °C)

Figure 15.19 – Immersion in rolling 90° stern down position

Figure 15.20 – Emersion after released in rolling 90° stern down position

Figure 15.21 – View of automatic release mechanism in rolling 90° stern down position at the moment of activation

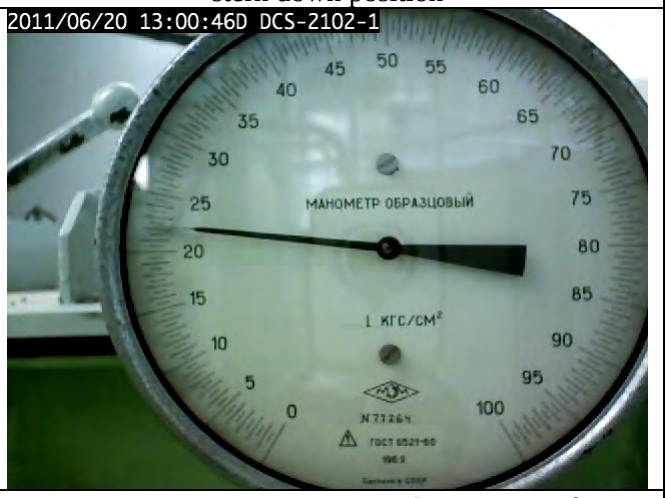

Figure 15.22 – Pressure meter at the moment of activation

f) upside down (at temperature +26 °C)

Figure 15.23 – Immersion in upside down position

Figure 15.24 – Emersion after released in upside down position

Figure 15.25 – View of automatic release mechanism in performance upside down position at the moment of activation

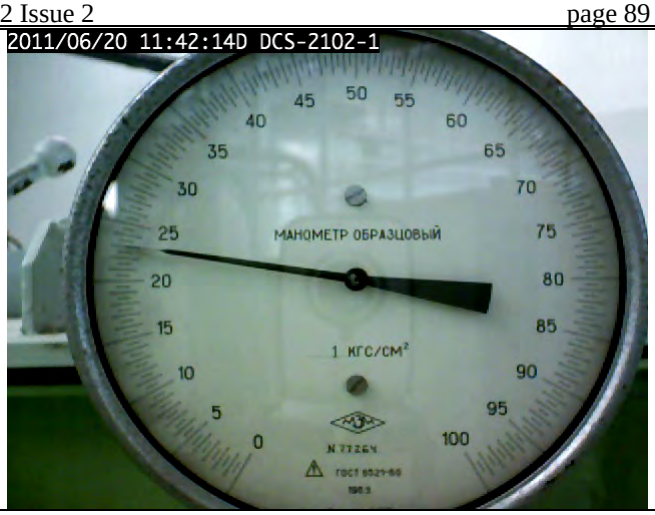

Figure 15.26 – Pressure meter at the moment of activation

EPIRB Tron 60GPS with release mechanism FB-60 after minimum stowage temperature minus 30 ºC

Figure 15.29 – Immersion in normal position

Figure 15.30 – Emersion after released in normal position

Figure 15.31 – View of automatic release mechanism in performance position at the moment of activation

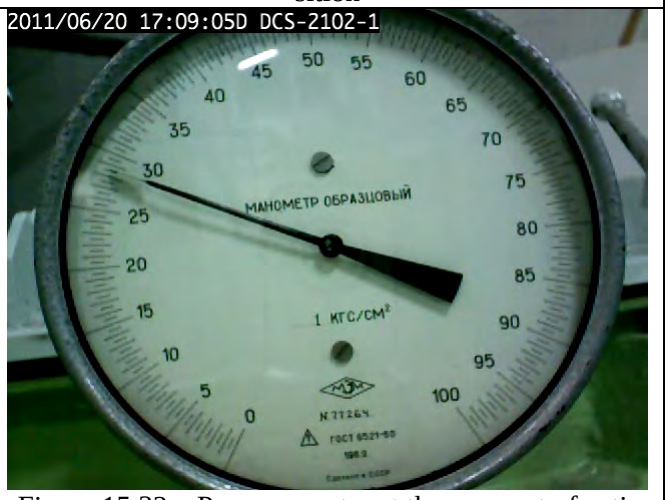

Figure 15.32 – Pressure meter at the moment of activation

EPIRB Tron 60GPS with release mechanism FB-60 after high stowage temperature 70 ºC

Figure 15.33 – View of the EPIRB Tron 60GPS in climatic chamber before before automatic release mechanism and automatic activation test

Figure 15.34 – Detailed measurement of temperature in climatic chamber before automatic release mechanism and automatic activation test

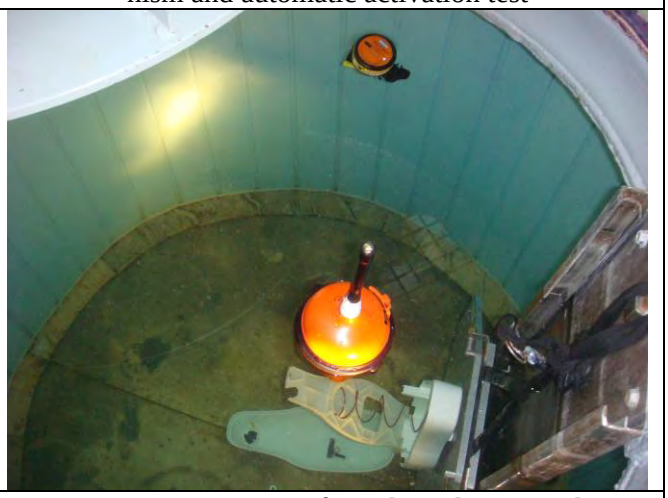

Figure 15.35 – Immersion in normal position

Figure 15.36 – Emersion after released in normal position

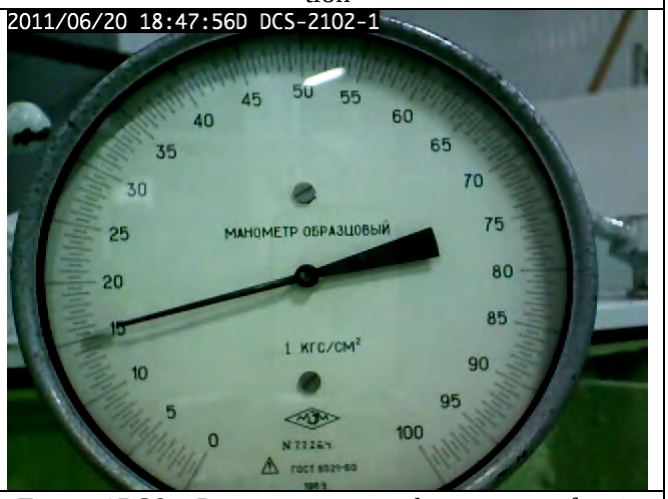

Figure 15.37 – View of automatic release mechanism in normal position at the moment of activation

Figure 15.38 – Pressure meter at the moment of activation

Test result for activation arrangements

Control position		EPIRB condition		EPIRB-mount or release mechanism status		Transmitter status	
ON	READY	WET*	DRY	OUT	IN	ON	OFF
X		X		X		Activated	
X		X			X		
X			X	X		Activated	
X			X		X		
	X	X		X		Activated	
	X	X			X		Activated
	X		X	X			Activated
	X		X		X		Activated
* Floating or immersed in water							

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Hydrostatic Tank	EDVI GA	101456	10.2012
2	Manometer	MO	77264	10.2011
3	Beacon tester	BT-611M	1005	06.2012

ANNEX 16.
STABILITY AND BUOYANCY TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.03
Sample No. 00104
Test Date: 21.06.2011
Test Conditions:
– Atmospheric pressure: 755 mm/Hg.
– Relative air humidity: 47 %.
– EUT were included
the satellite EPIRB with its release mechanism (Category 1): NO
the satellite EPIRB with its stowage bracket (Category 2): NO
– EPIRB is OFF during the test.
– EUT set up in operational position.
– Test equipment:
- The unit for buoyancy measurement No 101173;
- Installation for test automatic release mechanism and stability of EPIRB No 101173

With the antenna deployed in it's normal operating position, the EUT (EPIRB) was rotated to a horizontal position about its axis, submerged just below the surface, and released to pass through an upright position.
The satellite EPIRB was floated upright in calm fresh water with the base of the antenna a minimum of 40 mm above the waterline.
The reserve buoyancy of the satellite EUT (EPIRB) was determined by the following procedure:
EUT (EPIRB) was submerged and measured the buoyant force with dynamometer. The measured buoyant force was divided by the weight of the unit.
Buoyancy force: 2.75 N (i.e. 0.28 kg)
EUT weight: 0.69 kg

Thus, reverse buoyancy is:

0.28 / 0.69 = 0.41

– Test duration: 20 minutes.
– Measurement duration: 15 minutes.
– Step No. 1 Submerge EUT (EPIRB) just below the surface.
No. 2 Rotate EUT (EPIRB) to a horizontal position about any axis.
No. 3 Release EUT (EPIRB) to pass through an upright position.
No. 4 Submerge the complete unit (EPIRB).
No. 5 Measure the buoyant force with a scale.
No. 6 Divide the measured buoyant force by the weight of the unit.

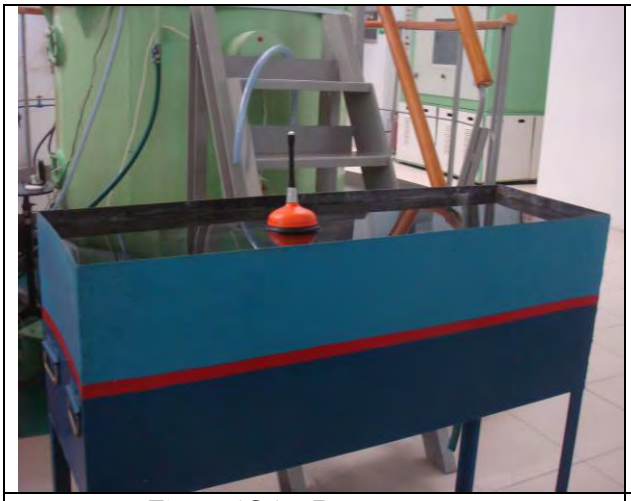

Figure 16.1 – Buoyancy test

Figure 16.2 – Measuring of distance from water level to the base of antenna while EUT floating in calm fresh water.

FINAL RESULTS OF STABILITY AND BUOYANCY TEST (A15.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Stability	≤ 2	s	1.3	PASS
• Buoyancy	> 5	%	41	PASS
• Float upright; Antenna base	> 4	cm	6.5	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Set of buoyancy	-	101173	10.2011
2	Set of stability	-	101175	05.2013
3	Scale	CAS AD-10H	60400410	10.2011
4	Dynamometer	G-3	60	10.2011

ANNEX 17.
INADVERTENT ACTIVATION TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS with release mechanism
Software release: 1.04
Sample No. 00104
Test Date: 27.10.2011
Test Conditions:
– Ambient temperature at open area test site: +7 °C .
– Relative air humidity: 59 %.
– Atmospheric pressure: 765 mm/Hg.
– EUT is OFF before test.
– Test duration is 5 minutes.
– Test is conducted with the EUT in normal position, as described in the manufacturer's instruction.

EUT was mounted on the rotatable support and fixed as it is described in the user's manual. A stream from a hose was directed at the EUT for a period of 5 min. The nozzle of the hose has a nominal diameter of 63.5 mm and a water-delivery rate of 2300 l of water per minute. The end of the nozzle was 3.50 m away from the EUT and 1,50 m above the base of the antenna. EUT was rotated during the test, so that water strikes the EUT in an arc of 180° perpendicular to the normal mounting position of the EUT.

Figure 13.1 – EUT (EPIRB and release mechanism) mounted on the rotatable support before test.

