PUBLIC ENTERPRISE TESTING CENTER «OMEGA»

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Approved by
Director
PE TC "OMEGA"

_____ Belikov N.I.
4 January, 2012

TEST REPORT No. 11/11
Issue 1

on
Emergency Position Indicating Radio Beacon (EPIRB)

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

Sevastopol
2011

PUBLIC ENTERPRISE TESTING CENTER «OMEGA»

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

Ministry of Transport Russian Federation Certificate of accreditation of testing laboratory No. АКР.0510-14 РТН valid until 19.05.2015

Russia Maritime Register of Shipping. Certificate of Recognition testing laboratory No. 07.18114.184 valid until 21.08.2012

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

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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	Jotron AS P.O. Box 54, NO-3280 Tjodalyng, Norway	
Technical officer		
Name	Øyvind L. Eggen	
Title	Systems Designer	
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E-mail	oyvind.eggen@jotron.com	
Test commencement date	10.01.2011	
Test completion date	11.11.2011	
Test reports shall be delivered to:	Jotron AS	copy 1
	PE TC “Omega”	copy 2

CONTENTS

Report Issue History		
No	**Data of issue**	**Report reissue reason**
1	04.01.2012	The initial issue

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 standard IEC 61097-2 (2008), IEC 60945 (2002) according to the test plan agreed by applicant with *Bundesamt für Seeschifffahrt und Hydrographie*. Present Test Report along with Test Report 11/9 Iss.4 (Vol.1 and Vol.2) and Test Report 11/10 Iss.4 (Vol.1 and Vol.2) is to be applied to *Bundesamt für Seeschifffahrt und Hydrographie* for type approval of 406 MHz satellite emergency position-indicating radio beacons (EPIRBs) for Council Directive 96/98/EC on marine equipment.

3. TEST CONDITIONS AND METHODS

Procedures, conditions and methods of testing correspond to requirements and methods of Standards IEC 61097-2 (2008), IEC 60945 (2002) and RTCM 11000.2 (2002). Standard RTCM 11000.2 is applied when it covers IEC 61097-2 and IEC 60945, as agreed by applicant with *Bundesamt für Seeschifffahrt und Hydrographie*.

4. TEST PROGRAM

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

No.	Test	Requirement	Method
1.	Message format and homing devices	A.1.1, 4.2, 3.3.3 g) IEC 61097-2	5.1.10, 5.1.11, 5.1.7 IEC 61097-2
2.	Dry heat test	A.1.2, 3.6.1, 3.6.3, 3.7 a) IEC 61097-2; 4.4, 8.2.2.3 IEC 60945	5.17.1 IEC 61097-2; 8.2.2.2 IEC 60945
3.	Damp heat test	A.1.3, 3.6.1, 3.6.3, 3.7 a) IEC 61097-2; 4.4, 8.3.1.3 IEC 60945	5.17.2 IEC 61097-2; 8.3.1.2 IEC 60945
4.	Vibration test	A.1.4, 3.6.4, 3.7 b) IEC 61097-2; 4.4, 8.7.3 IEC 60945	5.17.6 IEC 61097-2; 8.7.2 IEC 60945
5.	Ruggedness test	A.1.5, 3.6.4, 3.7 b) IEC 61097-2	5.17.7 IEC 61097-2
6.	Drop test on hard surface	A.1.6, 3.3.2 c) IEC 61097-2; 8.6.1.3 IEC 60945	5.17.5.1 IEC 61097-2; 8.6.1.2 IEC 60945
7.	Drop into water	A.1.7, 3.3.2 c) IEC 61097-2; 8.6.2.3 IEC 60945	5.17.5.2 IEC 61097-2; 8.6.2.2 IEC 60945
8.	Thermal Shock	A.1.8, 3.3.2 a) IEC 61097-2; A11.0 RTCM 11000.2	A11.0 RTCM 11000.2
9.	Immersion test	A.1.9, 3.3.2 a) IEC 61097-2; 8.9.2.3 IEC 60945	5.17.8 IEC 61097-2; 8.9.2.2 IEC 60945
10.	Spurious emissions test	A.1.10, 5.19 IEC 61097-2 A10.0 RTCM 11000.2	5.19 IEC 61097-2 A10.0 RTCM 11000.2
11.	Battery capacity and low temperature test	A.1.11, 4.6, 5.15.1 IEC 61097-2	5.15.1 IEC 61097-2
12.	COSPAS-SARSAT type-approval test procedure	A.1.12 IEC 61097-2	A.3 CS T.007
13.	Interference testing	A.1.13, 3.8, 5.18 IEC 61097-2; 10.4.3, 10.9.3 IEC 60945	5.18 IEC 61097-2; 10.4.2, 10.9.2 IEC 60945
14.	Prevention to inadvertent activation	A.2.1, 5.3.1 IEC 61097-2	5.5.1.1 IEC 61097-2
15.	Automatic release and activation test	A.2.2, 3.2 d), 3.2 e) IEC 61097-2	5.2.1 IEC 61097-2
16.	Stability and buoyancy test	A.2.3, 3.3.2 b) IEC 61097-2	5.3.2.2 IEC 61097-2
17.	Float free activation test	A.2.4, 3.3.3 a) IEC 61097-2	5.3.3.1 IEC 61097-2
18.	Compass safe distance	A.2.6 IEC 61097-2; 11.2.3 IEC 60945	5.20 IEC 61097-2; 11.2.2 IEC 60945
19.	Solar radiation test	A.2.7, 3.3.7, 3.5.1 e) IEC 61097-2; 8.10.4 IEC 60945	5.17.9 IEC 61097-2; 8.10.3 IEC 60945
20.	Oil resistance test	A.2.8, 3.3.7, 3.5.1 e) IEC 61097-2; 8.11.4 IEC 60945	5.17.10 IEC 61097-2; 8.11.3 IEC 60945
21.	Corrosion (salt mist) test	A.2.9 IEC 61097-2, A7.0 RTCM 11000.2	A7.0 RTCM 11000.2
22.	Signal light test	A.2.10, 3.3.3 c) IEC 61097-2	5.3.3.3 IEC 61097-2
23.	Homing device tests	A.2.12 IEC 61097-2	Annex D IEC 61097-2

5. TEST SCHEDULE

No.	List of Tests	Date	Comments
1.	Message format and homing devices	11.01.2011	
2.	Dry heat test	11.01.2011 … 13.01.2011 13.10.2011 … 15.10.2011	Note 1
3.	Damp heat test	13.01.2011 … 14.01.2011	
4.	Vibration test	17.01.2011 … 18.01.2011 18.10.2011 … 19.10.2011	Note 1
5.	Ruggedness test	18.01.2011 19.10.2011	Note 1
6.	Drop test on hard surface	24.01.2011	
7.	Drop into water	24.01.2011	
8.	Thermal Shock	26.02.2011 25.05.2011	Note 2
9.	Immersion test	27.05.2011	
10.	Spurious emissions test	20.06.2011 … 22.06.2011	
11.	Battery capacity and low temperature test	17.09.2011 … 19.09.2011	Note 3
12.	COSPAS-SARSAT type- approval test procedure	16.02.2011 … 21.09.2011	Note 4
13.	Interference testing	30.05.2011 … 02.06.2011	
14.	Prevention to inadvertent activation	23.08.2011 27.10.2011	Note 1
15.	Automatic release and activation test	20.06.2011 19.10.2011 … 20.10.2011	Note 1
16.	Stability and buoyancy test	21.06.2011	
17.	Float free activation test	20.06.2011 19.10.2011	Note 1
18.	Compass safe distance	25.06.2011	
19.	Solar radiation test	11.11.2011	
20.	Oil resistance test	21.10.2011	
21.	Corrosion (salt mist) test	18.01.2011 … 22.01.2011	
22.	Signal light test	23.06.2011 … 24.06.2011	
23.	Homing device tests	20.06.2011 … 22.06.2011	

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. 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 3. Test was combined with A.2.3 C/S T007 as it is allowed in IEC 61097-2.

Note 4. C/S type approval tests for EPIRB(s) Tron60GPS and Tron60S were conducted separately and test reports 11/9 and 11/10 are issued accordingly.

6. TEST RESULT

No.	Test	EUT model	Requirement	Result
1.	Message format and homing devices	Tron60S	A.1.1, 4.2, 3.3.3 g) IEC 61097-2	Passed
		Tron60GPS		Passed
2.	Dry heat test	Tron60GPS	A.1.2, 3.6.1, 3.6.3, 3.7 a) IEC 61097-2; 4.4, 8.2.2.3 IEC 60945	Passed
3.	Damp heat test	Tron60GPS	A.1.3, 3.6.1, 3.6.3, 3.7 a) IEC 61097-2; 4.4, 8.3.3 IEC 60945	Passed
4.	Vibration test	Tron60GPS	A.1.4, 3.6.4, 3.7 b) IEC 61097-2; 4.4, 8.7.3 IEC 60945	Passed
5.	Ruggedness test	Tron60GPS	A.1.5, 3.6.4, 3.7 b) IEC 61097-2	Passed
6.	Drop test on hard surface	Tron60GPS	A.1.6, 3.3.2 c) IEC 61097-2; 8.6.1.3 IEC 60945	Passed
7.	Drop into water	Tron60GPS	A.1.7, 3.3.2 c) IEC 61097-2; 8.6.2.3 IEC 60945	Passed
8.	Thermal Shock	Tron60GPS	A.1.8, 3.3.2 a) IEC 61097-2; A11.0 RTCM 11000.2	Passed
9.	Immersion test	Tron60GPS	A.1.9, 3.3.2 a) IEC 61097-2; 8.9.2.3 IEC 60945	Passed
10.	Spurious emissions test	Tron60GPS	A.1.10, 5.19 IEC 61097-2 A10.0 RTCM 11000.2	Passed
11.	Battery capacity and low temperature test	Tron60GPS	A.1.11, 4.6, 5.15.1 IEC 61097-2	Passed
12.	COSPAS-SARSAT type approval test procedure [1]	Tron60GPS	A.1.12 IEC 61097-2	Passed
		Tron60S		Passed
13.	Interference tests		A.1.13 IEC 61097-2	
	Immunity to radiated radio frequency disturbance	Tron60GPS	3.8, 5.18 IEC 61097-2; 10.4.3, 10.4.2 IEC 60945	Passed
		Tron60S		Passed
	Immunity to electrostatic discharge	Tron60GPS	3.8, 5.18 IEC 61097-2; 10.9 IEC 60945	Passed
		Tron60S		Passed
14.	Prevention to inadvertent activation	Tron60GPS	A.2.1, 5.3.1 IEC 61097-2	Passed
15.	Automatic release and activation test	Tron60GPS	A.2.2, 3.2 d), 3.2 e) IEC 61097-2	Passed
16.	Stability and buoyancy test	Tron60GPS	A.2.3, 3.3.2 b) IEC 61097-2	Passed
17.	Float free activation test	Tron60GPS	A.2.4, 3.3.3 a) IEC 61097-2	Passed
18.	Compass safe distance	Tron60GPS	A.2.6 IEC 61097-2, 11.2.3 IEC 60945	Passed
19.	Solar radiation test	Tron60GPS	A.2.7, 3.3.7, 3.5.1 e) IEC 61097-2; 8.10.4 IEC 60945	Waived
20.	Oil resistance test	Tron60GPS	A.2.8, 3.3.7, 3.5.1 e) IEC 61097-2; 8.11.4 IEC 60945	Passed
21.	Corrosion (salt mist) test	Tron60GPS	A.2.9 IEC 61097-2, A7.0 RTCM 11000.2	Passed
22.	Signal light test	Tron60GPS	A.2.10, 3.3.3 c) IEC 61097-2	Passed
23.	Homing device tests	Tron60GPS	A.2.12 IEC 61097-2	Passed

[1] - C/S type approval tests for EPIRB(s) Tron60GPS and Tron60S were conducted separately and test reports 11/9 and 11/10 are issued accordingly.

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 Standards:

Document	Edition
IEC 61097-2	Edition 3.0 (2008-01)
IEC 60945	Edition 4.0 (2002-08)
RTCM 11000.2	Version 2.1 (2002)

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the applicable standards for test program agreed with *Bundesamt für Seeschifffahrt und Hydrographie* and complies with requirements as demonstrated in the attached report.