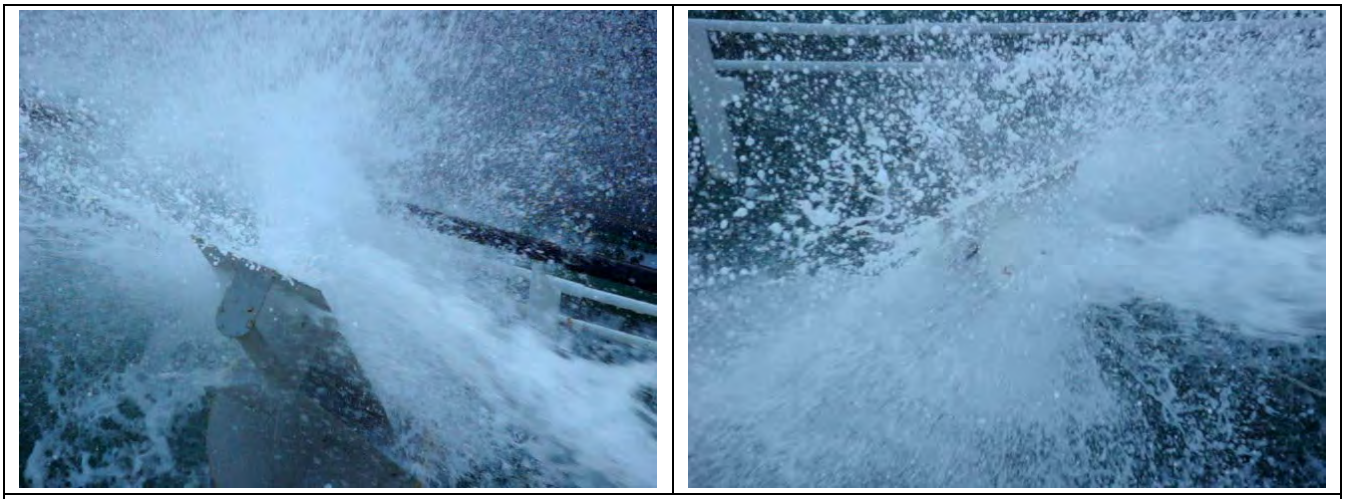

Figure 13.2 - The water strikes EUT in an arc of 180º.

Figure 13.3 - View of EUT upon completion of inadvertent activation test

FINAL RESULTS OF INADVERTENT ACTIVATION TEST (A16.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RE-SULTS	COMMENTS (PASS/FAULT)
• Release	EUT should not be re-leased from bracket	√	√	PASS
• Activation	EUT should not be automatically activated	√	√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2012
2	Set of water washes	-	101174	08.2012
3	Stopwatch	SOSpr-2b-2	2388	10.2012

ANNEX 18.
AUXILIARY RADIO-LOCATING DEVICE TRANSMITTER TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.03
Sample No. 00101
Test Date: 20.06-21.06.2011
Test Conditions:
– Atmospheric pressure: 751..756 mm/Hg
– Relative air humidity: 45.7..49.2 %
– Temperature Minimum: – 20 °C
Maximum: +55 °C
Ambient: +20 °C
Frequencies used 121.5 MHz
Description of Tests:
1. Carrier Frequency Test
The carrier frequency test was performed with a spectrum analyzer. The carrier frequency measured at the minimum and maximum operating temperatures.
2. Modulation Characteristics
The transmitter duty cycle, modulation frequency, modulation duty cycle, modulation factor and sweep repetition rate were determined by observing the detected RF signal with a storage oscilloscope. The frequency coherence test was performed with a spectrum analyzer.
All measurements were made at the minimum and maximum operating temperatures.
3. Peak Effective Radiated Power
The elevation angle between 5° and 20° which produces a maximum gain was determined with the EUT at an arbitrary azimuth. The peak envelope power was measured and the elevation angle should was noted and should remain fixed for the remainder of the test. The remaining 11 measurements of the peak effective radiated power were obtained by rotating the EUT in increments of 30° ± 3°. For each measurement the EUT peak effective radiated power (PERP) was computed using the following equation:

$$PERP = LOG^{-1}\frac{P_{REC} - G_{REC} + L_C + L_P}{10},$$

Where:
P_{REC} – Measured Power level from spectrum analyzer (dBm);
G_{REC} – Antenna gain of search antenna (dB);
L_C – Receive system attenuator and cable loss (dB);
L_P – Free space propagation loss (dB).
– Step No. 1 Self Test of the EUT (EPIRB) was made (before of Auxiliary Radio-Locating Device Transmitter Test)
No. 2 Carrier Frequency Test (A17.1)
Condition: The carrier frequency was measured at the minimum and maximum operating temperatures.
No. 3 Modulation Characteristics (A17.2)
Condition for Transmitter Duty Cycle Measurement: During the observation of the transmitted signal the carrier was not interrupted (except for up to two seconds during transmission of the 406 MHz pulse).
No. 4 Modulation Characteristics (A17.2)
Condition for Modulation Frequency and Sweep Repetition Rate Measurement: During the observation of the modulation envelope the upper and lower audio-frequency sweep limits and sweep repetition rate were measured.
No. 5 Modulation Characteristics (A17.2)
Condition for Modulation Duty Cycle Measurement: The modulation duty cycle was measured near the start, midpoint, and end of the modulation sweep period. Modulation duty cycle was calculated using the following formula

$$Duty\ Circle = \frac{A}{B} \times 100\%$$

No. 6 Modulation Characteristics (A17.2)

Condition for Modulation Factor Measurement: The modulation factor was defined with respect to the maximum and minimum amplitudes of the modulation envelope, by the following formula:

$$Modulation\ \ Factor = \frac{A - B}{A + B}$$

No. 7 Modulation Characteristics (A17.2)

Condition for Frequency Coherence Measurement:

The measurement was made for the total power emitted during any transmission cycle with or without modulation.

The measurement was made to define the carrier frequency shift after interruption by the transmission of the 406 MHz burst.

No. 8 Peak Effective Radiated Power (A17.3)

Condition for Peak Effective Radiated Power Measurement: This test was performed at ambient temperature for the EUT whose battery had been ON for a minimum of 44 hours.

The test site was positioned on the ground with uniform electrical characteristics. The site was clear of metal objects, overhead wires, etc., and was as free as possible from undesired signals such as ignition noise or other RF carriers. The distance from the EUT, or the search antenna to reflecting objects was more than 30 m. The EUT was placed in the center of a ground plane with a radius of no less than 75 cm ± 5 cm. The EUT was positioned vertically such that the ground plane was at the nominal waterline. The ground plane was resting on the ground and extended so that it completely enclosed and presented a snug fit to the below waterline portion of the EUT.

Measurement of the radiated signals was made at a point 10 m from the EUT. At this point, a wooden pole or insulated tripod with a movable horizontal boom was arranged. The search antenna was raised and lowered through an elevation angle of 5° to 20°. It was mounted on the end of the boom with its cable lying horizontally on the boom and run back to the supporting mast. The other end of the search antenna cable was connected to a spectrum analyzer located at the foot of the mast.

No. 9 Self Test of the EUT (EPIRB) was made (upon completion of Auxiliary Radio-Locating Device Transmitter test).

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	0.000	406037.001	0.000
Power, Wt	3.16	7.94	0.00	3.82	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499352	**Low Sweep Frequency, Hz**	385
Power, mW	31.4	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

Message	
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C

Figure 18.1 – Results of EPIRB Tron 60GPS Self Test
(before the auxiliary radio-locating device transmitter test)

MINIMUM OPERATING TEMPERATURE

Figure 18.2 – Site for Carrier Frequency Test and Modulation Characteristic Measurement at the minimum, ambient and maximum operating temperatures

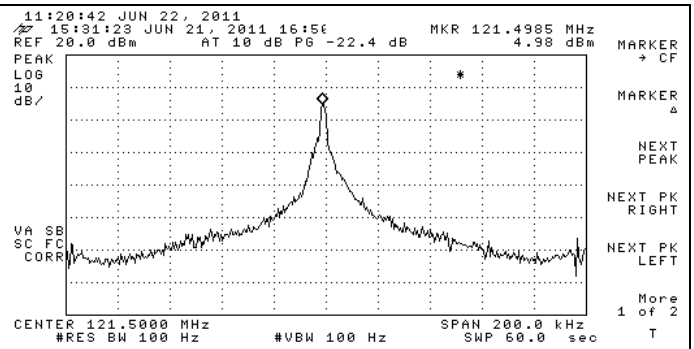

Figure 18.3 – Screenshot of Carrier Frequency Test Result at the minimum operating temperature

Frequency Coherence Measurement Test Result:

(i) Set the spectrum analyzer controls as follows:

- I.F. bandwidth: 10 kHz
- Video filter: OFF or as wide as possible
- Scan time: 100 ms./div.
- Amplitude scale: 5 dB/div.
- Scan width: 10 kHz/div.
- Center frequency: 121.5 MHz

(ii) Record the amplitude in dBm. (Figure 18.4)

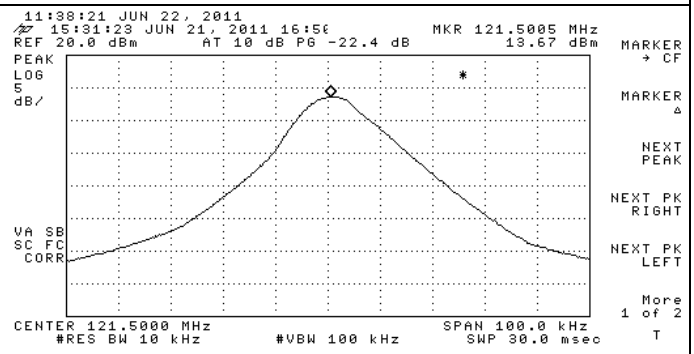

Figure 18.4 – Screenshot of Frequency Coherence Measurement Test Result (transmitted power at wide band) at the minimum operating temperature

(iii) Calculate the mean output power by adding 10 log(D), where D is the modulation duty cycle determined below, to the recorded signal level.

(iv) Set the spectrum analyzer controls as follows:

- I.F. bandwidth: 60 Hz or less
- Video filter: OFF or as wide as possible
- Scan time: 10 sec/div
- Amplitude scale: 0.5 dB/div
- Scan width: 20 Hz/div
- Center frequency: 121.5 MHz

(v) Measure and record the carrier power dBm as displayed on the spectrum analyzer (Figure 18.5).

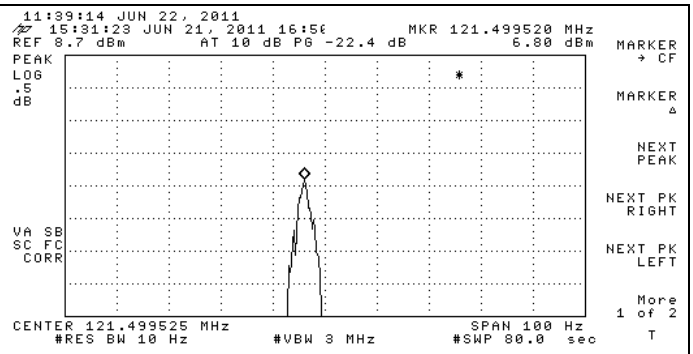

Figure 18.5 – Screenshot of Frequency Coherence Measurement Test Result (transmitted power at narrow band) at the minimum operating temperature

(vi) Calculate the ratio of carrier power to mean power from steps (iii) and (v) using the following formula:

$$\frac{Carrier\_power}{Mean\_power} = 10^{\frac{\text{dBc-dBmean}}{10}}$$

dB_C = carrier power in step (v)
dB_{mean} = mean power in step (iii)

TEST RESULTS

Output power measurement at the antenna connector as per steps (i) and (ii) is 13.67 dBm.

Mean power calculated as per step (iii) is 13.67 + 10 log(D), where D is the modulation duty cycle. In the worst case D is 37.33%, therefore mean power is 13.67 + 10 log(0.3733) = 9.39 dBm
Carrier power that measured with 10 Hz I.F. bandwidth is 6.8 dBm.
Ratio of carrier power to mean power is 55%.

$$\frac{Carrier\_power}{Mean\_power} = 10^{\frac{\text{dBc-dBmean}}{10}} = 10^{\frac{6.8-9.39}{10}} = 0.55$$

Carrier power is below of the mean power by 2.59 dB.

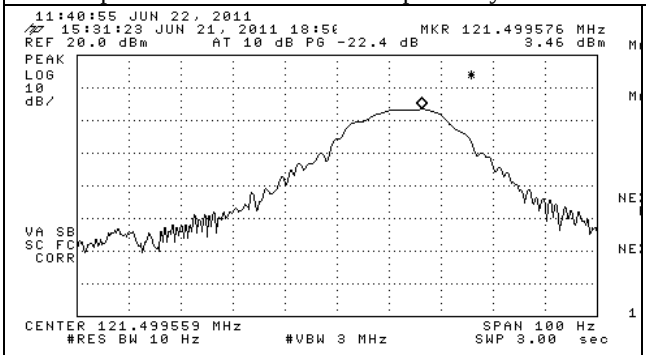

Figure 18.6 – Screenshot of Frequency Coherence Measurement Test Result (Frequency Shift) at the minimum operating temperature. Transmitted RF (121.5 MHz) before the interruption for the 406 MHz RF burst

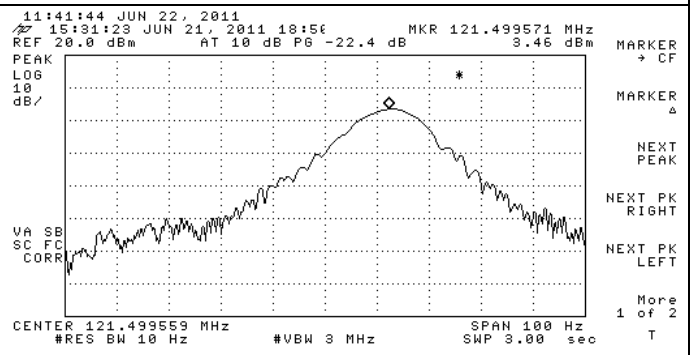

Figure 18.7 – Screenshot of Frequency Coherence Measurement Test Result (Frequency Shift) at the minimum operating temperature. Transmitted RF (121.5 MHz) after the interruption for the 406 MHz RF burst

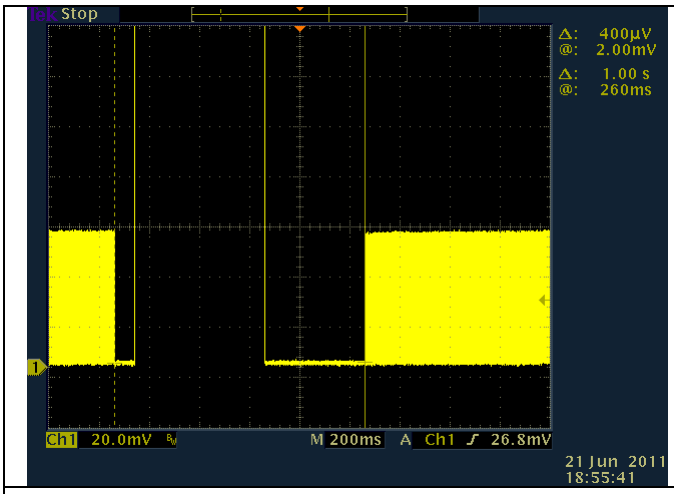

Figure 18.8 – Screenshot of Transmitter Duty Cycle Test Result at the minimum operating temperature

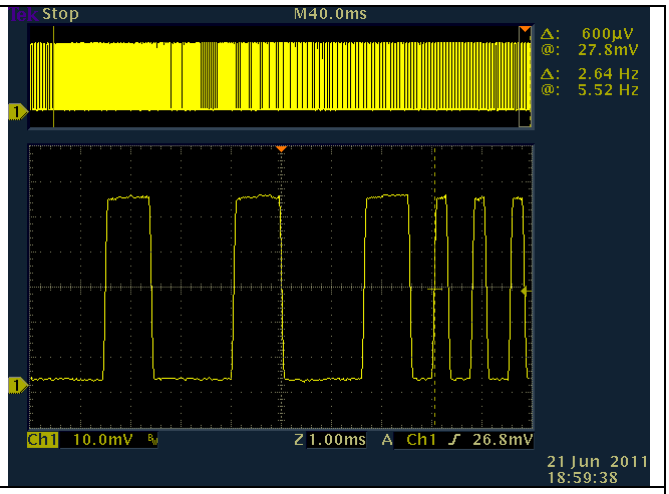

Figure 18.9 – Screenshot of Sweep repetition rate Test Result at the minimum operating temperature

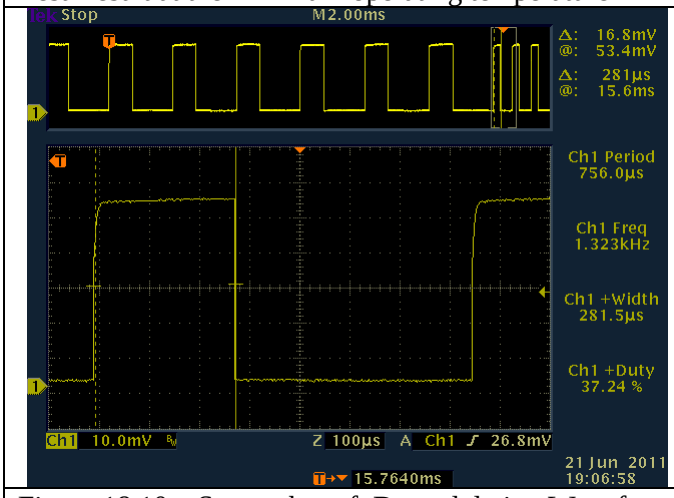

Figure 18.10 – Screenshot of Demodulation Waveform (A) measured near start of the modulation sweep period at the minimum operating temperature

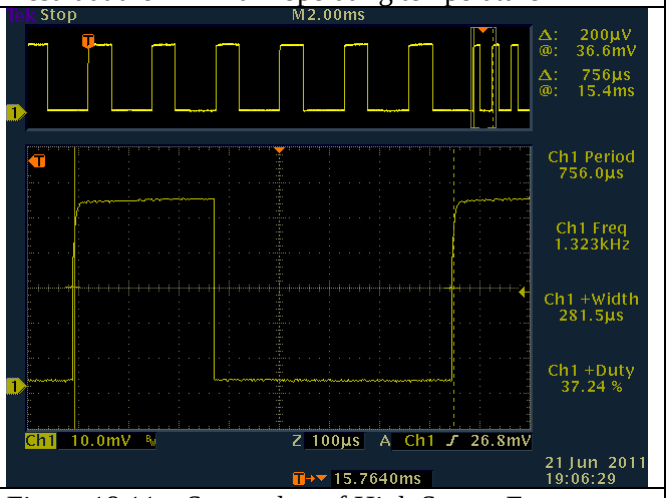

Figure 18.11 – Screenshot of High Sweep Frequency (B) Test Result measured start of the modulation sweep period at the minimum operating temperature

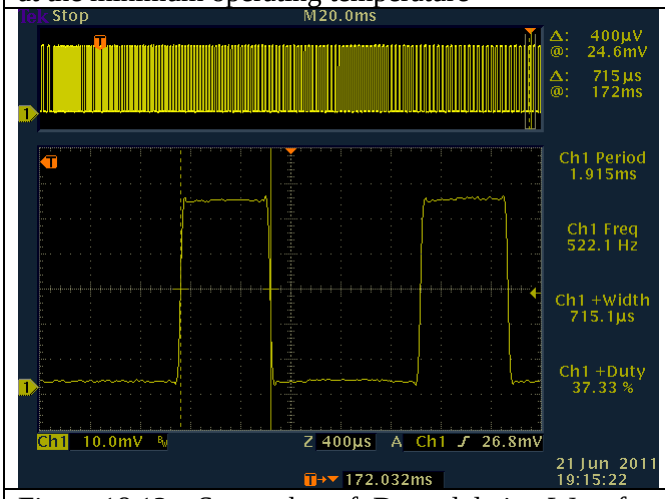

Figure 18.12 – Screenshot of Demodulation Waveform (A) measured near midpoint of the modulation sweep period at the minimum operating temperature

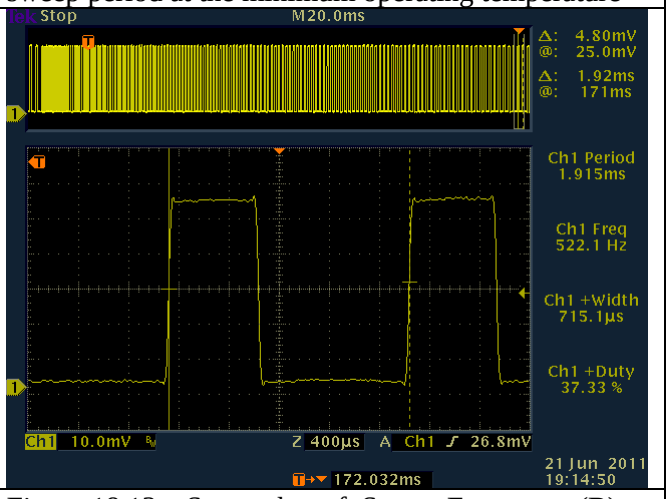

Figure 18.13 – Screenshot of Sweep Frequency (B) Test Result measured near midpoint of the modulation sweep period at the minimum operating temperature

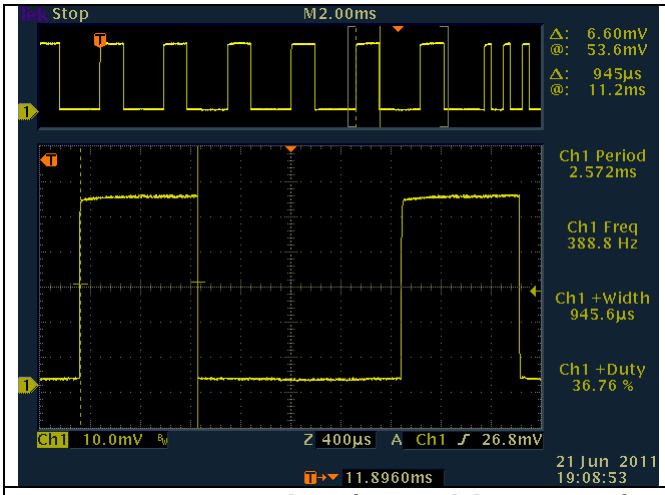

Figure 18.14 – Screenshot of Demodulation Waveform (A) measured near end of the modulation sweep period at the minimum operating temperature

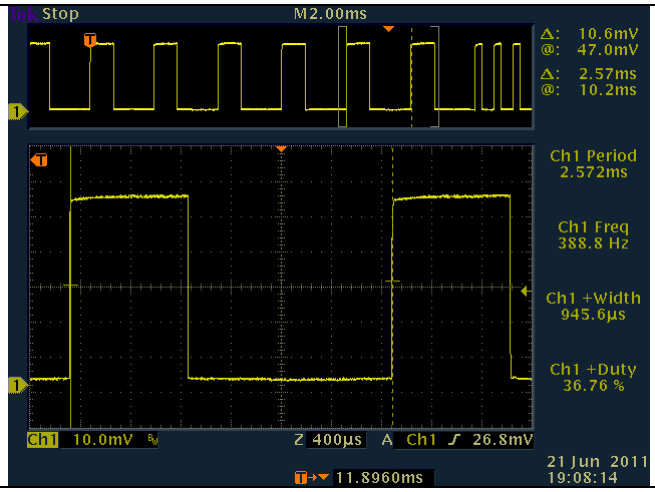

Figure 18.15 – Screenshot of Low Sweep Frequency (B) Test Result measured near end of the modulation sweep period at the minimum operating temperature