Department manager V. Kovalenko

(Name, Position and Signature of Accepted Laboratory Representative)

8. REFERENCE FOR DETAILED RESULTS OF TEST

No.	Test	Requirement	Test report reference
1.	Message format and homing devices	A.1.1, 4.2, 3.3.3 g) IEC 61097-2	Annex 1
2.	Dry heat test	A.1.2, 3.6.1, 3.6.3, 3.7 a) IEC 61097-2; 4.4, 8.2.3 IEC 60945	Annex 2
3.	Damp heat test	A.1.3, 3.6.1, 3.6.3, 3.7 a) IEC 61097-2; 4.4, 8.3.3 IEC 60945	Annex 3
4.	Vibration test	A.1.4, 3.6.4, 3.7 b) IEC 61097-2; 4.4, 8.7.3 IEC 60945	Annex 4
5.	Ruggedness test	A.1.5, 3.6.4, 3.7 b) IEC 61097-2	Annex 5
6.	Drop test on hard surface	A.1.6, 3.3.2 c) IEC 61097-2; 8.6.1.3 IEC 60945	Annex 6
7.	Drop into water	A.1.7, 3.3.2 c) IEC 61097-2; 8.6.2.3 IEC 60945	Annex 6
8.	Thermal Shock	A.1.8, 3.3.2 a) IEC 61097-2; 4.4, 8.5.3 IEC 60945	Annex 7
9.	Immersion test	A.1.9, 3.3.2 a) IEC 61097-2; 8.9.2.3 IEC 60945	Annex 8
10.	Spurious emissions test	A.1.10, 5.19 IEC 61097-2	Annex 9
11.	Battery capacity and low temperature test	A.1.11, 4.6, 5.15.1 IEC 61097-2	Annex 10
12.	Interference testing	A.1.13, 3.8, 5.18 IEC 61097-2; 10.4.3, 10.9.3 IEC 60945	Annex 11, Annex 12
13.	Prevention to inadvertent activation	A.2.1, 5.3.1 IEC 61097-2	Annex 13
14.	Automatic release and activation test	A.2.2, 3.2 d), 3.2 e) IEC 61097-2	Annex 18
15.	Stability and buoyancy test	A.2.3, 3.3.2 b) IEC 61097-2	Annex 16
16.	Float free activation test	A.2.4, 3.3.3 a) IEC 61097-2	Annex 18
17.	Compass safe distance	A.2.6 IEC 61097-2; 11.2.3 IEC 60945	Annex 17
18.	Solar radiation test	A.2.7, 3.3.7, 3.5.1 e) IEC 61097-2; 8.10.4 IEC 60945	Annex 14
19.	Oil resistance test	A.2.8, 3.3.7, 3.5.1 e) IEC 61097-2; 8.11.4 IEC 60945	Annex 15
20.	Corrosion (salt mist) test	A.2.9, 3.3.7, 3.5.1 d), 3.5.1 e) IEC 61097-2; 8.12 IEC 60945	Annex 19
21.	Signal light test	A.2.10, 3.3.3 c) IEC 61097-2	Annex 20

Note: C/S type approval tests for EPIRB(s) Tron60GPS and Tron60S were conducted separately and test reports 11/9 and 11/10 are issued accordingly.

Senior Engineer  A.V.Baydachniy

ANNEX 1
PERFORMANCE TEST, PERFORMANCE CHECK

1.1 Performance Check

EUT: Tron 60GPS s/n 00101
SW version: 1.01
Test Date: 11.01.2011
Test Conditions:

– Ambient temperature: 19 °C
– Relative air humidity: 53 %
– Atmospheric pressure: 762 mm/Hg
– Test duration: 10 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Performance Check	A.1.1, 5.1.7 IEC 61097-2	5.1.10 IEC 61097-2

TEST DESCRIPTION

EUT was activated and then following parameters were measured:
- the 406 MHz transmitted frequency (single burst only),
- the 406 MHz digital message and
- the presence of homing transmitter output.

TEST RESULT

Passed

TEST DETAILS

Summary table of performance check result

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036993
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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

EUT: Tron60S s/n 00100
SW version: 1.01
Test Date: 11.01.2011
Test Conditions:
- Ambient temperature: 19 °C
- Relative air humidity: 53 %
- Atmospheric pressure: 762 mm/Hg
- Test duration: 10 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Performance Check	A.1.1, 5.1.7 IEC 61097-2	5.1.10 IEC 61097-2

TEST DESCRIPTION

EUT was activated and then following parameters were measured:
- the 406 MHz transmitted frequency (single burst only),
- the 406 MHz digital message (15 Hex ID and 144 Hex message bits) and
- the presence of homing transmitter output.

TEST RESULT

Passed

TEST DETAILS

Summary table of performance check result

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036983
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

1.2 Performance Test

EUT: Tron60GPS s/n 00101
SW version: 1.01
Test Date: 11.01.2011
Test Conditions:

- Ambient temperature: 19 °C
- Relative air humidity: 53 %
- Atmospheric pressure: 762 mm/Hg
- Test duration: 2 hours
- Measurement duration: 30 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Performance Test	A.1.1, 5.1.7 IEC 61097-2	5.1.11 IEC 61097-2

TEST DESCRIPTION

EUT was activated and then following parameters were measured as defined in C/S T.007 Annex A.2.1:

a) 406 MHz transmitted power output;
b) 406 MHz digital message;
c) 406 MHz digital message generator (Bit Rate and Stability (T.007 A.3.1.3) only);
d) 406 MHz modulation;
e) 406 MHz transmitted frequency; and
f) 406 MHz spurious output.

TEST RESULT

Passed

TEST DETAILS

Summary table of performance test

No	Parameter	Measured value
1	406 MHz transmitted power output, W	3.95
2	406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
3	406 MHz digital message generator (bit rate)	399.59 to 399.87
4	406 MHz modulation: +Phase deviation, rad -Phase deviation, rad Phase time rise, us Phase time fall, us Asymmetry, %	 1.10 to 1.14 -1.11 to -1.15 130.00 to 132.10 130.40 to 131.82 0.46 to 0.79
5	406 MHz transmitted frequency, MHz	406.037000 to 406.037004
6	406 MHz spurious emissions	Figure 1.1

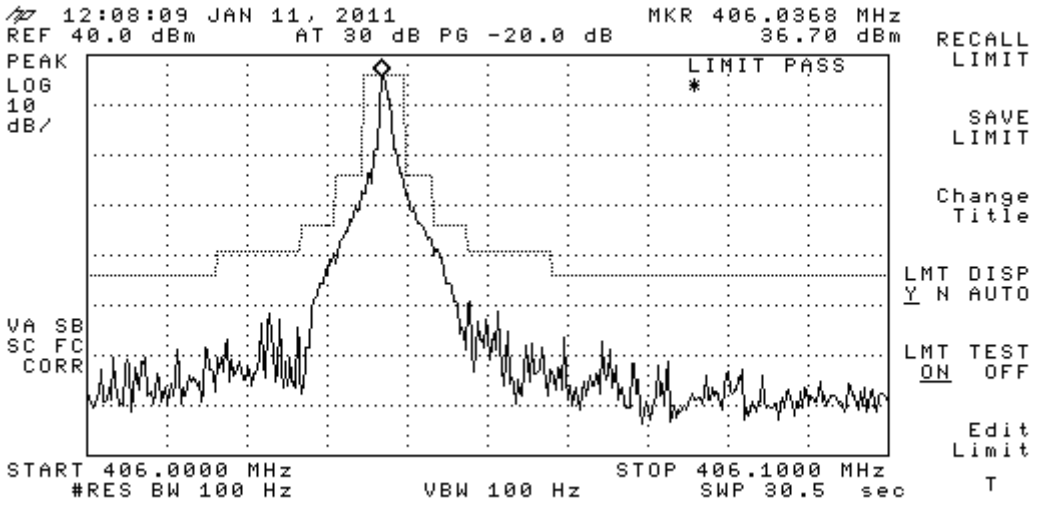

Figure 1.1 - 406 MHz spurious emissions

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

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

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

EUT: Tron 60S s/n 00100
SW version: 1.01
Test Date: 11.01.2011
Test Conditions:

- Ambient temperature: 19 °C
- Relative air humidity: 53 %
- Atmospheric pressure: 762 mm/Hg`
- Test duration: 2 hours
- Measurement duration: 30 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Performance Test	A.1.1, 5.1.7 IEC 61097-2	5.1.11 IEC 61097-2

TEST DESCRIPTION

The performance test is consisted in activating the satellite EPIRB and measuring the following as defined in C/S T.007 Annex A.2.1:

a) 406 MHz transmitted power output;
b) 406 MHz digital message;
c) 406 MHz digital message generator (Bit Rate and Stability (T.007 A.3.1.3) only);
d) 406 MHz modulation;
e) 406 MHz transmitted frequency; and
f) 406 MHz spurious output.

TEST RESULT

Passed

TEST DETAILS

Summary table of performance test

No	Parameter	Measured value
1	406 MHz transmitted power output, W	4.41 to 4.43
2	406 MHz digital message	FFFE2F 4C9418618618668A26F19 0
3	406 MHz digital message generator (bit rate)	399.67 to 399.81
4	406 MHz modulation: +Phase deviation, rad -Phase deviation, rad Phase time rise, us Phase time fall, us Asymmetry, %	 1.08 to 1.12 -1.12 to -1.15 147.98 to 152.55 138.06 to 139.87 0.47 to 4.43
5	406 MHz transmitted frequency, MHz	406.036984 to 406.036986
6	406 MHz spurious emissions	Figure 1.2

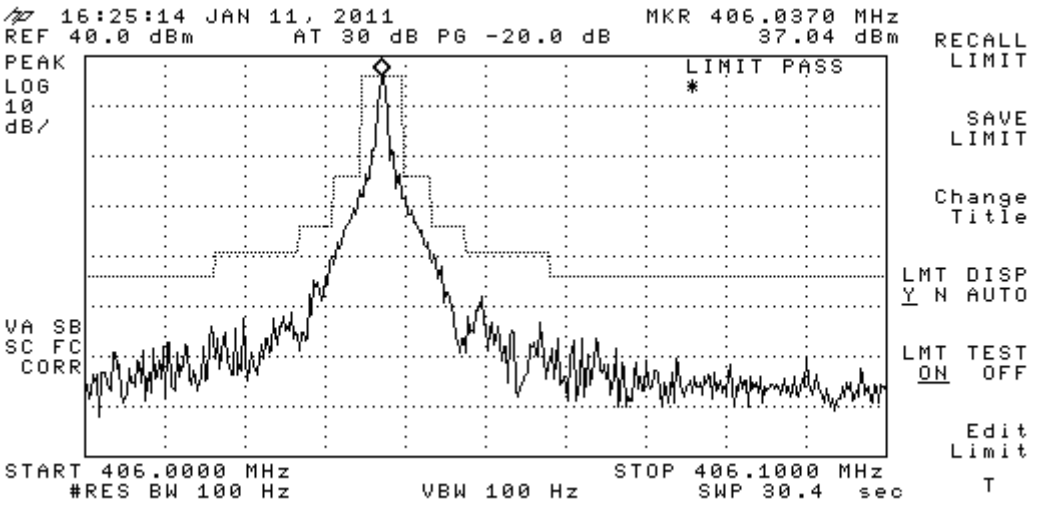

Figure 1.2 - 406 MHz spurious emissions

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201 - **Albania**	27-36	0011001001
User type: Maritime User	37-39	010
Maritime MMSI (6 digits): 999999	40-75	0000110000110000110000110000110000011
Specific bcn: 0	76-81	001101
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	010001001101111000110
Calculated BCH 1:	N/A	010001001101111000110
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered or Nationally assigned	109-112	0000
15 Hex ID:	N/A	992830C30C30CD1

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

ANNEX 2
DRY HEAT TEST

EUT: Tron 60GPS s/n 00104 with release mechanism FB-60
SW version: 1.01
Test Date: 13.10.2011 – 15.10.2011
Test Conditions:

- Ambient temperature: 16-17 °C
- Relative humidity: 51-53 %
- Atmospheric pressure: 759-760 mm/Hg
- Test temperature: 55 ºC
- Test duration: 22 hours
- Measurement duration: 30 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Dry heat test (functional)	A.1.2, IEC 61097-2 4.4 IEC 60945:2002	8.2.2.2 IEC 60945:2002

TEST DESCRIPTION

The EUT was activated and placed in the test chamber at ambient temperature. The chamber temperature was raised to 55 ºC, and EUT was allowed to stabilize for two hours.

During the next 16-hour period, the temperature was maintained to 55 ± 3 ºC in the test chamber.

At the end of the exposure period, EUT was removed from the test chamber and allowed to stabilize at ambient temperature for two hours.

Then EUT was subjected to performance test.

TEST RESULT

Passed

TEST DETAILS

Summary table of performance test

No	Parameter	Measured value
1	406 MHz transmitted power output, W	3.95
2	406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
3	406 MHz digital message generator (bit rate)	399.59 to 399.87
4	406 MHz modulation: +Phase deviation, rad -Phase deviation, rad Phase time rise, us Phase time fall, us Asymmetry, %	 1.10 to 1.14 -1.11 to -1.15 130.00 to 132.10 130.40 to 131.82 0.46 to 0.79
5	406 MHz transmitted frequency, MHz	406.037000 to 406.037004
6	406 MHz spurious emissions	Figure 2.1

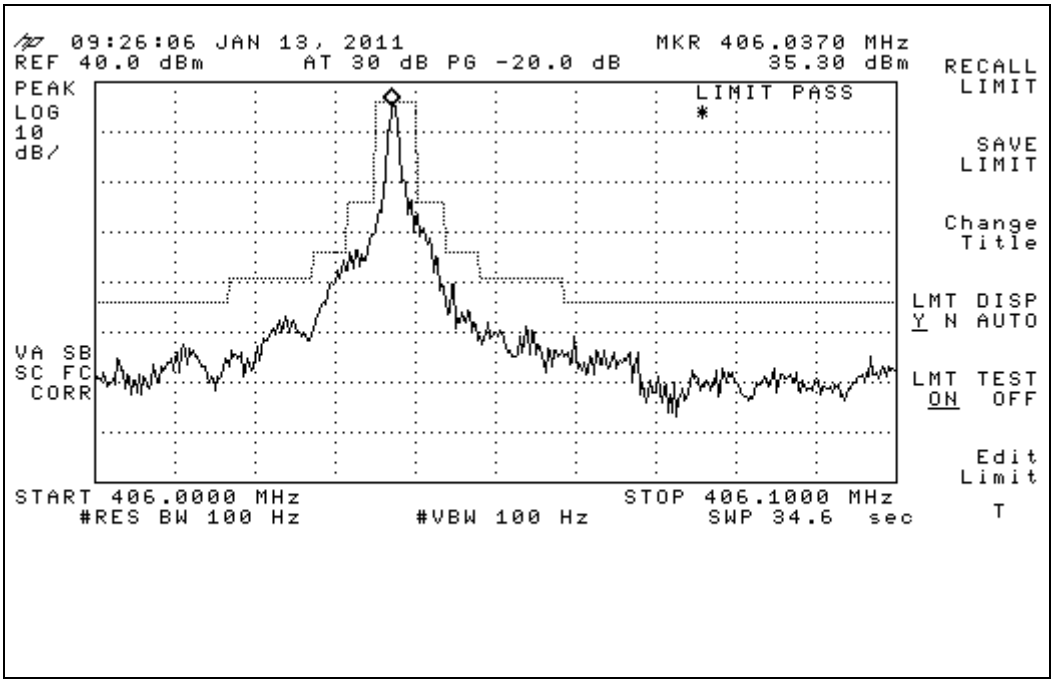

Figure 2.1 - 406 MHz spurious emissions

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

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

ANNEX 3
DAMP HEAT TEST

Equipment under Test: EPIRB Tron60GPS s/n 00101 with release mechanism FB-60
SW version: 1.01
Test Date: 13.01.2011 - 14.01.2011
Test conditions:
- Ambient temperature: 17-18 ºC
- Relative humidity: 49-53 %
- Atmospheric pressure: 758-760 mm/Hg
- Test duration is 23 hours.
- Measurement duration is 2 hours.

TEST PROGRAM

No	Test name	Requirements	Methods
1	Damp heat test	A.1.3 IEC 61097-2 4.4 IEC 60945:2002	8.3 IEC 60945:2002

TEST DESCRIPTION

EUT in mode READY was placed in the climatic test chamber at ambient temperature and relative humidity. The temperature was raised to +40 ºC, and the relative humidity was raised to 93 % over the period of 3 hours.

During the next 16-hour period, the temperature was maintained in the climatic test chamber 40 ± 2 ºC and the relative humidity 93 % ± 3 %.

After exposure period of 16 hours EUT was activated and was kept operational at the temperature 40 ± 2 ºC and the relative humidity 93 % ± 3 % for 2 hours, during which period EUT was subjected to performance check.

At the end of the test period while EUT still in the chamber, the chamber was brought to room temperature during 1 hour.

TEST RESULT

Passed

TEST DETAILS

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	Activated
2	The 406 MHz transmitted frequency	406.037008 – 406.037009 MHz
3	The 406 MHz digital message	FFFE2F 8C9EF423F07FDFFA53F7F 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	Present

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: EPIRB Tron60GPS s/n 00104 with release mechanism FB-60
SW version: 1.04
Test Date: 13.10.2011-14.10.2011
Test Conditions:
- Ambient temperature: 19-20 ºC
- Relative humidity: 51-71 %
- Atmospheric pressure: 752-758 mm/Hg
- Measurement duration is 2 hours.

TEST PROGRAM

No	Test name	Requirements	Methods
1	Vibration test	A.1.4, 3.6.4, 3.7 b) IEC 61097-2 4.4, 8.7.3 IEC 60945	8.7.2 IEC 60945

TEST DESCRIPTION

Testing was performed in accordance to the methods of the standard IEC 60945 item 8.7.

Vibrations were conducted sequentially in vertical and two horizontal orthogonal axes.

EUT was subjected to sequentially vibration at all frequencies between:

2 Hz to 13,2 Hz with an excursion of ±1mm ±10%
above 13,2 Hz and up to 100 Hz with a constant acceleration of 7 m/s^2 (0.71 g)

The frequency sweep rate was less than 0.5 octaves/min. Sensors were fixed to EPIRB and release mechanism. A resonance search was carried out throughout the frequency sweep period. Then relative magnitude ratio was calculated as magnitude measured by a sensor fixed to the EUT divided to magnitude on the surface where the EUT is fastened.

During the resonance search EUT was externally observed by unaided aural and visual means. After resonance found EUT was subjected to vibration endurance test for 2 hours in vertical and two horizontal orthogonal axes with constant acceleration 7 m/s^2 at appropriate frequencies.

Performance check was carried out on completion of test.

TEST RESULT

Passed

TEST DELAILS

For vibration in vertical axes Z EUT was fastened to the vibration table in its normal attitude using special brackets (see Figure 4.1).

Figure 4.1 - Vibration test in vertical axis Z

Relative magnitude during vibration in vertical axis Z is shown on Figure 4.2.

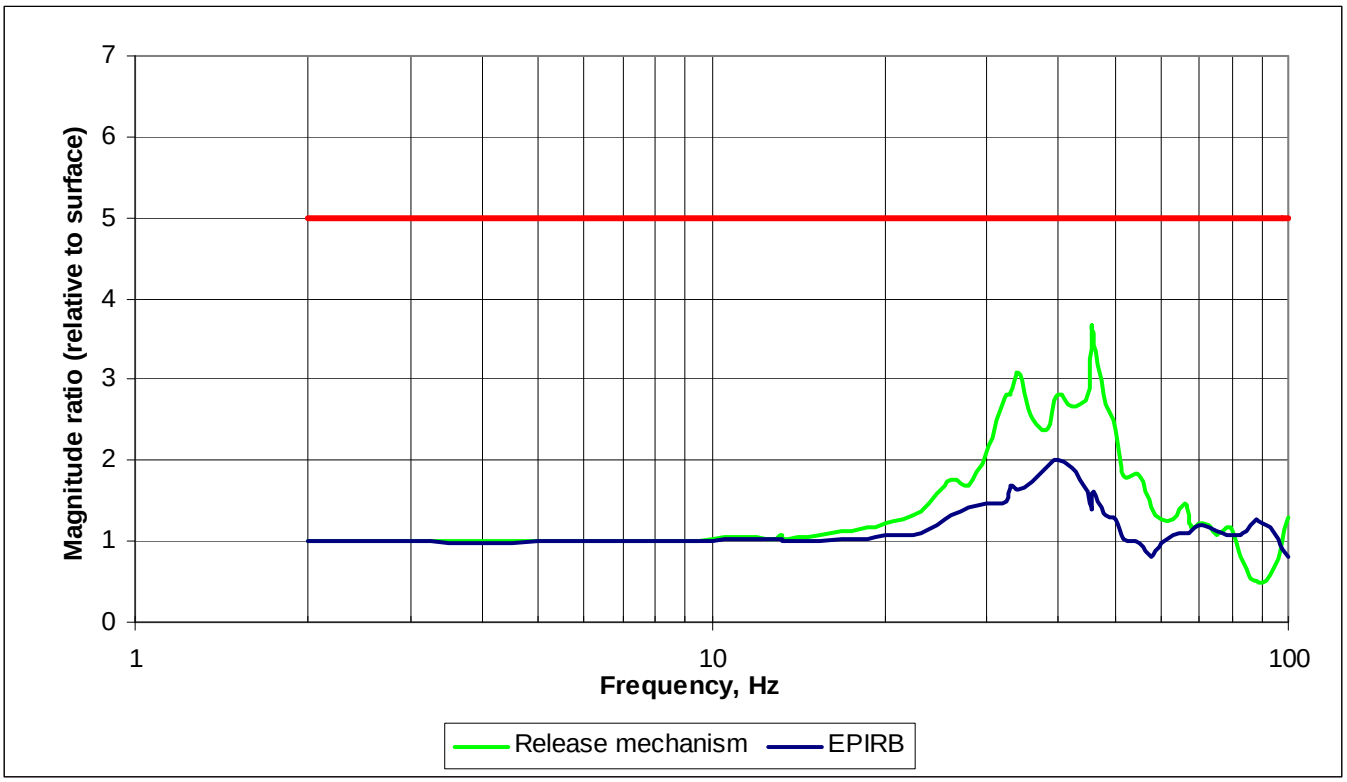

Figure 4.2 - Magnitude ratio vs. frequency during vibration in vertical axis Z

For vibration in horizontal axis X EUT was fastened to the vibration table in its normal attitude using special brackets (see Figure 4.3).

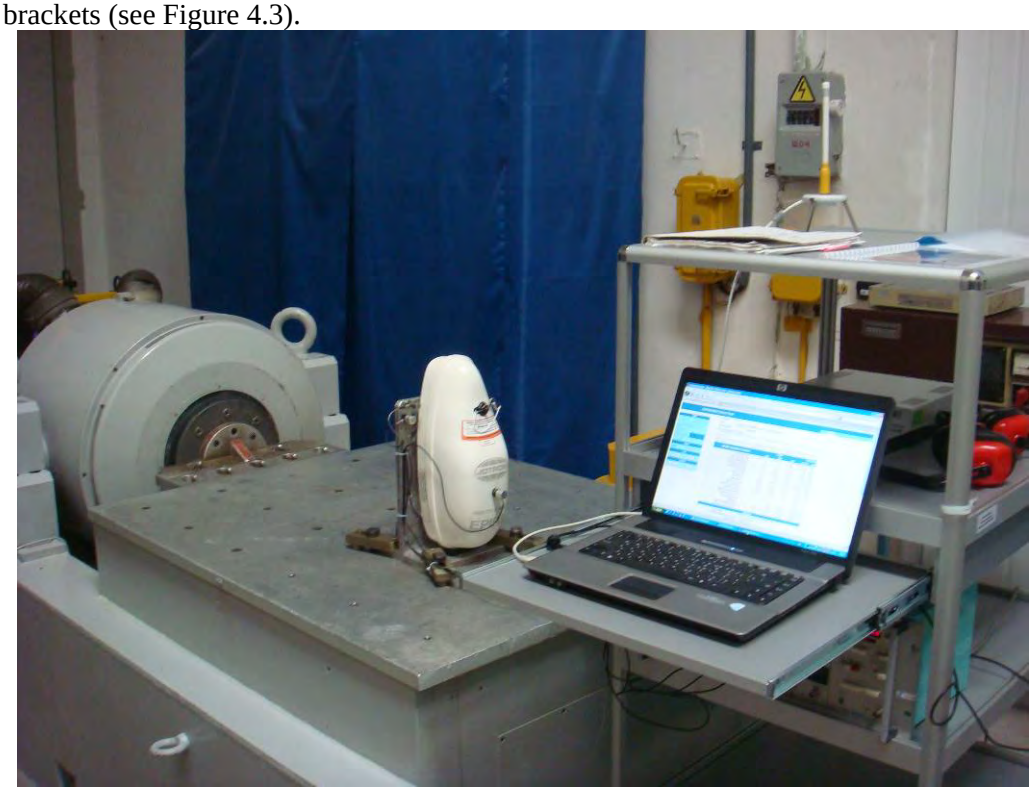

Figure 4.3 - Vibration test in horizontal axis X

Relative magnitude during vibration in horizontal axis X is shown in Figure 4.4.

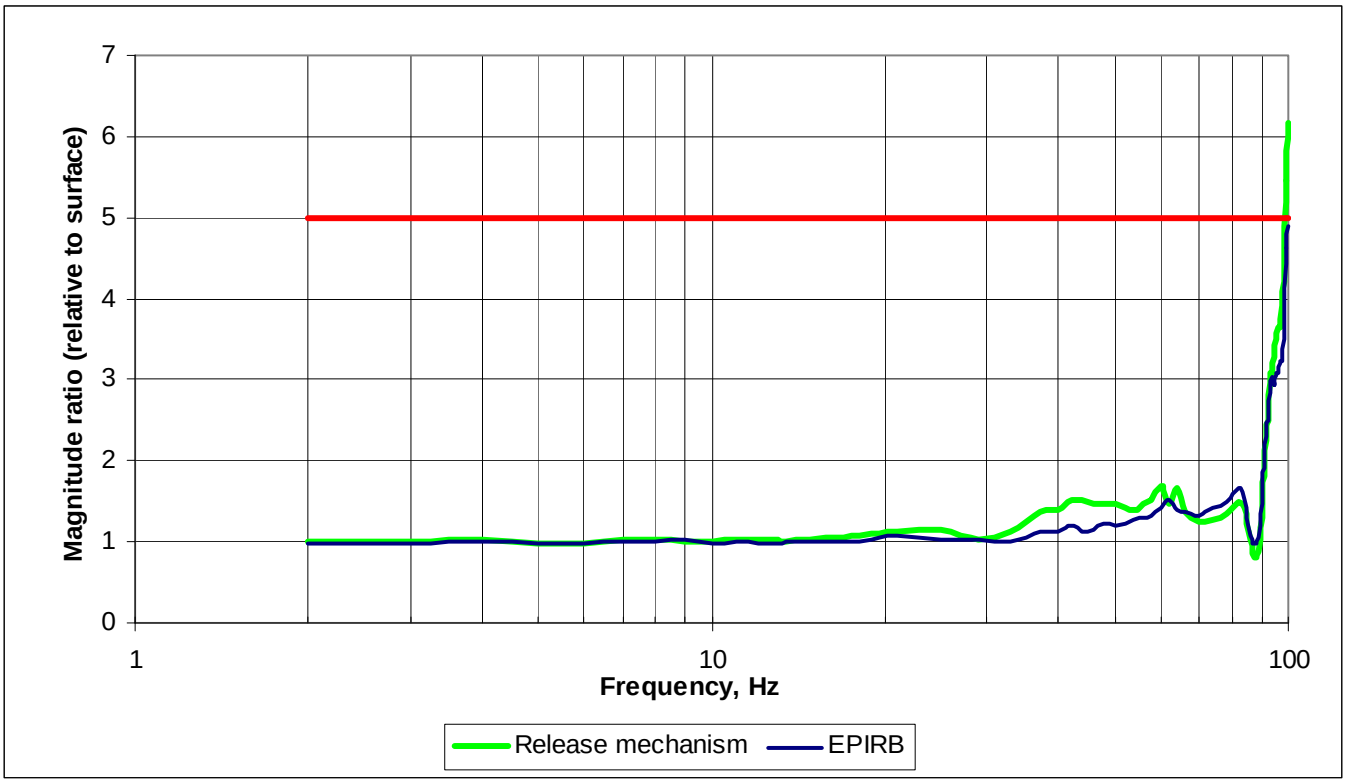

Figure 4.4 - Magnitude ratio vs. frequency during vibration on horizontal axis X

For vibration in horizontal axis Y EUT was fastened to the vibration table in its normal attitude using special brackets (see Figure 4.5).