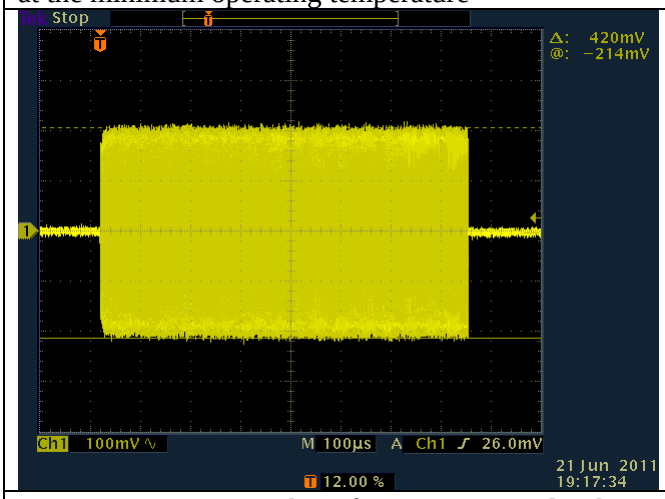

Figure 18.16 – Screenshot of maximum amplitude signal for determination of the Modulation Factor at the minimum operating temperature

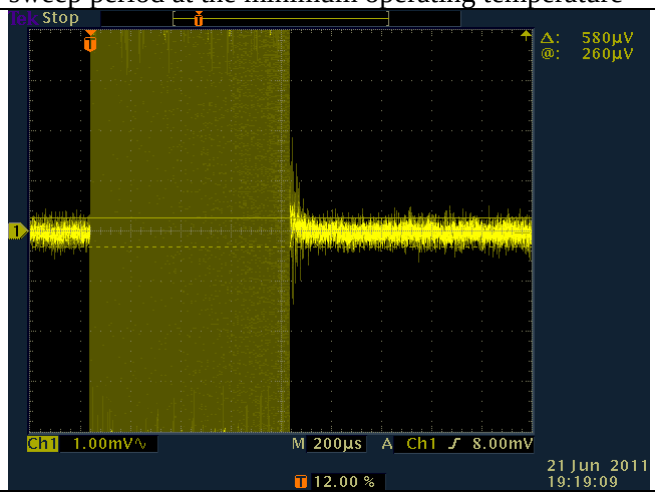

Figure 18.17 – Screenshot of minimum amplitude signal for determination the Modulation Factor at the minimum operating temperature

AMBIENT TEMPERATURE

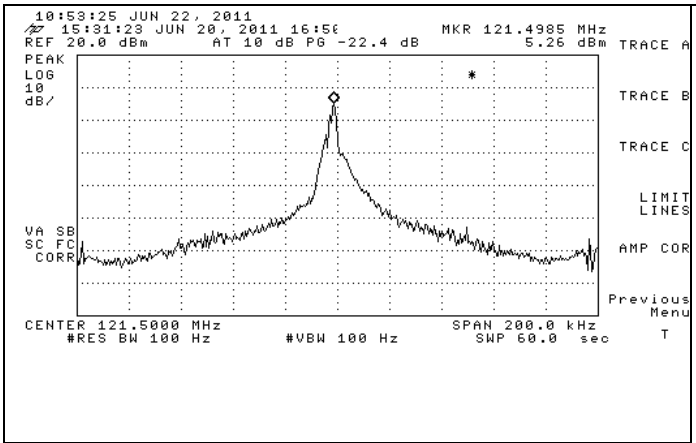

Figure 18.18 – Screenshot of Carrier Frequency Test Result at the ambient temperature

Frequency Coherence Measurement Test Result:

(i) Set the spectrum analyzer controls as follows:

- I.F. bandwidth: 10 kHz
- Video filter: OFF or as wide as possible
- Scan time: 100 ms./div.
- Amplitude scale: 5 dB/div.
- Scan width: 10 kHz/div.
- Center frequency: 121.5 MHz

(ii) Record the amplitude in dBm. (Figure 18.19)

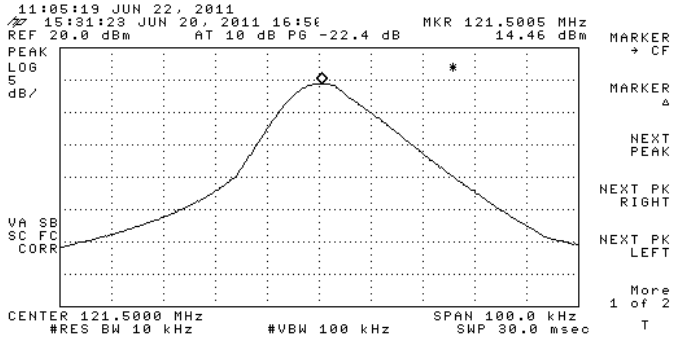

Figure 18.19 – Screenshot of Frequency Coherence Measurement Test Result (transmitted power at wide band) at the ambient temperature

(iii) Calculate the mean output power by adding 10 log(D), where D is the modulation duty cycle determined below, to the recorded signal level.

(iv) Set the spectrum analyzer controls as follows:

- I.F. bandwidth: 60 Hz or less
- Video filter: OFF or as wide as possible
- Scan time: 10 sec/div
- Amplitude scale: 0.5 dB/div
- Scan width: 20 Hz/div
- Center frequency: 121.5 MHz

(v) Measure and record the carrier power dBm as displayed on the spectrum analyzer (Figure 18.20).

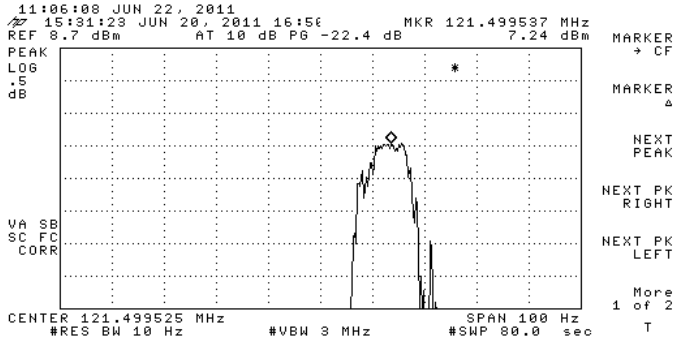

Figure 18.20 – Screenshot of Frequency Coherence Measurement Test Result (transmitted power at narrow band) at the ambient temperature

(vi) Calculate the ratio of carrier power to mean power from steps (iii) and (v) using the following formula:

$$\frac{Carrier\_power}{Mean\_power} = 10^{\frac{dBc-dBmean}{10}}$$

dB_C = carrier power in step (v)
dB_{mean} = mean power in step (iii)

TEST RESULTS

Output power measurement at the antenna connector as per steps (i) and (ii) is 14.46 dBm.

Mean power calculated as per step (iii) is 14.46 + 10 log(D), where D is the modulation duty cycle. In the worst case D is 36.96%, therefore mean power is 14.46 + 10 log(0.3696) = 10.14 dBm

Carrier power that measured with 10 Hz I.F. bandwidth is 7.24 dBm.

Ratio of carrier power to mean power is 51%.

$$\frac{Carrier\_power}{Mean\_power} = 10^{\frac{dBc-dBmean}{10}} = 10^{\frac{7.24-10.14}{10}} = 0.51$$

Carrier power is below of the mean power by 2.9 dB.

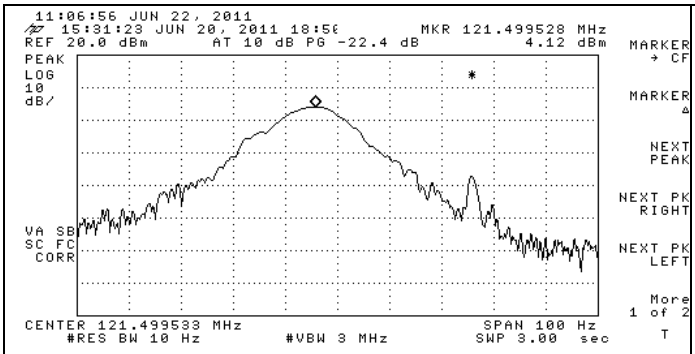

Figure 18.21 – Screenshot of Frequency Coherence Measurement Test Result (Frequency Shift) at the ambient temperature. Transmitted RF (121.5 MHz) before the interruption for the 406 MHz RF burst

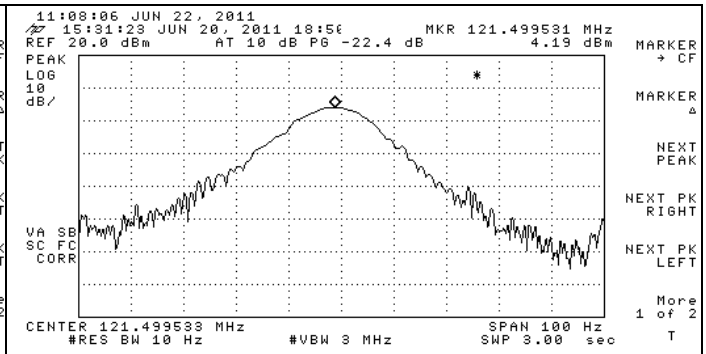

Figure 18.22 – Screenshot of Frequency Coherence Measurement Test Result (Frequency Shift) at the ambient temperature. Transmitted RF (121.5 MHz) after the interruption for the 406 MHz RF burst

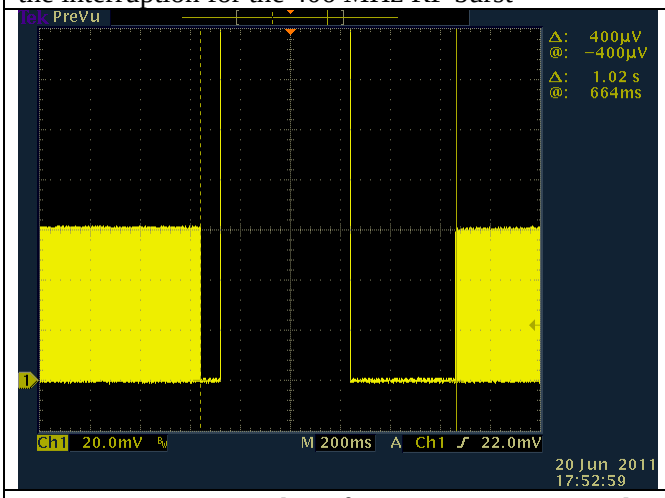

Figure 18.23– Screenshot of Transmitter Duty Cycle Test Result at the ambient temperature

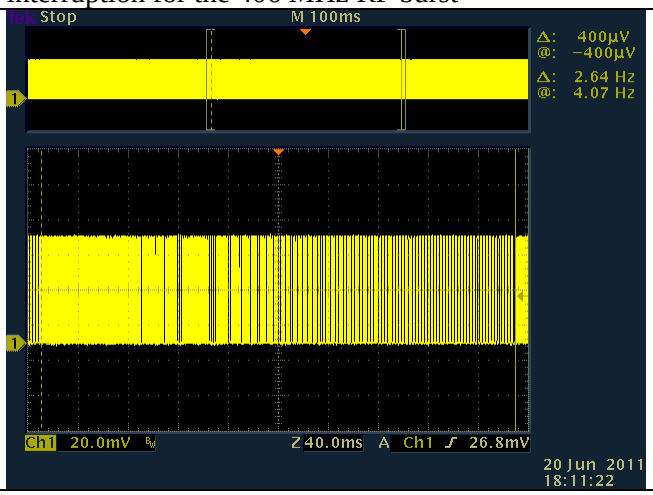

Figure 18.24 – Screenshot of Sweep repetition rate Test Result at the ambient temperature

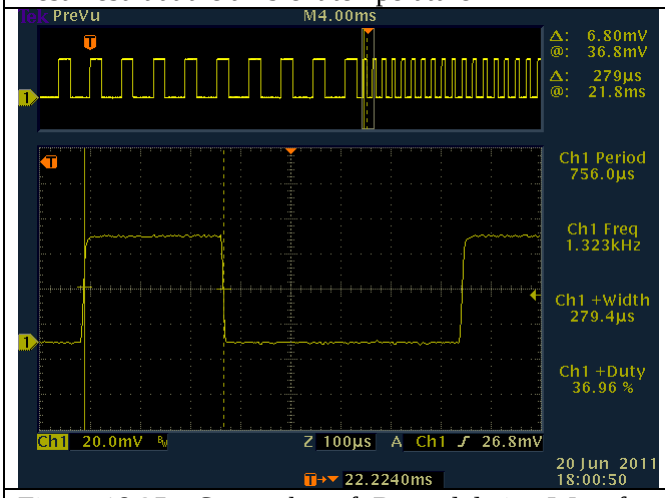

Figure 18.25 – Screenshot of Demodulation Waveform (A) measured near start of the modulation sweep period at the ambient temperature

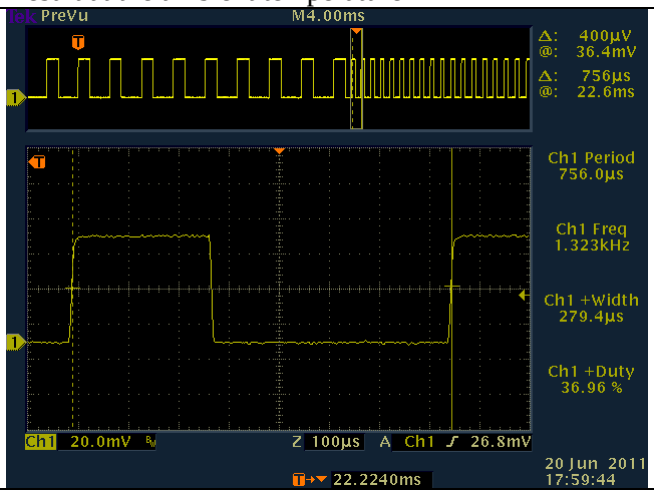

Figure 18.26 – Screenshot of High Sweep Frequency (B) Test Result measured start of the modulation sweep period at the ambient temperature

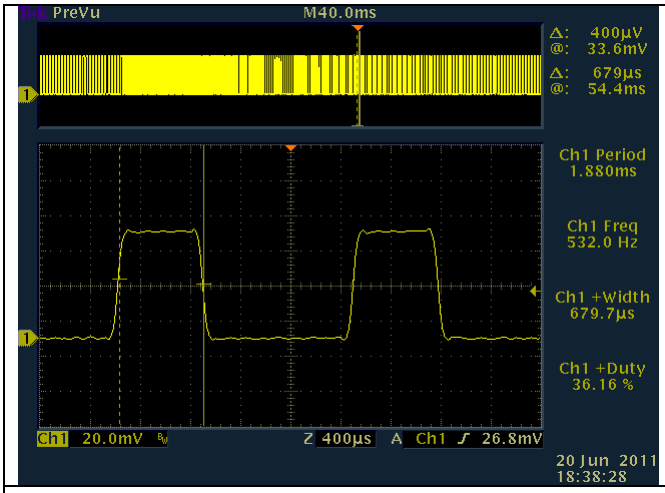

Figure 18.27 – Screenshot of Demodulation Waveform (A) measured near midpoint of the modulation sweep period at the ambient temperature

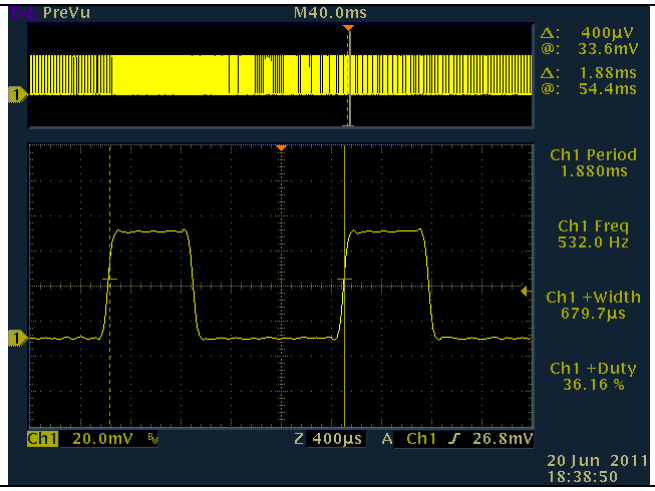

Figure 18.28 – Screenshot of Sweep Frequency (B) Test Result measured near midpoint of the modulation sweep period at the ambient temperature

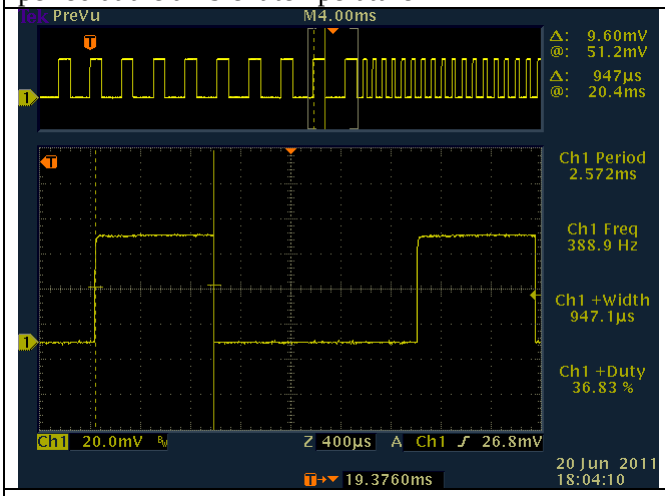

Figure 18.29 – Screenshot of Demodulation Waveform (A) measured near end of the modulation sweep period at the ambient temperature

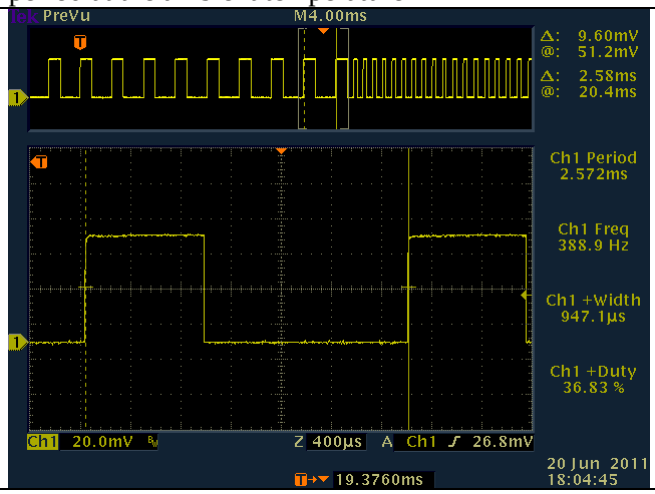

Figure 18.30 – Screenshot of Low Sweep (B) Frequency Test Result measured near end of the modulation sweep period at the ambient temperature

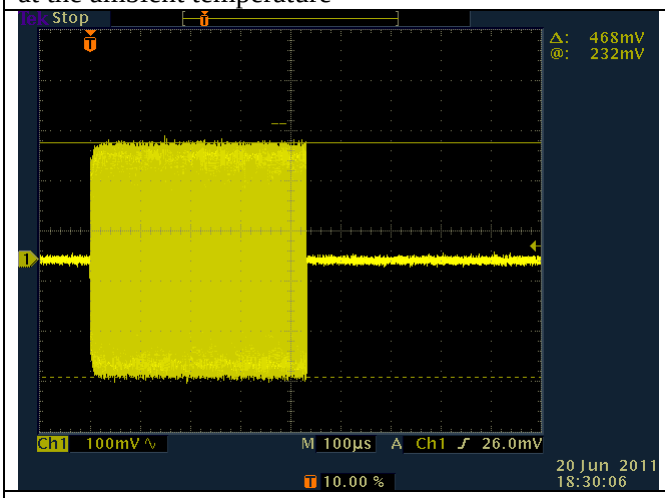

Figure 18.31 – Screenshot of maximum amplitude signal for determination of the Modulation Factor at the ambient temperature

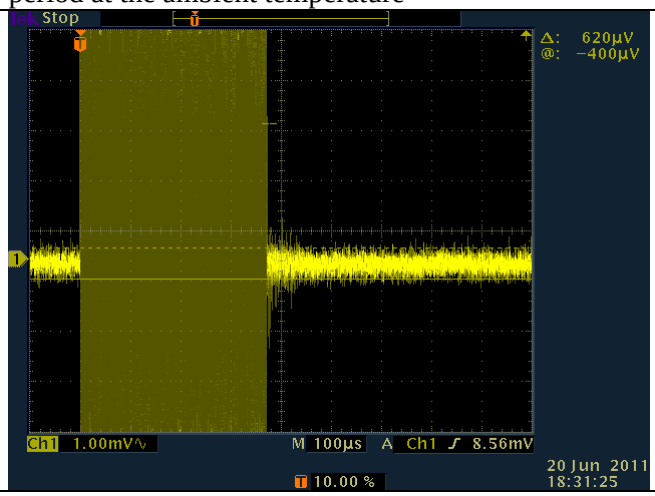

Figure 18.32 – Screenshot of minimum amplitude signal for determination of the Modulation Factor at the ambient temperature

MAXIMUM TEMPERATURE

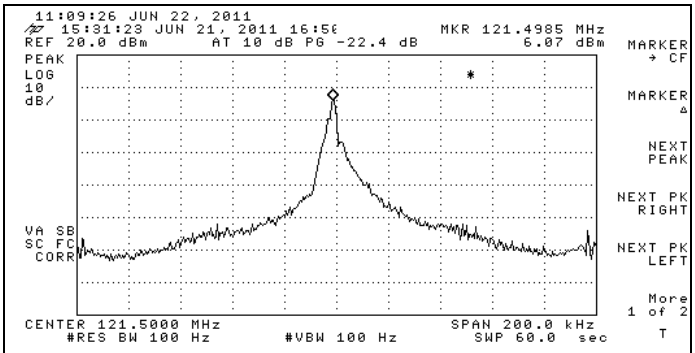

Figure 18.33 – Screenshot of Carrier Frequency Test Result at the maximum operating temperature

Frequency Coherence Measurement Test Result:

(i) Set the spectrum analyzer controls as follows:

- I.F. bandwidth: 10 kHz
- Video filter: OFF or as wide as possible
- Scan time: 100 ms./div.
- Amplitude scale: 5 dB/div.
- Scan width: 10 kHz/div.
- Center frequency: 121.5 MHz

(ii) Record the amplitude in dBm. (Figure 18.34)

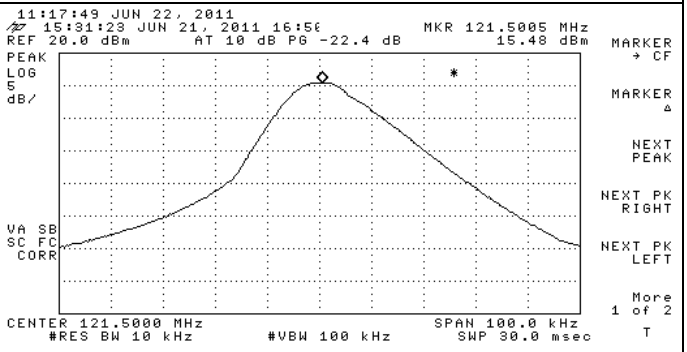

Figure 18.34 – Screenshot of Frequency Coherence Measurement Test Result (transmitted power at wide band) at the maximum operating temperature

(iii) Calculate the mean output power by adding 10 log(D), where D is the modulation duty cycle determined below, to the recorded signal level.

(iv) Set the spectrum analyzer controls as follows:

- I.F. bandwidth: 60 Hz or less
- Video filter: OFF or as wide as possible
- Scan time: 10 sec/div
- Amplitude scale: 0.5 dB/div
- Scan width: 20 Hz/div
- Center frequency: 121.5 MHz

(v) Measure and record the carrier power dBm as displayed on the spectrum analyzer (Figure 18.35).