Figure 4.5 - Vibration test in horizontal axis Y

Relative magnitude during vibration in horizontal axis Y is shown in Figure 4.6.

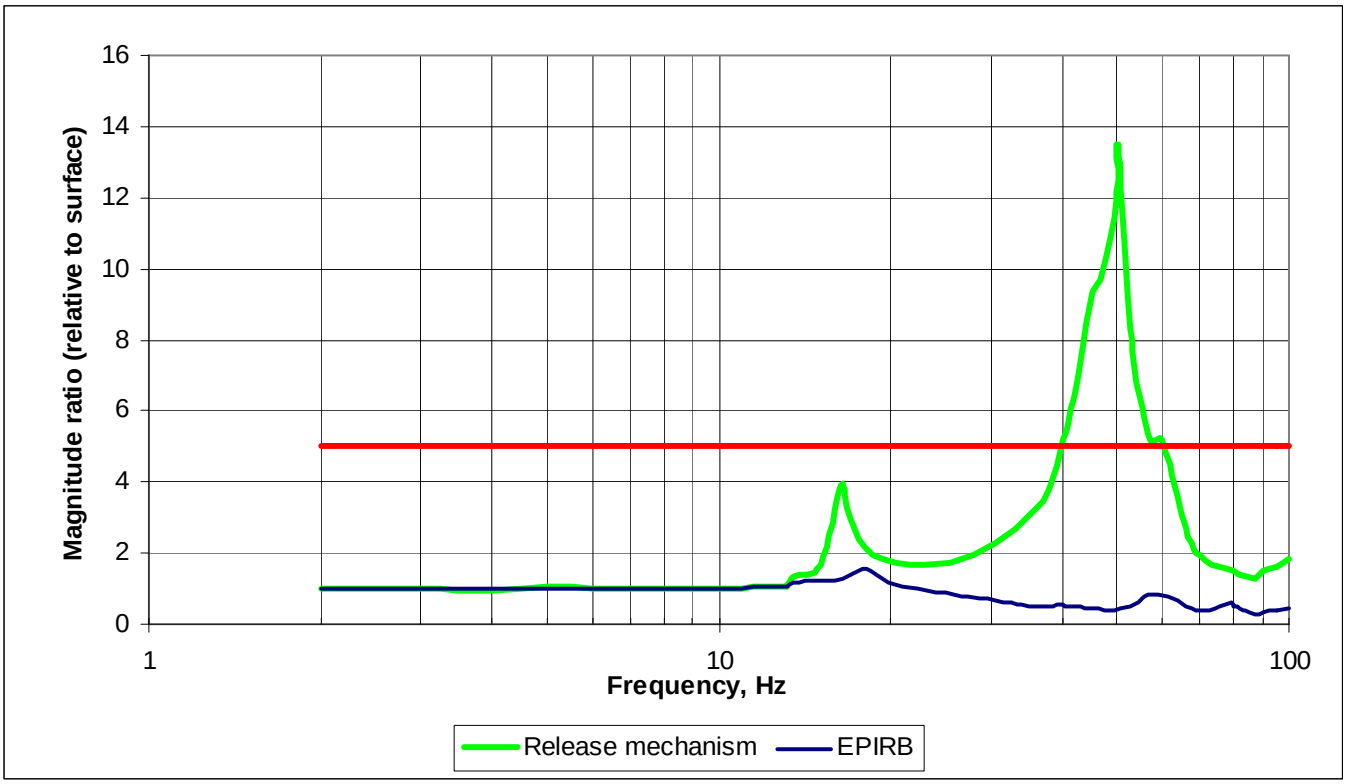

Figure 4.6 - Magnitude ratio vs. frequency during vibration on horizontal axis Y

After resonance found EUT was subjected to vibration endurance test for 2 hours at 7 m/s^2 at following frequencies:

- Z axis: 45.6 Hz
- X axis: 100.0 Hz
- Y axis: 50.3 Hz and 59.7 Hz

After endurance test EUT was subjected to performance check. Result of performance check is shown below.

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037007
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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
RUGGEDNESS TEST

Equipment under Test: EPIRB Tron60GPS s/n 00104 with release mechanism FB-60
SW version: 1.01
Test Date: 19.10.2011
Test Conditions:

- Ambient temperature: 17 °C
- Relative humidity: 59 %
- Atmospheric pressure: 761 mm/Hg
- Peak acceleration: 98 m/s2 ± 10 %
- Pulse duration: 16 ms ± 10 %
- Wave shape: Half-cycle sine wave
- Test axis: Vertical
- Number of bumps: 4 000
- Test duration: 2 hours

TEST PROGRAM

No	Test name	Requirements	Methods
1	Ruggedness test	A.1.5, 3.6.4, 3.7 b) IEC 61097-2	5.17.7 IEC 61097-2

TEST DESCRIPTION

The EUT was secured to the testing equipment through its normal attachments and mounted in the normal operating position. Additional straps or other holding means were not used.

After completion of the ruggedness test a performance check was carried out.

TEST RESULT

Passed

TEST DETAILS

Figure 5.1 - EUT set-up for ruggedness test

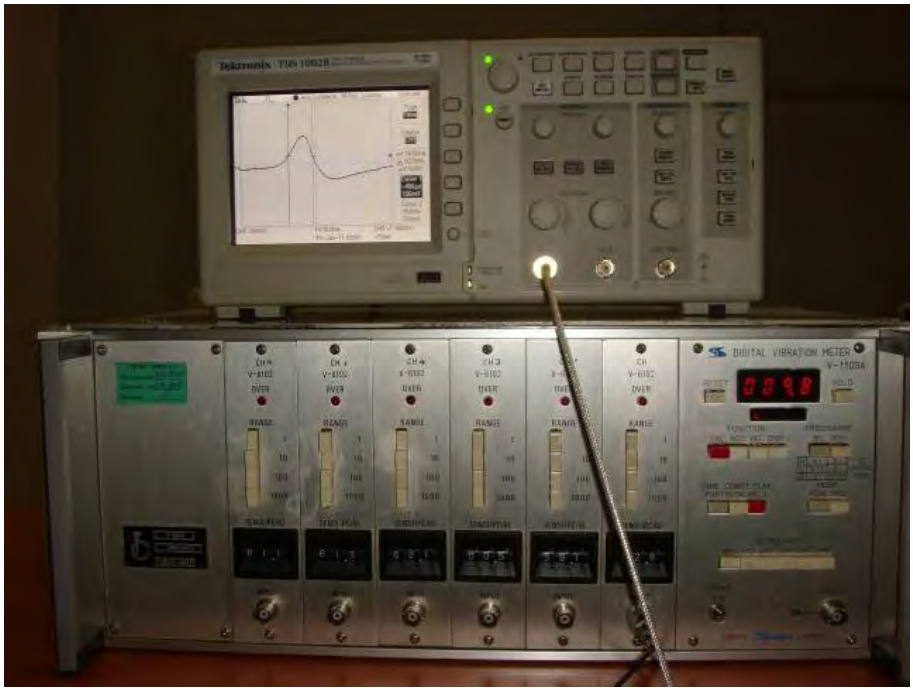

Figure 5.2 - Diagram of the bump testing equipment control channel

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037017
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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
DROP TEST

6.1 Drop on hard surface test

Equipment under Test: Tron60GPS s/n 00104
SW version: 1.01
Test Date: 24.01.2011
Test Conditions:

- Ambient temperature: 15 ºC
- Relative air humidity: 63 %
- Atmospheric pressure: 754 mm/Hg
- Test duration: 3 hours
- Measurement duration: 15 minutes

TEST PROGRAM

Item	Test name	Requirements	Methods s
1	Drop on hard surface test	A.1.6, 3.3.2 c) IEC 61097-2, 8.6.1.3 of IEC 60945	5.17.5.1 of IEC 61097-2, 8.6.1.2 of IEC 60945

TEST DESCRIPTION

The EUT was soaked at minimum stowage temperature -40 ºC for 2 hours.

Then drop test was performed within two minutes after removal from a temperature chamber. One drop was carried out at performance position of EUT.

The test surface consists of a piece of solid hard wood with a thickness of 150 mm and a mass of 30 kg.

The height of the lowest part of the EUT relative to the test surface at the moment of release was 1000 mm ± 10 mm.

The EUT was subjected to this test configured for use as in operational circumstances.

The three drops was initiated from a different orientation, namely:

- antenna vertically up,
- antenna vertically down and
- antenna horizontal.

At the end of the test the EUT was subjected to a performance check and examined for external indications of damage.

TEST RESULT

Passed

TEST DELAILS

Figure 6.1.1 - Set-up for drop test

No indication of damage was detected at the end of test.

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037101
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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

6.2 Drop into water test

Equipment under Test: Tron 60GPS s/n 00104
SW version: 1.01
Test Date: 24.01.2011
Test Conditions:

- Ambient temperature at open area test site: 2 ºC
- Relative air humidity: 65 %
- Atmospheric pressure: 754 mm/Hg
- Test duration: 2 hours
- Measurement duration: 15 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Drop into water test	A.1.7, 3.3.2 c) IEC 61097-2	5.17.5.2 of IEC 61097-2, 8.6.2.2 IEC 60945

TEST DESCRIPTION

The height of the lowest part of the EUT under test relative to the water surface at the moment of release was 20 m ± 1 m.

The three drops was initiated with a different orientation, namely:

- antenna vertically up,
- antenna vertically down and
- antenna horizontal.

At the end of the test EUT was subjected to a performance check, and then was examined for damage and for unwanted ingress of water.

TEST RESULT

Passed

TEST DETAILS

Figure 6.2.1 - View of test set-up from the bottom up.

Figure 6.2.2 - EUT dropping in water with antenna vertically up.

Figure 6.2.3 - EUT dropping in water with antenna horizontal.

Figure 6.2.4 - EUT dropping in water with antenna vertically down

No water ingress was detected inside of EUT on drop test completion.

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037029
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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 7
THERMAL SHOCK

Equipment under Test: EPIRB Tron 60GPS s/n 00104
SW version: 1.01
Test Date: 25.05.2011
Test Conditions:

- Ambient temperature: 23 ºC
- Relative humidity: 63 %
- Atmospheric pressure: 756 mm/Hg
- Test duration: 4 hours
- Measurement duration: 15 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Thermal shock	A.1.8 IEC 61097-2, A11.0, A11.1, A11.2 RTCM 11000.2	8.5.2 IEC 60945:2002 A11.0, A11.1, A11.2 RTCM 11000.2

TEST DESCRIPTION

EUT in mode READY was soaked in a temperature chamber at temperature -30 ºC ± 3 ºC for 3 h. After that EUT was totally immersed in fresh water at 2.5 °C for 8 seconds and then floated in water maintained at that temperature. Time of activation after immersed was noted.

Then EUT was removed from the water, deactivated set to REDY mode and thermally soaked at temperature -30 ºC ± 3 ºC for 3 h. After that EUT was totally immersed in salt water (5% NaCl) at 1.5 °C for 8 seconds and then floated in water maintained at that temperature. Time of activation after immersed was noted.

After 20 minutes, the following measurements were conducted while EUT was still in the water:

- aliveness test;
- short term frequency stability;
- medium term frequency stability:
    a. mean slope;
    b. residual frequency variation

EUT in mode READY was soaked in a temperature chamber at temperature 70 ºC ± 3 ºC for 3 h. After that EUT was totally immersed in fresh water at 30 °C for 8 seconds and then floated in water maintained at that temperature. Time of activation after immersed was noted.

Then EUT was removed from the water, deactivated set to REDY mode and thermally soaked at temperature 70 ºC ± 3 ºC for 3 h. After that EUT was totally immersed in salt water (5% NaCl) at 30 °C for 8 seconds and then floated in water maintained at that temperature. Time of activation after immersed was noted.

After 20 minutes, the following measurements were conducted while EUT was still in the water:

- aliveness test;
- short term frequency stability;
- medium term frequency stability:
    a. mean slope;
    b. residual frequency variation

TEST RESULT

Passed

TEST DETAILS

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	0.38	PASS
• Self-activation in salt water	5	minutes	0.33	PASS
• Aliveness Test:				
- Carrier Frequency	406.037 ± 0.001	MHz	406037.004 – 406037.010	PASS
- Power Output	35 - 39	dBm	36.04 – 36.09	PASS
• Frequency Stability				
- short term stability	≤0.002	parts/ million in 100 ms	0.000104 – 0.000110	PASS
medium term stability				
- mean slope	≤+0.001	parts/ million/ minute	-0.000815 to -0.000651	PASS
- residual frequency variation	≤0.003	parts/ million	0.000327 – 0.000428	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	406037.001 – 406037.003	PASS
- Power Output	35 - 39	dBm	36.01 – 36.02	PASS
• Frequency Stability				
- short term stability	≤0.002	parts/ million in 100 ms	0.000086 – 0.000093	PASS
medium term stability				
- mean slope	≤±0.001	parts/ million/ minute	-0.000366 to -0.000307	PASS
- residual frequency variation	≤0.003	parts/ million	0.000219 – 0.000247	PASS

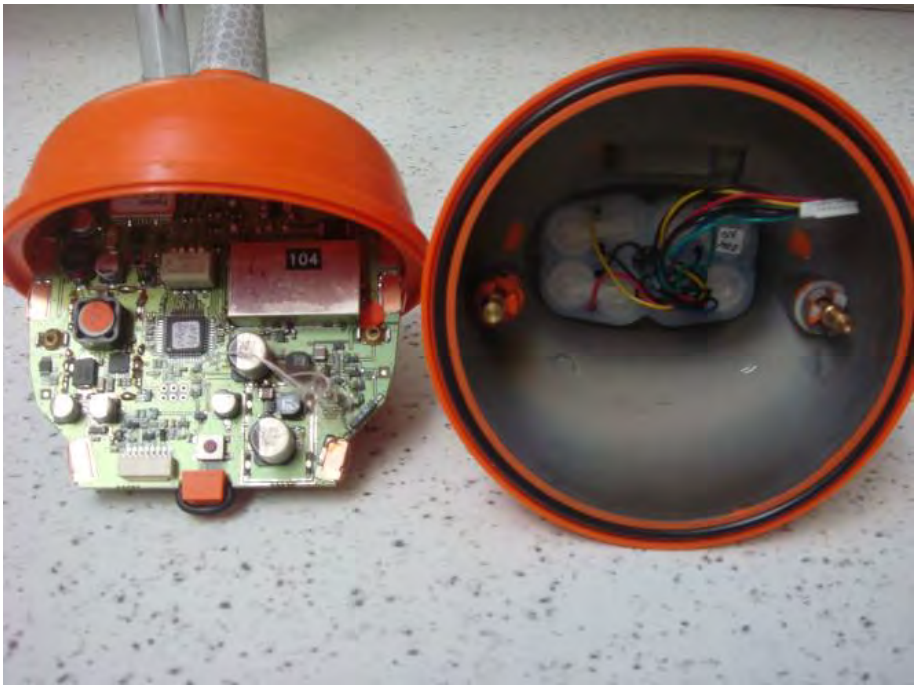

Figure 7.1 - Examination after test

Neither water ingress, nor damage was detected on completion of the test. Performance check result is presented in table below.

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 8
IMMERSION TEST

Equipment under Test: EPIRB Tron 60GPS s/n 00104 with release mechanism FB-60
SW version: 1.01
Test Date: 27.05.2011
Test Conditions:

- Ambient temperature: 24 ºC
- Relative humidity: 64 %
- Atmospheric pressure: 758 mm/Hg
- Hydraulic pressure of 100 kPa (1 bar)
- Test duration: 25 minutes
- Measurement duration: 3 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1.	Immersion test	A.1.9, 3.3.2 a) IEC 61097-2	5.17.8 of IEC 61097-2 8.9.2 of IEC 60945

TEST DESCRIPTION:

A hydraulic pressure of 100 kPa (1 bar) was applied to the EUT for a period of 5 min.

At the end of the test EUT was subjected to a performance check, and examined for a damage and unwanted ingress of water.

TEST RESULT

Passed

TEST DETAILS

Figure 8. 1 - Hydraulic pressure set-up (1 bar)

Neither water ingress, nor damage was detected on completion of the test. Performance check result is presented in table below.

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037000
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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 9
SPURIOUS EMISSION TEST

Equipment Under Test: EPIRB Tron 60GPS s/n 00101
EUT Software Release: 1.03
Test Date: 20.06.2011 - 22.06.2011
Test Conditions:
– Atmospheric pressure: 751..756 mm/Hg
– Relative air humidity: 45.7..49.2 %
– Temperatures Minimum: -20 °C
Maximum: +55 °C
Ambient: +26 °C

TEST PROGRAM

No	Test name	Requirements	Methods
1.	Spurious emission test	A.1.12 IEC 61097-2, A10.0 RTCM 11000.2	5.19 IEC 61097-2, A10.0 RTCM 11000.2

TEST DESCRIPTION:

The spurious and harmonic emissions measurements for the 406 MHz and 121.5 MHz signals were performed with the EUT at the minimum, maximum, and ambient temperatures.

TEST RESULT

Passed

TEST DETAILS

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

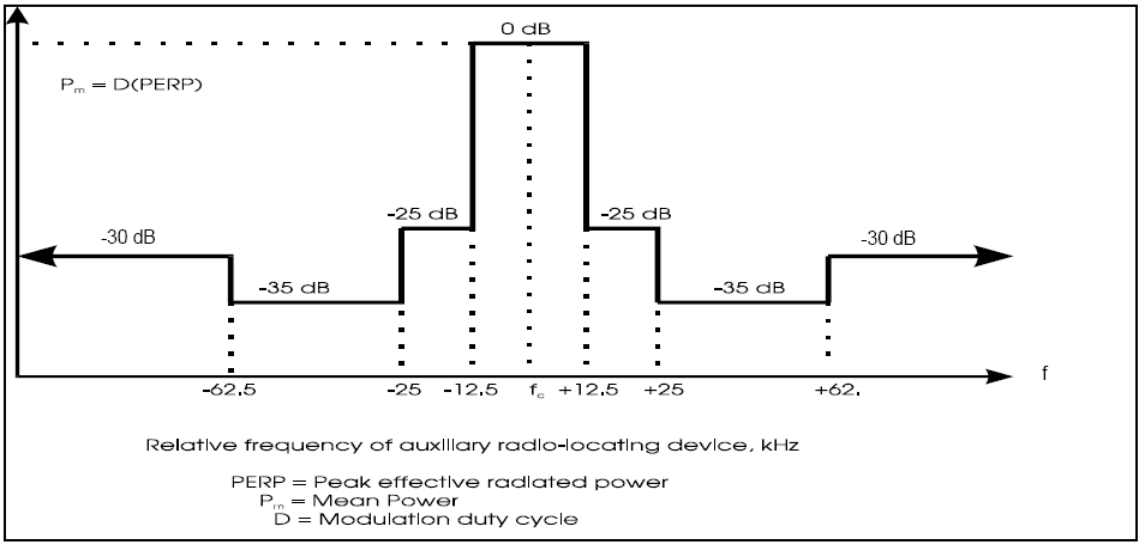

Figure 10.2 – Required Spurious Emissions for 121.5 MHz

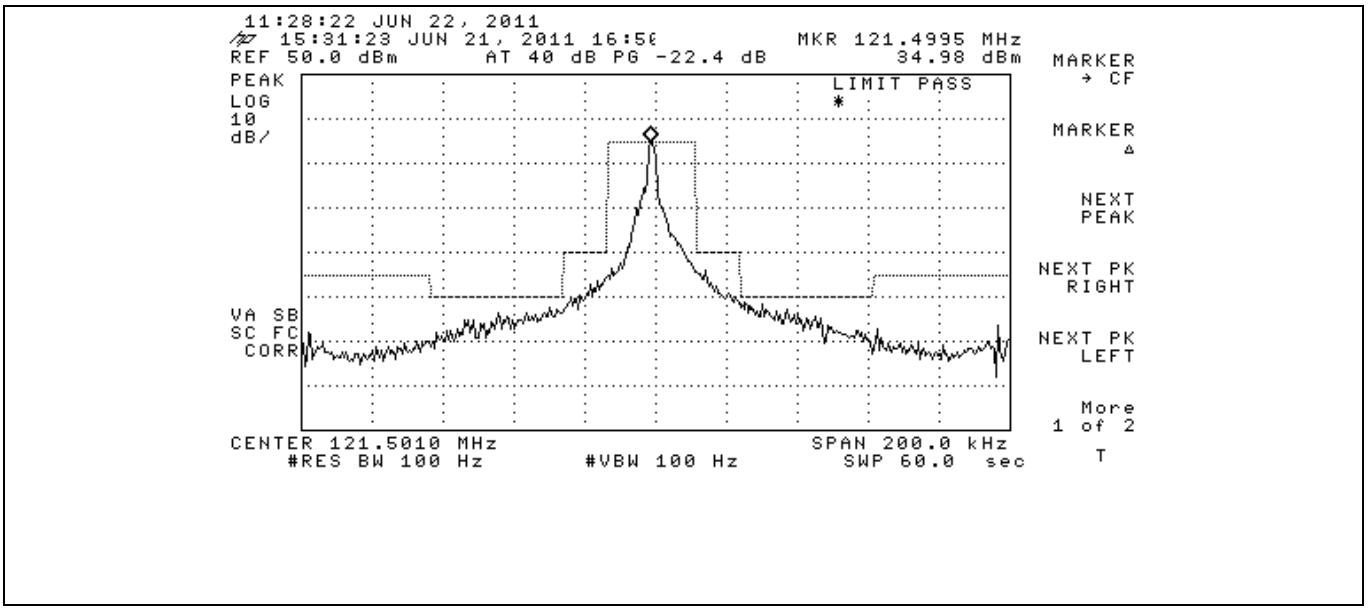

Figure 10.3 – EPIRB Tron 60GPS class 2 Spurious Emissions for 121.5 MHz at Minimum Temperature

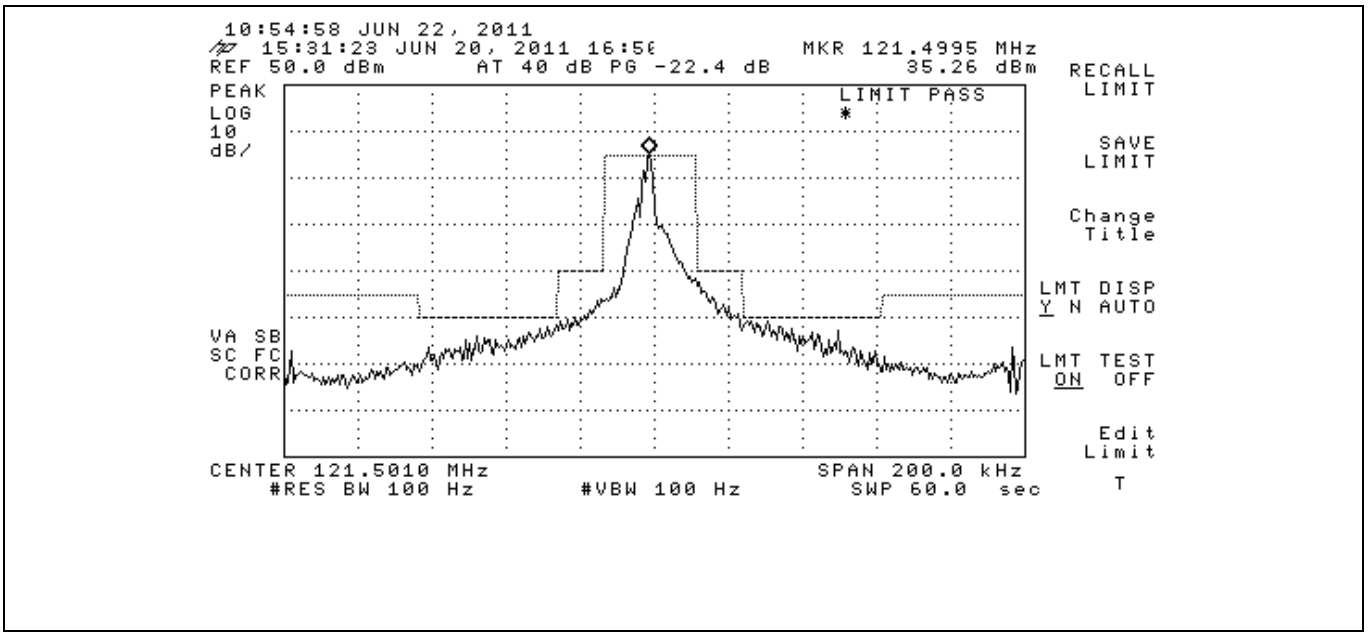

Figure 10.4 – EPIRB Tron 60GPS class 2 Spurious Emissions for 121.5 MHz at Ambient Temperature