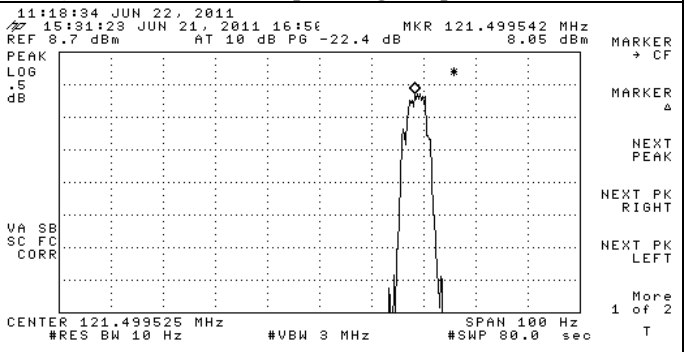

Figure 18.35 – Screenshot of Frequency Coherence Measurement Test Result (transmitted power at narrow band) at the maximum operating temperature

(vi) Calculate the ratio of carrier power to mean power from steps (iii) and (v) using the following formula:

$$\frac{Carrier\_power}{Mean\_power} = 10^{\frac{\text{dBc-dBmean}}{10}}$$

dB_C = carrier power in step (v)
dB_{mean} = mean power in step (iii)

TEST RESULTS

Output power measurement at the antenna connector as per steps (i) and (ii) is 15.48 dBm.

Mean power calculated as per step (iii) is 15.48 + 10 log(D), where D is the modulation duty cycle. In the worst case D is 36.94%, therefore mean power is 15.48 + 10 log(0.3694) = 11.16 dBm

Carrier power that measured with 10 Hz I.F. bandwidth is 8.05 dBm.

Ratio of carrier power to mean power is 49%.

$$\frac{Carrier\_power}{Mean\_power} = 10^{\frac{\text{dBc-dBmean}}{10}} = 10^{\frac{8.05-11.16}{10}} = 0.49$$

Carrier power is below of the mean power by 3.11 dB.

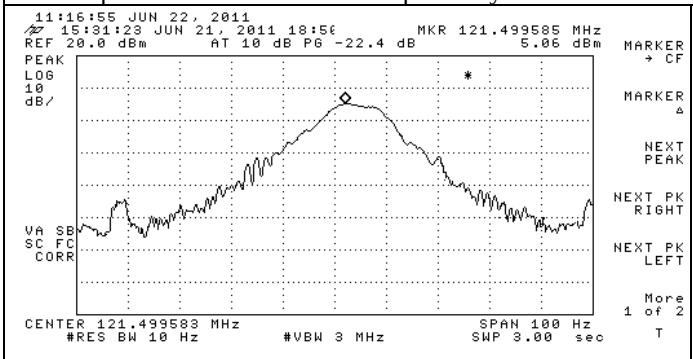

Figure 18.36 – Screenshot of Frequency Coherence Measurement Test Result (Frequency Shift) at the maximum operating temperature. Transmitted RF (121.5 MHz) before the interruption for the 406 MHz RF burst

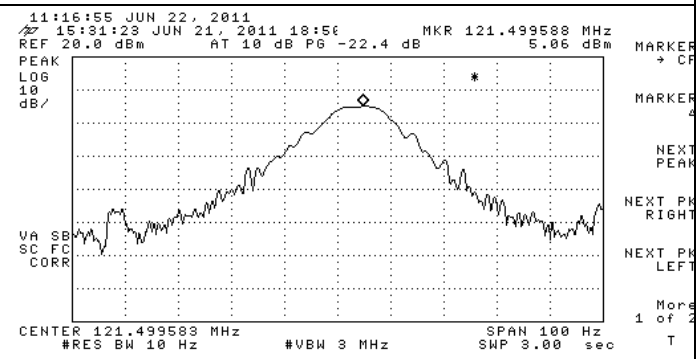

Figure 18.37 – Screenshot of Frequency Coherence Measurement Test Result (Frequency Shift) at the maximum operating temperature. Transmitted RF (121.5 MHz) after the interruption for the 406 MHz RF burst

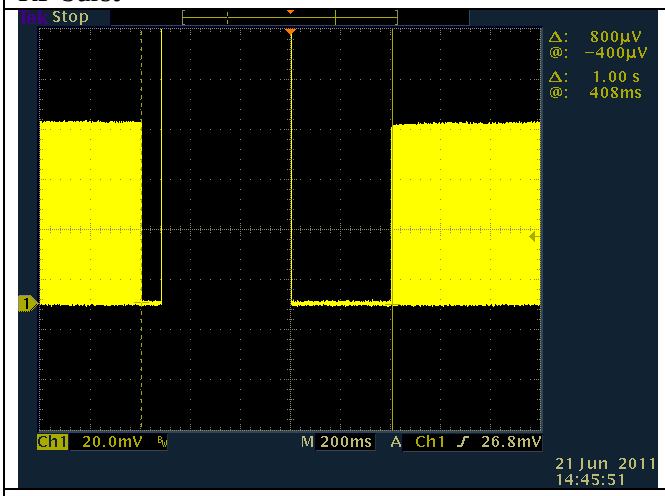

Figure 18.38 – Screenshot of Transmitter Duty Cycle Test Result at the maximum operating temperature

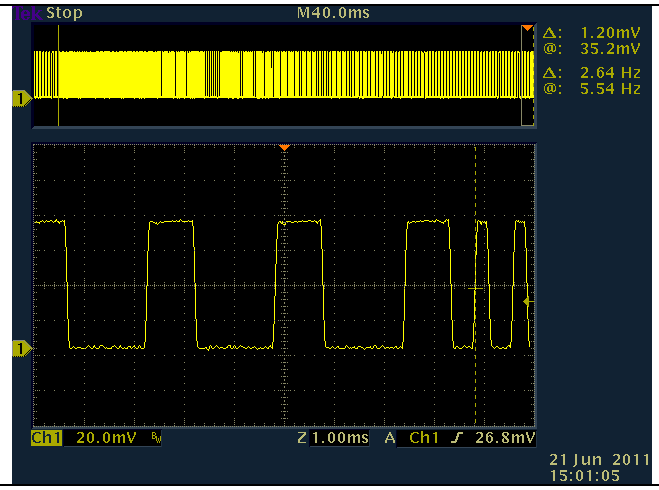

Figure 18.39 – Screenshot of Sweep repetition rate Test Result at the maximum operating temperature

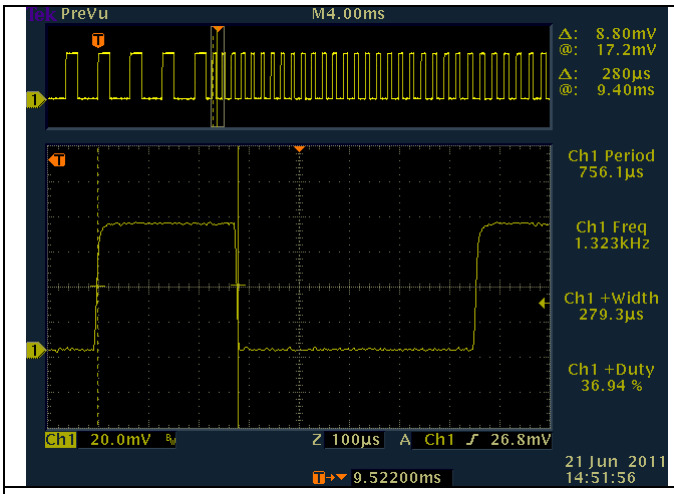

Figure 18.40 – Screenshot of Demodulation Waveform (A) measured near start of the modulation sweep period at the maximum operating temperature

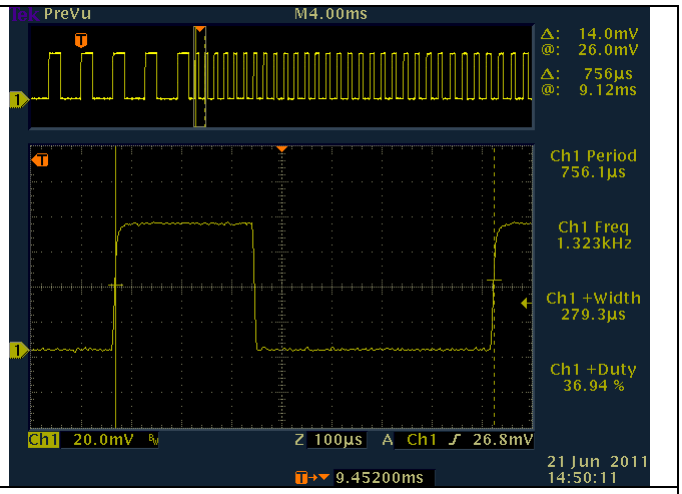

Figure 18.41 – Screenshot of High Sweep Frequency (B) Test Result measured near start of the modulation sweep period at the maximum operating temperature

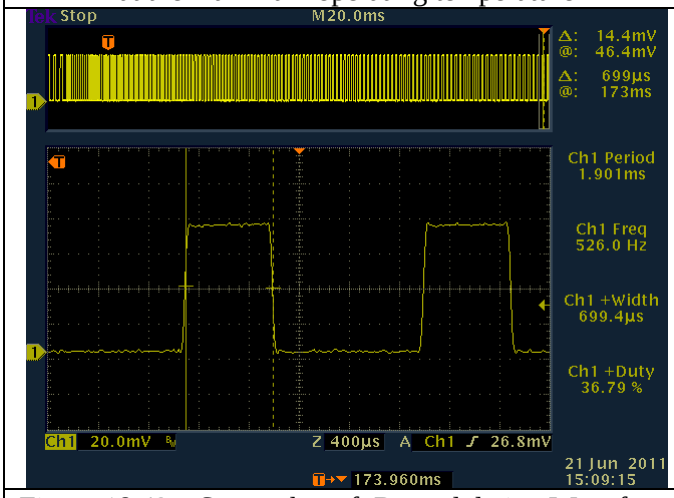

Figure 18.42 – Screenshot of Demodulation Waveform (A) measured near midpoint of the modulation sweep period at the maximum operating temperature

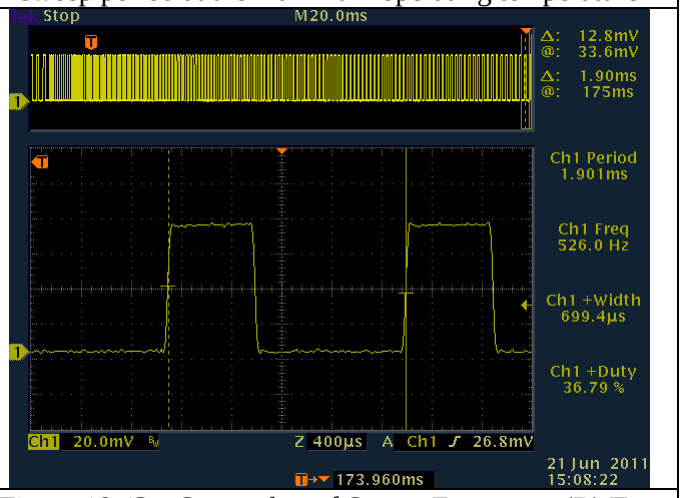

Figure 18.43 – Screenshot of Sweep Frequency (B) Test Result measured near midpoint of the modulation sweep period at the maximum operating temperature