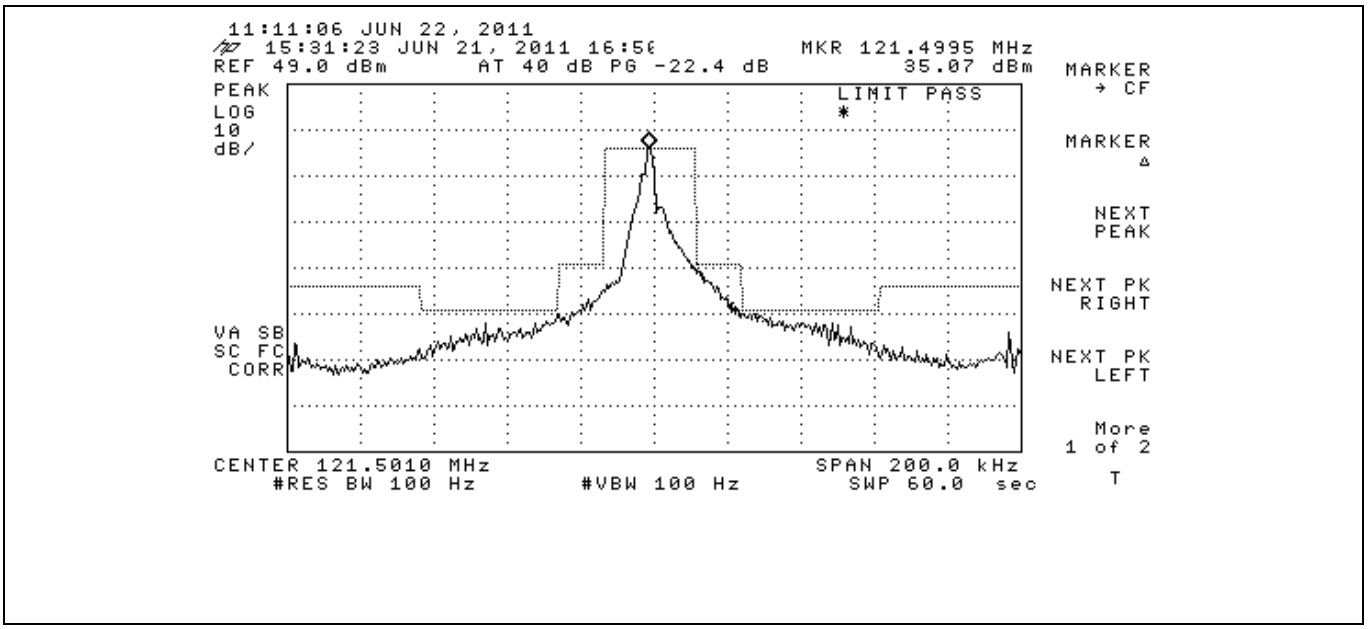

Figure 10.5 – EPIRB Tron 60GPS class 2 Spurious Emissions for 121.5 MHz at Maximum Temperature

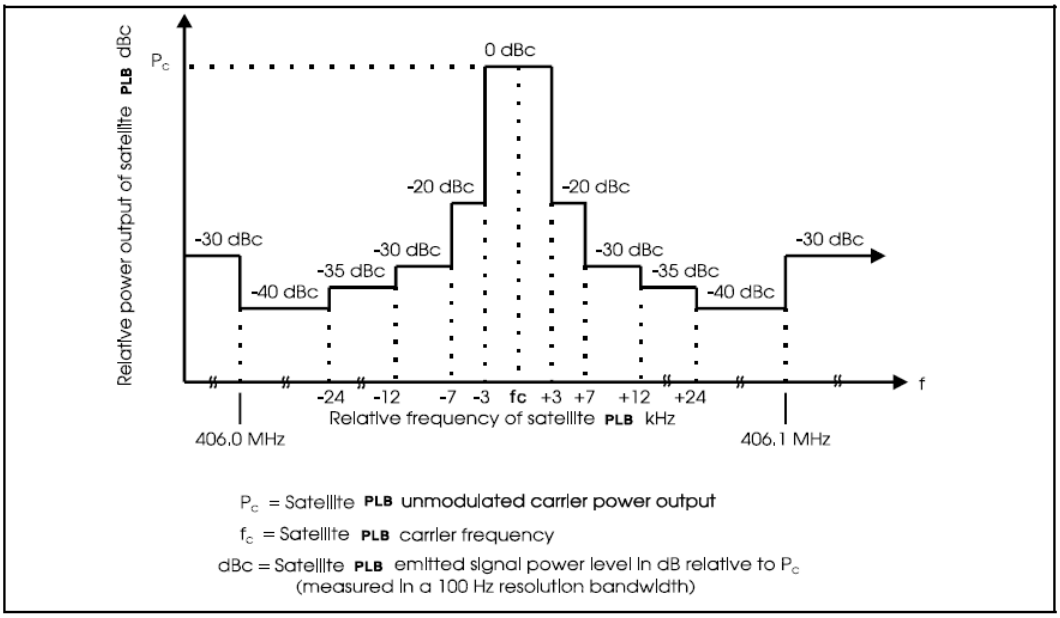

Figure 10.6 – Required Spurious Emissions for 406 MHz

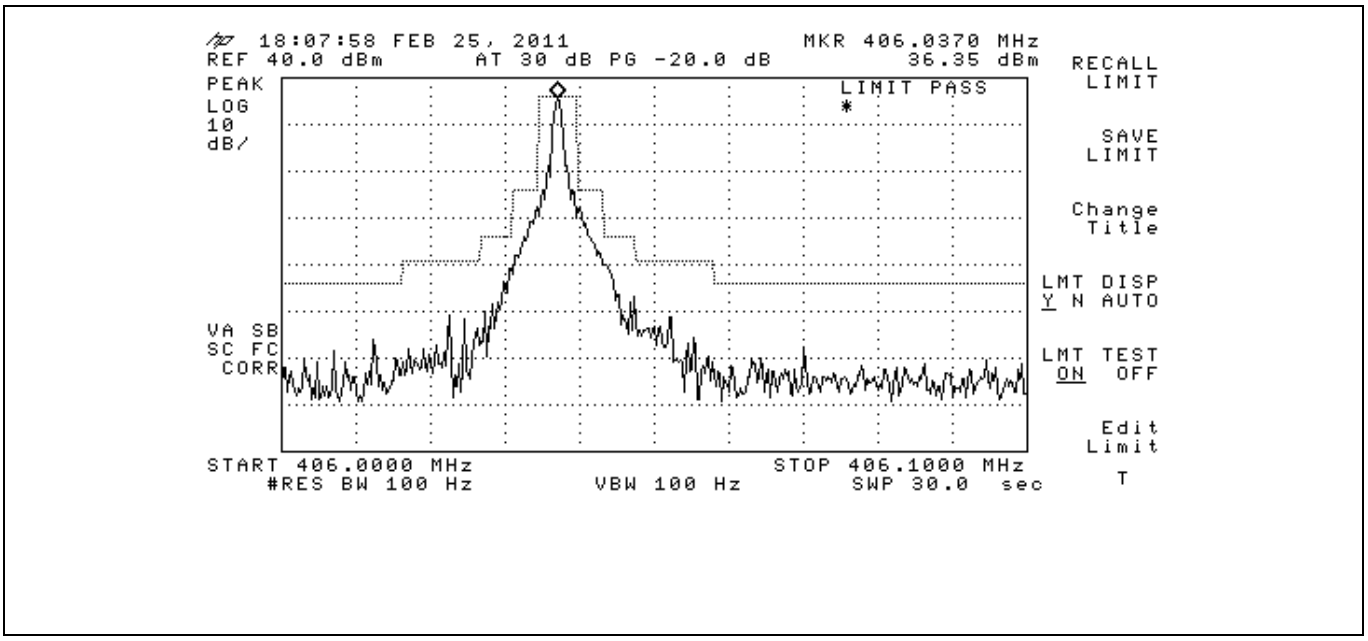

Figure 10.7 - EPIRB Tron 60GPS class 2 Spurious Emissions for 406 MHz at Minimum Temperature

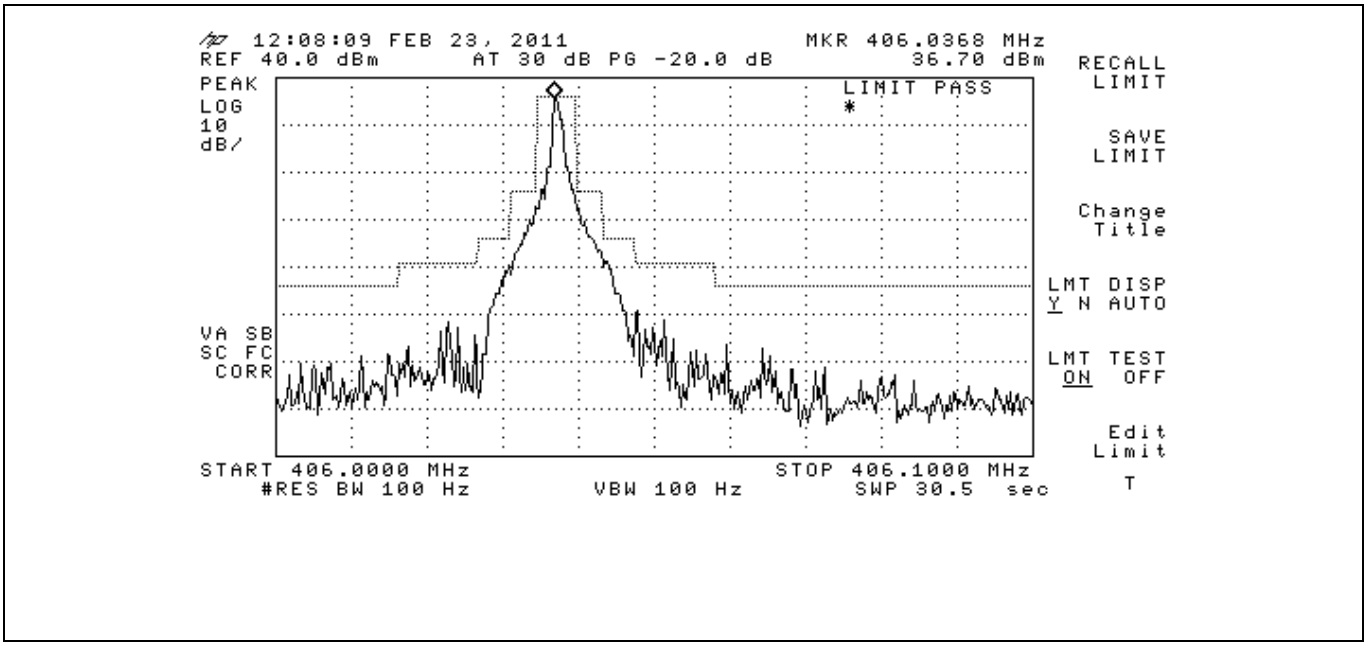

Figure 10.8 – EPIRB Tron 60GPS class 2 Spurious Emissions for 406 MHz at Ambient Temperature

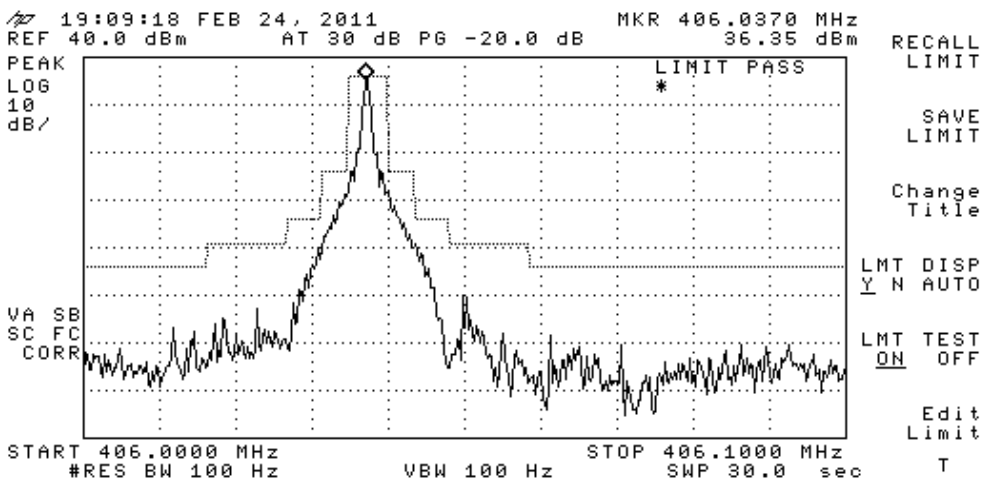

Figure 10.9 - EPIRB Tron 60GPS class 2 Spurious Emissions for 406 MHz at Maximum Temperature

FINAL RESULTS OF SPURIOUS EMISSIONS TEST (A10.0 RTCM 11000.2 Version 2.1) EPIRB Tron 60GPS class 2:

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. 10.3	PASS
Spurious Emissions 121.5 MHz at minimum temperature	Fig. 10.2	dBm	Fig. 10.4	PASS
Spurious Emissions 121.5 MHz at maximum temperature	Fig. 10.2	dBm	Fig. 10.5	PASS
Spurious Emissions 406 MHz at ambient temperature	Fig. 10.6	dBm	Fig.10.7	PASS
Spurious Emissions 406 MHz at minimum temperature	Fig. 10.6	dBm	Fig. 10.8	PASS
Spurious Emissions 406 MHz at maximum temperature	Fig. 10.6	dBm	Fig. 10.9	PASS

TEST EQUIPMENT

No	Name of test equipment	Type, model	S/N	Calibration Due date
1	Spectrum analyzer	HP8593E	3831U02306	07.2012
2	Climatic chamber	KPK-400V	15	08.2011

ANNEX 10
BATTERY CAPACITY AND LOW-TEMPERATURE TEST

Equipment under Test : EPIRB Tron 60GPS s/n 00104 with release mechanism
SW version: 1.04
Test Date: 17.09.2011 - 19.09.2011
Test Conditions:

- Ambient temperature at open area test site: 15…16 ºC
- Low operating temperature: -20 ºC
- Relative air humidity: 53…57 %
- Atmospheric pressure: 756…758 mm/Hg
- GNSS signal was not available during test.

TEST PROGRAM

No	Test name	Requirements	Methods
1	Battery capacity and low temperature test	A.1.11 IEC 61097-2, 4.6.1 IEC 61097-2	5.15.1 IEC 61097-2, A.2.3 C/S T.007

TEST DESCRIPTION

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.

Measurements at 6:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.83
Slope	-1.00E-09	1.00E-09	2.55E-11
Residual variations	0.00E-09	3.00E-09	3.15E-10
Short term variations	0.00E-09	2.00E-09	1.24E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 12:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.86
Slope	-1.00E-09	1.00E-09	5.50E-12
Residual variations	0.00E-09	3.00E-09	3.00E-10
Short term variations	0.00E-09	2.00E-09	3.71E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 18:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.86
Slope	-1.00E-09	1.00E-09	9.70E-12
Residual variations	0.00E-09	3.00E-09	3.74E-10
Short term variations	0.00E-09	2.00E-09	3.07E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	011001010111111000000
BCH 1 Calculated:	N/A	011001010111111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 24:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.83
Slope	-1.00E-09	1.00E-09	-8.68E-13
Residual variations	0.00E-09	3.00E-09	3.28E-10
Short term variations	0.00E-09	2.00E-09	3.62E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 30:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.74
Slope	-1.00E-09	1.00E-09	8.26E-13
Residual variations	0.00E-09	3.00E-09	3.77E-10
Short term variations	0.00E-09	2.00E-09	2.93E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 36:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.83
Slope	-1.00E-09	1.00E-09	6.67E-13
Residual variations	0.00E-09	3.00E-09	3.89E-10
Short term variations	0.00E-09	2.00E-09	3.29E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 42:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.85
Slope	-1.00E-09	1.00E-09	0.06E-11
Residual variations	0.00E-09	3.00E-09	3.46E-10
Short term variations	0.00E-09	2.00E-09	3.53E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Measurements at 48:00

406 MHz Transmitter Parameters	Limits		Measured
	min	max	current
Frequency, MHz	406.036	406.038	406.036994
Power*, W	3.16	7.94	4.85
Slope	-1.00E-09	1.00E-09	-2.10E-11
Residual variations	0.00E-09	3.00E-09	3.67E-10
Short term variations	0.00E-09	2.00E-09	3.14E-10
Message			
Contents (full)	:FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C		

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

Performance test result at 49:00

No	Parameter	Measured value
1	406 MHz transmitted power output, W	4.74 to 4.85
2	406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
3	406 MHz digital message generator (bit rate)	399.64 to 399.90
4	406 MHz modulation: +Phase deviation, rad -Phase deviation, rad Phase time rise, us Phase time fall, us Asymmetry, %	 1.07 to 1.11 -1.11 to -1.16 135.41 to 139.60 138.84 to 141.16 1.19 to 1.64
5	406 MHz transmitted frequency, MHz	406.036994
6	406 MHz spurious emissions	Figure 10.1

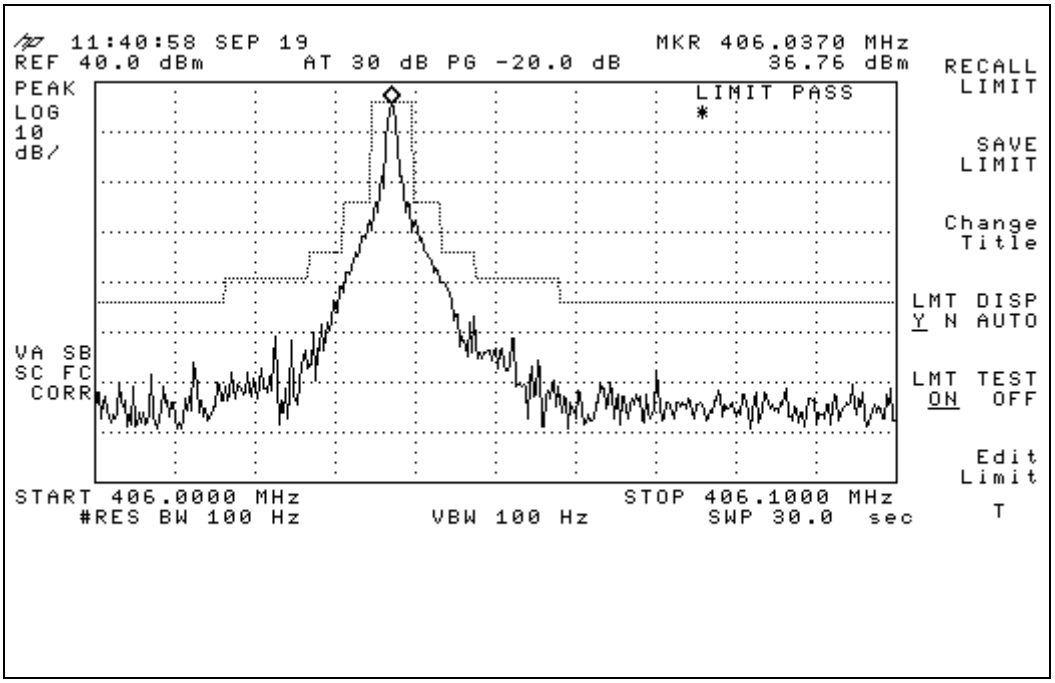

Figure 10. 1 Spurious emission

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201 - **Albania**	27-36	0011001001
Type of location protocol: Standard Location - EPIRB (MMSI)	37-40	0010
MID: 999999	41-60	11110100001000111111
Specific Beacon: 0	61-64	0000
Latitude Sign: default	65	0
Latitude Degrees: default	66-72	1111111
Latitude Minutes: default	73-74	11
Longitude Sign: default	75	0
Longitude Degrees: default	76-83	11111111
Longitude Minutes: default	84-85	11
BCH 1 Encoded:	86-106	01100101011111000000
BCH 1 Calculated:	N/A	01100101011111000000
Fixed bits (1101): Pass	107-110	1101
Position Data: Encoded Position Data Source From Internal Navigation Device	111	1
Aux Device: 121.5 MHz homer	112	1
Latitude Offset Sign: default	113	1
Latitude Offset Minutes: default	114-118	00000
Latitude Offset Seconds: default	119-122	1111
Longitude Offset Sign: default	123	1
Longitude Offset Minutes: default	124-128	00000
Longitude Offset Seconds: default	129-132	1111
BCH 2 Encoded:	133-144	011001101100
BCH 2 Calculated:	N/A	011001101100
Composite Latitude: default	N/A	Composite Longitude: default
15 Hex ID:	N/A	1925E847E0FFBFF

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 11
IMMUNITY TO RADIATED RADIO FREQUENCY DISTURBANCE

Equipment under Test #1: EPIRB Tron 60GPS s/n 00104 with release mechanism FB-60.
SW version: 1.01
Equipment under Test #2: EPIRB Tron 60S s/n 00102 with release mechanism FB-60.
SW version: 1.01
Test Date: 30.05.2011 … 01.06.2011
Test Conditions:

- Ambient temperature: 22…24 ºC
- Relative humidity: 63…69 %
- Atmospheric pressure: 757…761 mm/Hg
- Radiated disturbance: 10 V/m
- Range: 80 MHz - 2 GHz
- Equipment set- up: Table top
- EUT modes: 1) ON (normal operation mode)
  2) READY

TEST PROGRAM

No	Test name	Requirements	Methods
1.	**Interference testing.** Immunity to radiated radio frequency disturbance	A.1.13, 3.8 IEC 61097-2 10.4.3 IEC 60945	5.18 IEC 61097-2 10.4.2 IEC 60945

TEST DESCRIPTION

Test was carried out according to IEC60945 clause 10.4 and IEC61000-4-6.

EUT was installed in the radio adsorbing shielded room of a size 5,5 × 10 m and commensurate with the size of the EUT (figure 11.1).

EUT was set in the area of uniform field on the wooden rotating table 0,8 m height. The uniform area is calibrated with the test room empty.

EUT was tested in two configurations:

1) Normal operation mode: EUT was removed from release mechanism. EUT was set in centre of wooden rotating table and turned on for transmitting.

2) EUT was set in centre of wooden rotating table in READY mode.

EUT has not any associated cables.

The test was carried out as described in IEC 61000-4-3, at severity level 3 that equal 10 V/m at the 3 meter distance.

EUT was installed in vertical position and the test was carried out with the generating antenna facing each of the four sides of the EUT. Additionally the test was carried out with the generating antenna facing of the up side and bottom side of the EUT.

Generating antenna was placed at both vertical and horizontal polarizations sequentially during test.

EUT is initially placed with one face coincident with the calibration plane.

In configuration 1) EUT transmitted radio messages 0,5 s duration with 50 s period. In this configuration the influencing frequency swept by step progressive 1% from start range frequency (from 80 MHz for range 80 MHz to 300 MHz and progressive 1% from 1 GHz for range 1 GHz to 2 GHz) during 60 s periods that is enough to allow the detection of any malfunction of EUT.

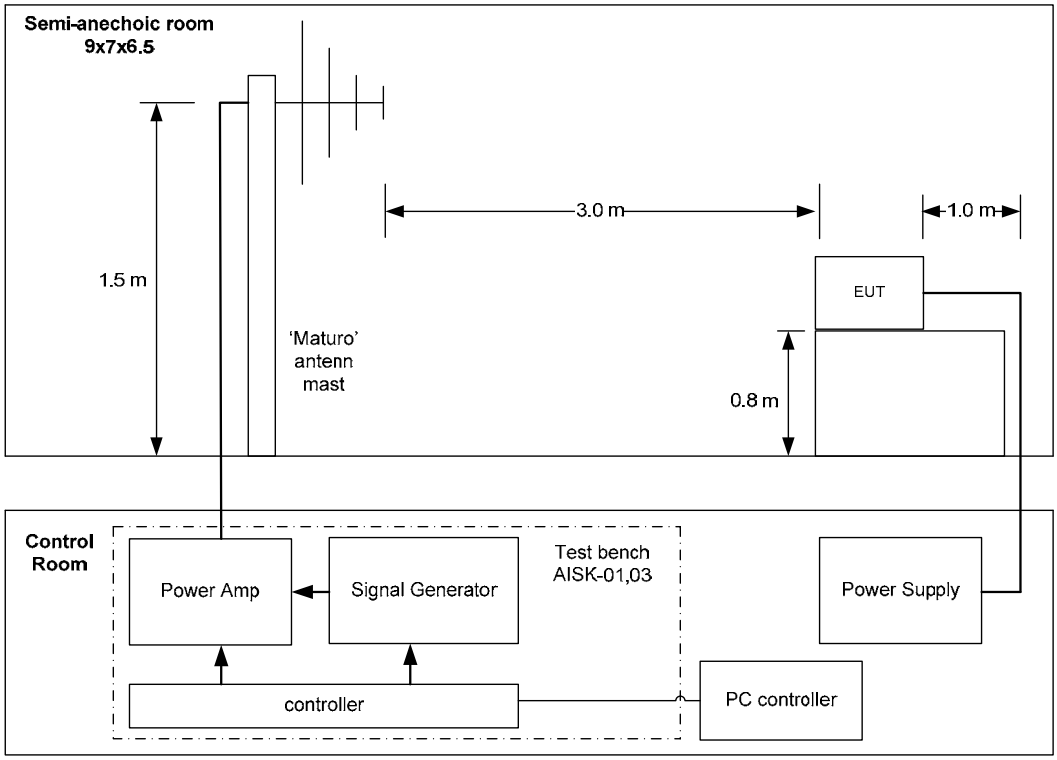

Figure 11. 1 - Test set-up.

In configuration 2) EUT was set to READY mode. EUT was checked for transmission and activation. Frequency range swept at a rate of $1{,}5 \cdot 10^{-3}$ decades/s for the frequency range 80 MHz to 1 GHz and of $0{,}5 \cdot 10^{-3}$ decades/s for the frequency range 1 GHz to 2 GHz.

EUT was placed in a modulated electric field of strength 10 V/m swept over the frequency range 80 MHz to 2 GHz. The modulation is at 400 Hz ± 10 % to a depth of 80 % ± 10 %.

At first EUT was tested at configuration 1). The test was carried out with the influencing frequency swept for each frequency range with horizontal polarizations position of the generating antenna. The test was repeated for vertical polarizations position of the generating antenna.

All previous tests were repeated with the generating antenna facing each of another five sides of the EUT.

Then EUT was tested at configuration 2).