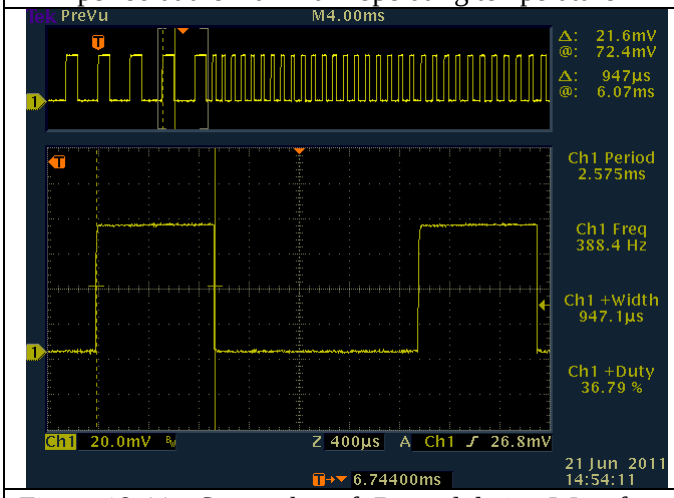

Figure 18.44 – Screenshot of Demodulation Waveform (A) measured near end of the modulation sweep period at the maximum operating temperature

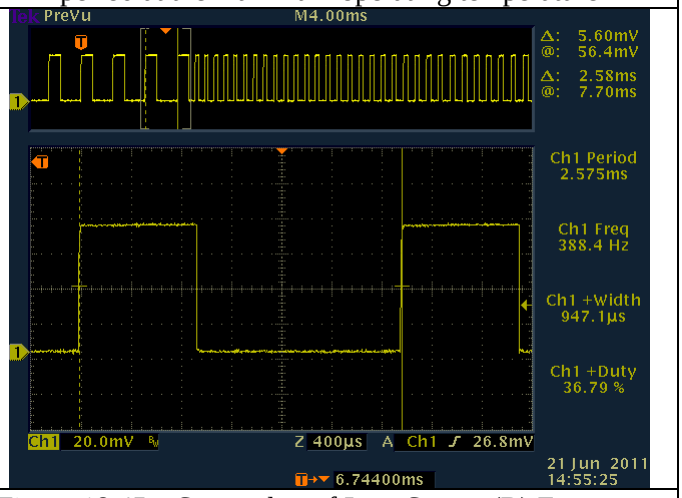

Figure 18.45 – Screenshot of Low Sweep (B) Frequency Test Result measured near end of the modulation sweep period at the maximum operating temperature

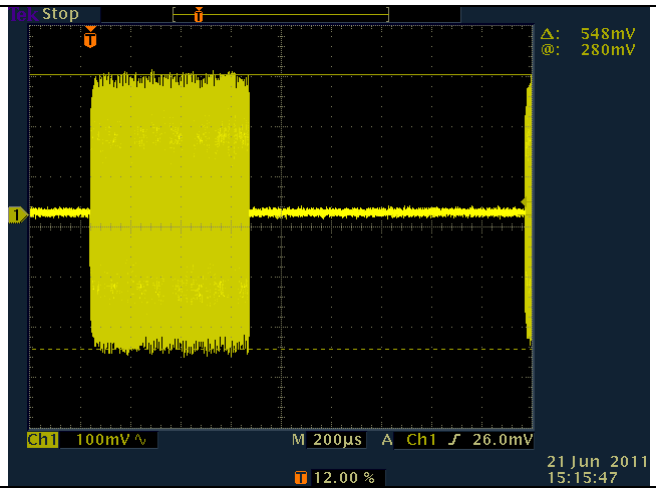

Figure 18.46 – Screenshot of maximum amplitude signal for determination of the Modulation Factor at the maximum operating temperature

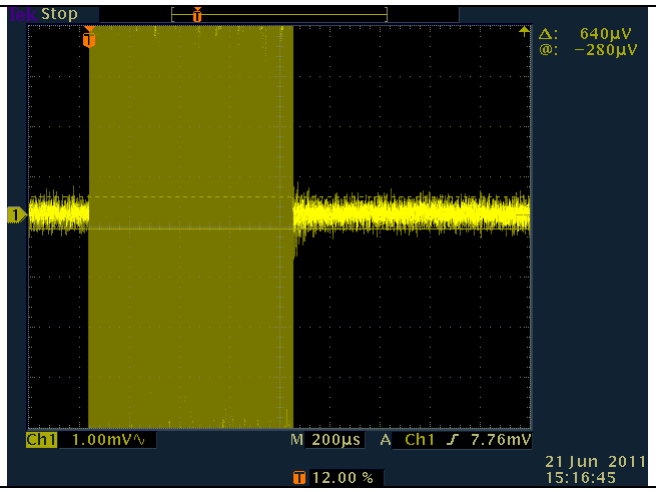

Figure 18.47 – Screenshot of minimum amplitude signal for determination of the Modulation Factor at the maximum operating temperature

Figure 18.48 – Site for Peak Effective Radiated Power Measurement

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	0.000	406037.001	0.000
Power, Wt	3.16	7.94	0.00	3.80	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499756	**Low Sweep Frequency, Hz**		385	
Power, mW	31.4	**High Sweep Frequency, Hz**		1333	
Sweep Period, sec	0.4	**Sweep Range, Hz**		948	
Modulation Index, %	100				
Message					
Digital message	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C				

Figure 18.49 – Results of EUT (EPIRB) Self Test
(upon completion of the auxiliary radio-locating device transmitter test)

RESULTS OF PEAK EFFECTIVE RADIATED POWER MEASUREMENT (A17.3 RTCM 11000.2 Version 2.1):

	Elevation Angle: 15° (at maximum antenna gain)				
Azimuth	Prec, dBm	Grec, dBm	LC, dB	LP, dB	PERP, dBm
0°	-35.4	-14.82	1.729	34.428	15.58
30°	-35.6	-14.82	1.729	34.428	15.38
60°	-35.7	-14.82	1.729	34.428	15.28
90°	-35.6	-14.82	1.729	34.428	15.38
120°	-35.3	-14.82	1.729	34.428	15.68
150°	-35.7	-14.82	1.729	34.428	15.28
180°	-35.6	-14.82	1.729	34.428	15.38
210°	-35.7	-14.82	1.729	34.428	15.28
240°	-35.5	-14.82	1.729	34.428	15.48
270°	-35.4	-14.82	1.729	34.428	15.58
300°	-35.8	-14.82	1.729	34.428	15.18
330°	-35.6	-14.82	1.729	34.428	15.38

FINAL RESULTS OF AUXILIARY RADIO-LOCATING DEVICE TRANSMITTER TEST (A17.0 RTCM 11000.2 Version 2.1):

Parameters To Be Measured During Tests	Range Of Specification	Units	Test Results			Comments
			$T_{min.}$ (-20 °C)	$T_{amb.}$ (20 °C)	$T_{max.}$ (+55 °C)	
Carrier Frequency (A17.1)	121.5 ± 0.006	MHz	121.4985	121.4985	121.4985	See fig. 18.3, 18.18, 18.33
PERP (A17.3)	14 – 20	dBm	-	15.18-15.68	-	
Modulation (A17.2)						
- Frequency	≥ 700 Hz within range of 300 – 1600 Hz	Hz	389 – 1323	389 – 1323	388 – 1323	See fig.18.10 - 18.15,
- Direction	Upward	√	√	√	√	
- Duty cycle	33 – 55	%	36.76 – 37.33	36.16 – 36.96	36.79 – 36.94	See fig. 18.10 – 18.15, 18.25 – 18.30, 18.40 – 18.45
- Factor	0.85 – 1.0		0.99	0.99	0.99	See fig. 18.16, 18.17, 18.31, 18.32, 18.46, 18.47
- Sweep repetition rate	2 – 4	Hz	2.64	2.64	2.64	See fig. 18.9, 18.24, 18.39
- Frequency Coherence (Total power emitted)	at least 30% of the total power emitted should be contained within ± 30 Hz of the carrier frequency	%	55	51	49	See fig. 18.4, 18.5, 18.19, 18.20, 18.34, 18.35
- Frequency Coherence (Frequency Shift)	< ± 30 Hz	Hz	-5	3	3	See fig. 18.6, 18.7, 18.21, 18.22, 18.36, 18.37
Antenna						
- Pattern	Omnidirection	√	√	√	√	
- Polarization	Vertical	√	√	√	√	
- VSWR (A17.4)	≤ 1.5:1	√	-	Not applicable	-	Antenna EPIRB not removable

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KTK-800	280707	02.2012
2	Antenna	HK116	100345	02.2012
3	Digital oscilloscope	TDS-3052	B011258	01.2012
4	Spectrum analyzer	HP8593E	3831U02306	07.2012

ANNEX 19.
HUMIDITY TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.04
Sample No. 00104
Test Date: 19.12.2011
Test Conditions:

– Atmospheric pressure: 756…760 mm/Hg.
– Relative air humidity: 64 %.
– EPIRB was OFF during the test.
– EUT was set up in operational position.
– Test equipment:
  - Climatic chamber KTK-800, ILKA NEMA, DDR, Man.No 308286
  - Beacon tester BT-611 No 1005
– The humidity test was conducted with the modified housing (a hole was cut out in upper part of housing) to expose the internal components to the humid test environment.
  The test chamber atmosphere was maintained at a relative humidity of 95 % and at a temperature 41 °C for a period of 8 hours.
  At the end of the period, the EUT was removed from the test chamber to ambient room conditions. After removal, the EUT was turned ON immediately.
  Fifteen minutes after application of power, the aliveness test was conducted.

– Test duration: 800 minutes.
– Measurement duration: 15 minutes.
– Step
  No. 1 The EUT was switched to OFF and was placed in the climatic chamber.
  No. 2 The chamber temperature was risen to 41 ºC and allowed to stabilize for 2 hours.
  No. 3 The chamber conditions were adjusted to 95 % RH and maintained for a period of 8 hours 2 minutes.
  No. 4 The EUT was removed from the chamber into laboratory ambient conditions. The EUT was powered on immediately after being removed from the chamber.
  No. 5 Fifteen minutes after application of power, the aliveness test was conducted.

Figure 19.1 - View of the EPIRB Tron 60GPS with the modified housing before the humidity test

Figure 19.2 - View of the modified EPIRB installed in release mechanism

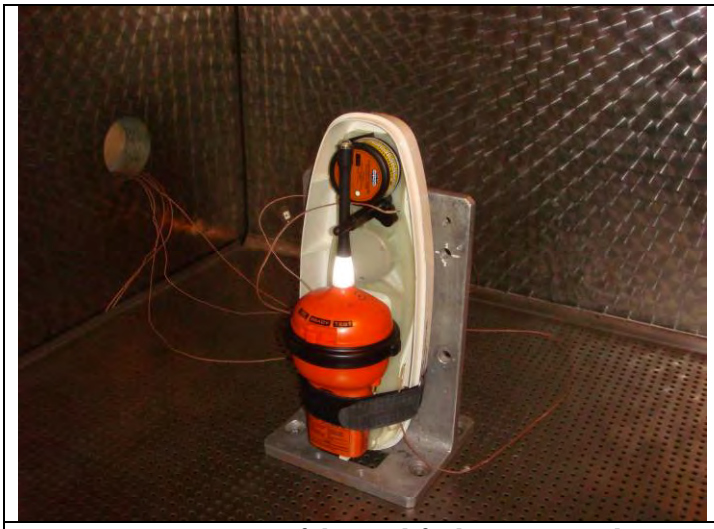

Figure 19.3 - View of the modified EPIRB in release mechanism in climatic chamber

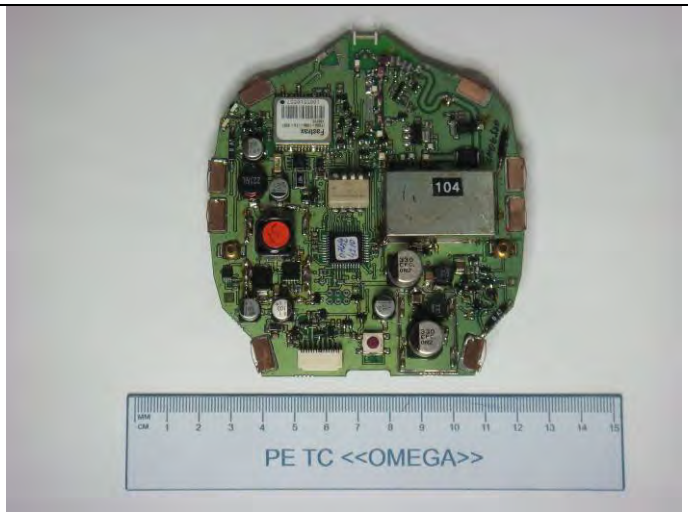

Figure 19.4 – View of the PCB (EPIRB Tron 60GPS) upon completion of the humidity test

Test duration 0 h 20 m	Bursts received 24	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	406036.971	406036.987	406036.988
Power, Wt	3.16	7.94	4.10	4.11	4.11
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499452				
Power, mW	36				
Message					
Digital message	: FFFED0 8C9EF423F07FDFFA53F7F 783E0F66C				

Figure 19.6 – Results of the aliveness test upon completion of the humidity test

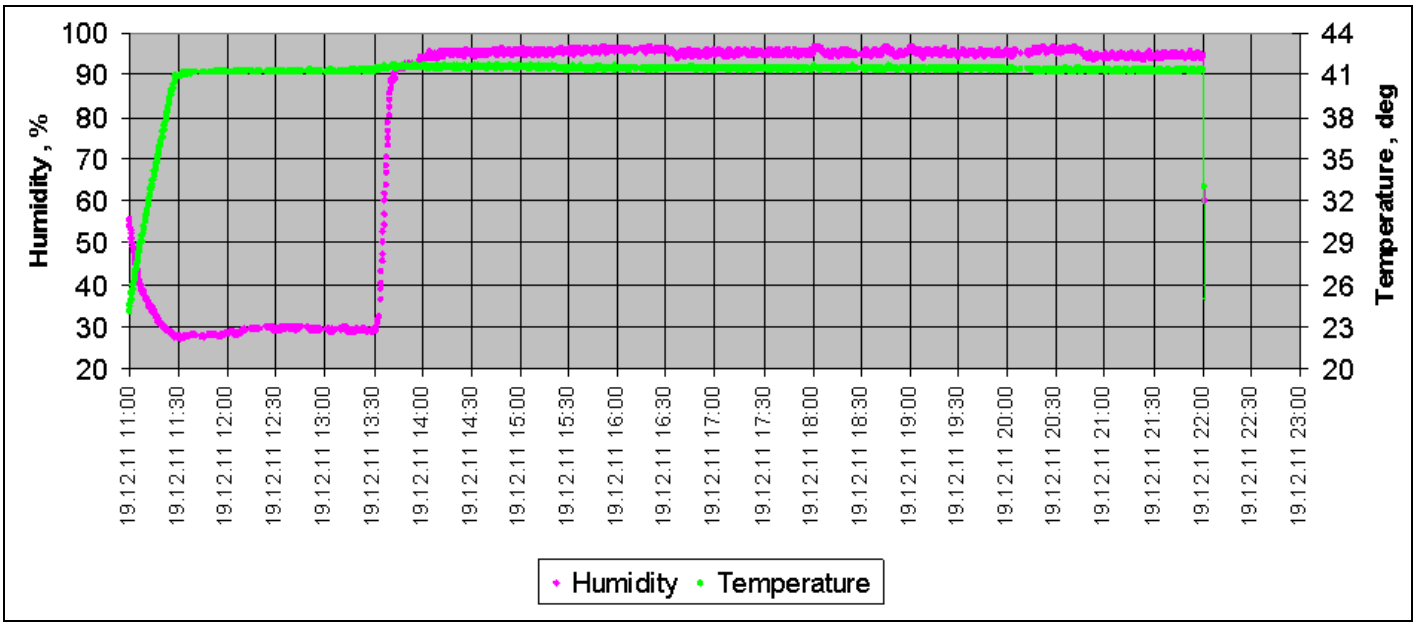

Figure 19.7 – Heat-Humidity Test Conditions Plot

FINAL RESULTS OF HUMIDITY TEST (A18.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	36.13 – 36.14	PASS
- Digital Message	Correct	√	√	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KTK-800	280707	02.2012
2	Antenna	HK116	100345	02.2012
3	Digital oscilloscope	TDS-3052	B011258	01.2012
4	Spectrum analyzer	HP8593E	3831U02306	07.2012

ANNEX 20.
ORIENTATION TEST

Equipment Under Test (EUT): EPIRB Tron 60GPS
Software release: 1.04
Sample No. 00104
Test Date: 21.12.2011
Test Conditions:
– Atmospheric pressure: 759 mm/Hg.
– Relative air humidity: 69 %.
– EPIRB is ON during the test.
– Test equipment:
- Beacon tester BT-611 No 1005
– Test duration is 15+2x3=21 minutes.
– Step No. 1 The EUT activated and positioned vertically
No. 2 After 15 minutes, the aliveness test was performed.
No. 3 The EUT was placed in a horizontal position.
No. 4 After 2 minutes, the aliveness test was performed.
No. 5 The EUT was placed in a upside down position.
No. 6 After 2 minutes, the aliveness test was performed.
No. 7 The EUT was returned to its initial upright position
No. 8 After 2 minutes, the aliveness test was performed.
The operation of the strobe light and auxiliary radio-locating transmitter was observed throughout the test and their uninterrupted operation verified.

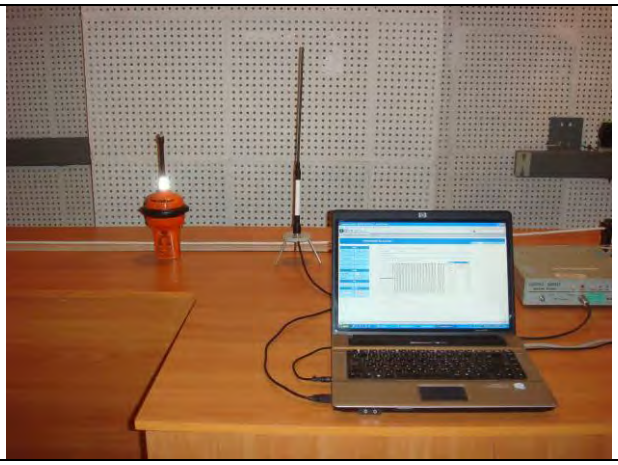
Figure 20.1 – View of the EPIRB Tron 60GPS before orientation test

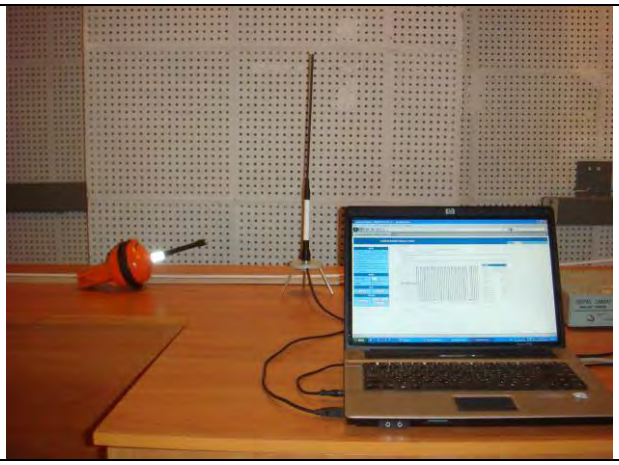
Figure 20.2 – View of the EPIRB Tron 60GPS in a horizontal position.

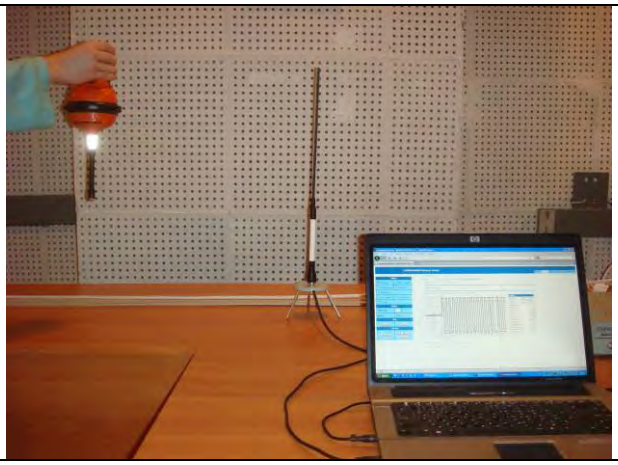
Figure 20.3 – View of the EPIRB Tron 60GPS in a upside down position.

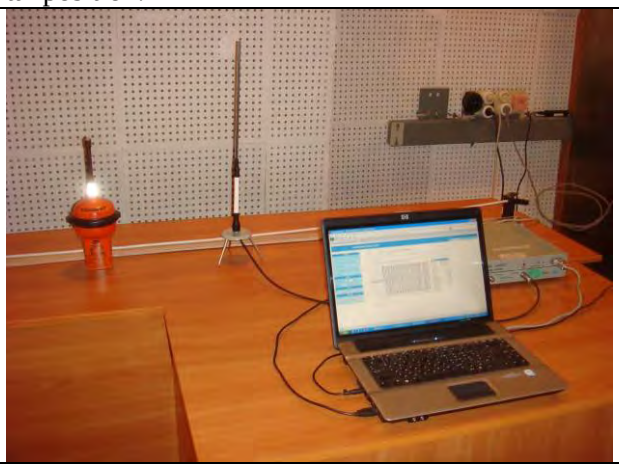
Figure 20.4 - View of the EPIRB Tron 60GPS in a initial upright position

Test duration 0 h 0 m	Bursts received 2	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	0.000	406037.008	0.000
Power, Wt	3.16	7.94	0.00	3.86	0.00
Total burst duration, ms	514.80	525.20	0.00	520.00	0.00
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499437				
Power, mW	40.1				
Message					
Digital message	:FFFED0 911EF9C0687FDFFBB929F 783E0F66C				

Figure 20.5 – Aliveness test results after EUT activated in vertical position

Test duration 0 h 0 m	Bursts received 2	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	0.000	406037.017	0.000
Power, Wt	3.16	7.94	0.00	3.87	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499448				
Power, mW	40.2				
Message					
Digital message	:FFFED0 911EF9C0687FDFFBB929F 783E0F66C				

Figure 20.6 – Aliveness test results after EUT activated in horizontal position t

Test duration 0 h 0 m	Bursts received 2	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	0.000	406037.013	0.000
Power, Wt	3.16	7.94	0.00	3.87	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499729				
Power, mW	40.1				
Message					
Digital message	:FFFED0 911EF9C0687FDFFBB929F 783E0F66C				

Figure 20.7 – Aliveness test results after EUT activated in upside down position

Test duration 0 h 0 m	Bursts received 2	BCH error 0	Self-Test 1		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, kHz	406036.000	406038.000	0.000	406037.012	0.000
Power, Wt	3.16	7.94	0.00	3.88	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz	121499434				
Power, mW	40.1				
Message					
Digital message	:FFFED0 911EF9C0687FDFFBB929F 783E0F66C				

Figure 20.8 – Aliveness test results after EUT activated in initial vertical position

FINAL RESULTS OF THE ORIENTATION TEST (A19.0 RTCM 11000.2 Version 2.1):

PARAMETERS TO BE MEASURED DURING TESTS	RANGE OF SPECIFICATION	UNITS	TEST RESULTS	COMMENTS (PASS/FAULT)
• Aliveness Test of EUT in vertical position:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 – 39	dBm	35.87	PASS
• Aliveness Test of EUT in horizontal position				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 – 39	dBm	35.88	PASS
• Aliveness Test of EUT in upside down position				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 – 39	dBm	35.88	PASS
• Aliveness Test of EUT in initial vertical position:				
- Carrier Frequency	406.037 ± 0.001	MHz	406.0370	PASS
- Power Output	35 - 39	dBm	35.89	PASS
• Operation of the strobe light	uninterrupted operation	-	uninterrupted operation	PASS
• Operation of the auxiliary radio-locating transmitter	uninterrupted operation	-	uninterrupted operation	PASS