The antenna of beacon tester was placed at 3 meters distance from EPIRB to receive unwanted transmission if any emitted while EUT in READY mode.

Performance check was carried out on completion of test.

Both EUT#1 and EUT#2 were subjected to test sequentially.

EUTs were checked during and after test with criteria B as following:

EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.

TEST RESULT

Passed

TEST DETAILS

Figure 11. 2 - General view of immunity test set-up. Vertical polarization.

Figure 11. 3 - General view of immunity test set-up. Horizontal polarization.

Table 11.1. Immunity to radiated radio frequency disturbance. Test Results configuration 1.

EUT No.	EUT position	Frequency range			
		80 MHz -1.0 GHz		1.0 GHz -2.0 GHz	
		Antenna polarization			
		Horizontal	Vertical	Horizontal	Vertical
#1	front	√ [1]	√	√	√
	right	√	√	√	√
	left	√	√	√	√
	rear	√	√	√	√
	up	√	√	√	√
	bottom	√	√	√	√
#2	front	√	√	√	√
	right	√	√	√	√
	left	√	√	√	√
	rear	√	√	√	√
	up	√	√	√	√
	bottom	√	√	√	√

[1] - Symbol √ indicates that testing demonstrated conformance EUT to requirements (criteria B).

Table 11.2. Immunity to radiated radio frequency disturbance. Test Results in configuration 2.

EUT No	EUT position	Frequency range			
		80 MHz -1.0 GHz		1.0 GHz -2.0 GHz	
		Antenna polarization			
		Horizontal	Vertical	Horizontal	Vertical
#1	front	√ [1]	√	√	√
	right	√	√	√	√
	left	√	√	√	√
	rear	√	√	√	√
	up	√	√	√	√
	bottom	√	√	√	√
#2	front	√	√	√	√
	right	√	√	√	√
	left	√	√	√	√
	rear	√	√	√	√
	up	√	√	√	√
	bottom	√	√	√	√

[1] - Symbol √ indicates that testing demonstrated conformance EUT to requirements (criteria B).

Table 11.3. Test levels for up side EUT (EUT#1 and EUT#2) orientations against the transmitting antenna.

Antenna polarization	Range, GHz	Field, V/m r.m.s.	Modulation	Sweep Rate, decades/s	Test Result
H	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
V	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
H	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass
V	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass

Table 11.4. Test levels for bottom side EUT (EUT#1 and EUT#2) orientations against the transmitting antenna.

Antenna polarization	Range, GHz	Field, V/m r.m.s.	Modulation	Sweep Rate, decades/s	Test Result
H	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
V	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
H	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass
V	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass

Table 11.5. Test levels for right side EUT (EUT#1 and EUT#2) orientations against the transmitting antenna

Antenna polarization	Range, GHz	Field, V/m r.m.s.	Modulation	Sweep Rate, decades/s	Test Result
H	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
V	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
H	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass
V	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass

Table 11.6. Test levels for left side EUT (EUT#1 and EUT#2) orientations against the transmitting antenna

Antenna polarization	Range, GHz	Field, V/m r.m.s.	Modulation	Sweep Rate, decades/s	Test Result
H	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
V	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
H	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass
V	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass

Table 11.7. Test levels for front side EUT (EUT#1 and EUT#2) orientations against the transmitting antenna

Antenna polarization	Range, GHz	Field, V/m r.m.s.	Modulation	Sweep Rate, decades/s	Test Result
H	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
V	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
H	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass
V	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass

Table 11.8. Test levels for rear side EUT (EUT#1 and EUT#2) orientations against the transmitting antenna

Antenna polarization	Range, GHz	Field, V/m r.m.s.	Modulation	Sweep Rate, decades/s	Test Result
H	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
V	0.08-1.0	10	AM, 400 Hz, depth 80%	$1.5 \cdot 10^{-3}$	Pass
H	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass
V	1.0-2.0	10	AM, 400 Hz, depth 80%	$0.5 \cdot 10^{-3}$	Pass

Table 11.9. Summary table of performance check for EUT#1 during range (80-300) MHz, vertical polarization.

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036962
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 11.10. Summary table of performance check for EUT#2 during range (80-300) MHz, vertical polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036974
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

Table 11.11. Summary table of performance check for EUT#1 during range (80-300) MHz, horizontal polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036999
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 11.12. Summary table of performance check for EUT#2 during range (80-300) MHz, horizontal polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036960
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

Table 11.13. Summary table of performance check for EUT#1 during range (0.3-1) GHz, vertical polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037004
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 11.14. Summary table of performance check for EUT#2 during range (0.3-1) GHz, vertical polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036961
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

Table 11.15. Summary table of performance check for EUT#1 during range (0.3-1) GHz, horizontal polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036999
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 11.16. Summary table of performance check for EUT#2 during range (0.3-1) GHz, horizontal polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036967
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

Table 11.17. Summary table of performance check for EUT#1 during range (1-2) GHz, vertical polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037008
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 11.18. Summary table of performance check for EUT#2 during range (1-2) GHz, vertical polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036960
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

Table 11.19. Summary table of performance check for EUT#1 during range (1-2) GHz, horizontal polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037005
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 11.20. Summary table of performance check for EUT#2 during range (1-2) GHz, horizontal polarization

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036965
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

TEST EQUIPMENT

No	Name	Type, model	Ser. No	Calibration Due date
1	Test bench	AISK-01	468223.002	03.2012
2	Test bench	AISK-03	468223.0027	03.2012
3	Antenna	VULB9163	DS0512089163244	03.2012
4	Antenna mast	Maturo AM 4.0	101450	N/A
5	Beacon tester	BT-611	1005	06.2011

ANNEX 12
IMMUNITY TO ELECTROSTATIC DISCHARGE

Equipment under Test #1: EPIRB Tron 60GPS s/n 00104
SW version: 1.01
Equipment under Test #2: EPIRB Tron 60S s/n 00102
SW version: 1.01
Test Date: 02.06.2011
Test Conditions:

- Ambient temperature: 23 ºC
- Relative humidity: 70 %
- Atmospheric pressure: 759 mm/Hg
- EUT modes: 1) ON (Normal operation)
  2) READY
- Test duration: 1 hour.
- Measurement duration: 30 minutes.

TEST PROGRAM

Item	Test name	Requirements item	Methods
1	**Interference testing.** Immunity to electrostatic discharge	A.1.13, 3.8 IEC 61097-2, 10.9.3 IEC 60945	5.18 IEC 61097-2, 10.9.2 IEC 60945

TEST DESCRIPTION

The test was carried out as described in IEC 61000-4-2 using an electrostatic discharge (ESD) generator, that was an energy storage capacitance of 150 pF and a discharge resistance of 330 Ω connected to a discharge tip.

The EUT was placed on, but insulated from, a metal ground plane which projected beyond the EUT on all sides (figure 12.1).

Discharges from the generator were applied to those points and surfaces that are accessible to personnel during normal usage. The ESD generator was held perpendicular to the surface. Each position was tested with 10 discharges positive and negative with intervals of 1 s between discharges.

In order to simulate discharges on objects placed or installed near to the EUT, 10 single contact discharges, positive and negative, were applied to the ground plane at positions on each side of, and 0,l m from, the EUT. A further 10 discharges were applied to the centre of one edge of a vertical coupling plane (VCP), with this plane in enough different positions so that the four faces of the EUT were completely illuminated.

The test levels were 6 kV contact discharge and 8 kV air discharge.

EUT was subjected to the test in both modes ON and READY sequentially.

The antenna of beacon tester was placed at 3 meters distance from EPIRB to receive unwanted transmission if any emitted while EUT in READY mode.

Both EUT#1 and EUT#2 were subjected to test sequentially.

EUTs were checked during and after test with criteria B as following:

EUT shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed, as defined in the relevant equipment standard and in the technical specification published by the manufacturer. During the test, degradation or loss of function or performance which is self-recoverable is however, allowed, but no change of actual operating state or stored data is allowed.

TEST RESULT

Passed

TEST DETAILS

Table 12.1. Immunity to Electrostatic Discharge. EUT in mode ON.

	Contact discharge to conducted surfaces and to coupling planes				Air discharge at insulating surfaces	
	Direct contact discharge		Indirect contact discharge			
Test voltage	Reaction of EUT	Result	Reaction of EUT	Result	Reaction of EUT	Result
+ 2 kV – 2 kV	absent	passed	absent	passed	n/a	n/a
+ 4 kV – 4 kV	absent	passed	absent	passed	n/a	n/a
+ 6 kV – 6 kV	absent	passed	absent	passed	n/a	n/a
+ 8 kV – 8 kV	n/a	n/a	n/a	n/a	absent	passed

Table 12.2. Immunity to Electrostatic Discharge Test Results. EUT in mode READY.

	Contact discharge To conducted surfaces and to coupling planes				Air discharge At insulating surfaces	
	Direct contact discharge		Indirect contact discharge			
Test voltage	Reaction of EUT	Result	Reaction of EUT	Result	Reaction of EUT	Result
+ 2 kV – 2 kV	no EPIRB's transmission	√	no EPIRB's transmission	√	n/a	n/a
+ 4 kV – 4 kV	no EPIRB's transmission	√	no EPIRB's transmission	√	n/a	n/a
+ 6 kV – 6 kV	no EPIRB's transmission	√	no EPIRB's transmission	√	n/a	n/a
+ 8 kV – 8 kV	n/a	n/a	n/a	n/a	no EPIRB's transmission	√

Table 12.3. Summary table of performance check for EUT#1 after electrostatic discharge

No	**Parameter**	**Measured value**
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036998
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

Table 12.4. Summary table of performance check for EUT#2 after electrostatic discharge

No	**Parameter**	**Measured value**
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.036965
3	The 406 MHz digital message	FFFE2F 4C9418618618668A26F190
4	15 HEX ID	992830C30C30CD1
5	Homing Transmitter output	present

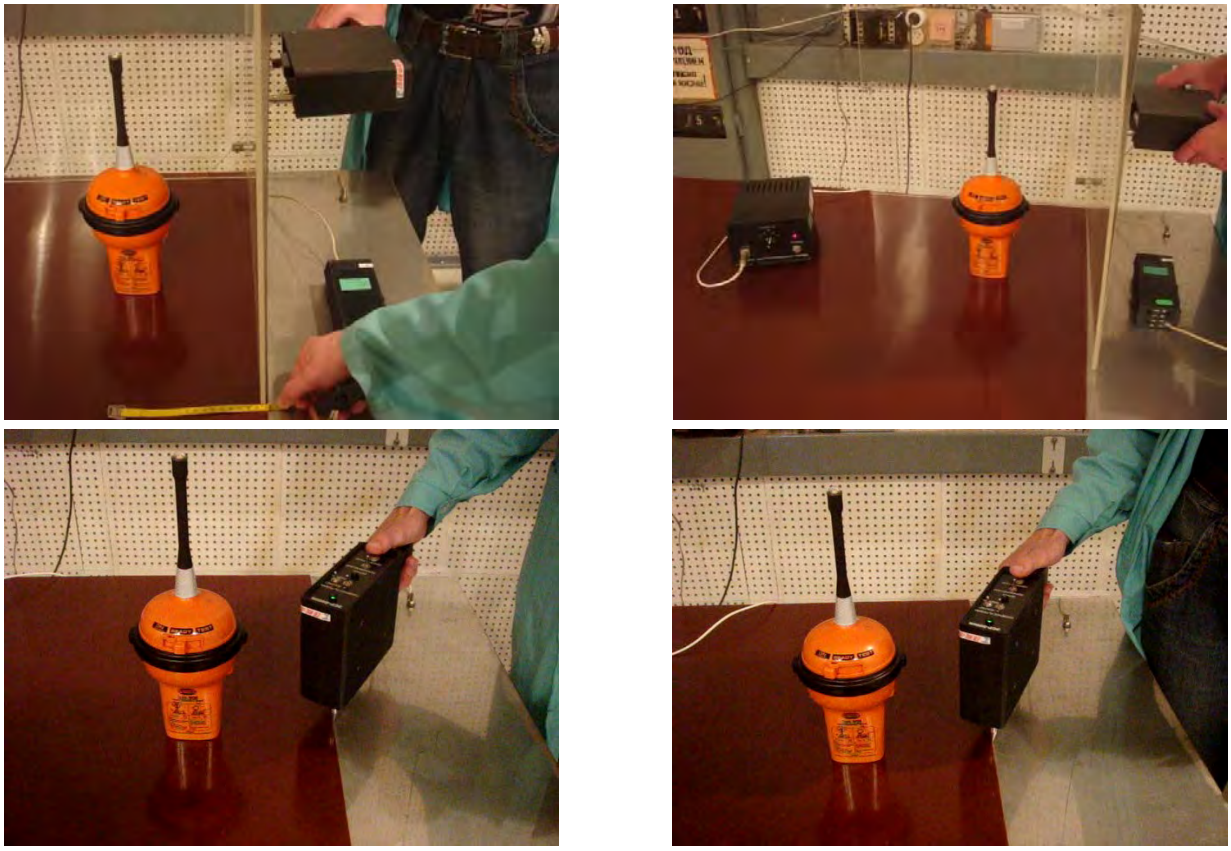

Figure 12.1 - Site for Test of Immunity to Electrostatic Discharge (EUT#1)

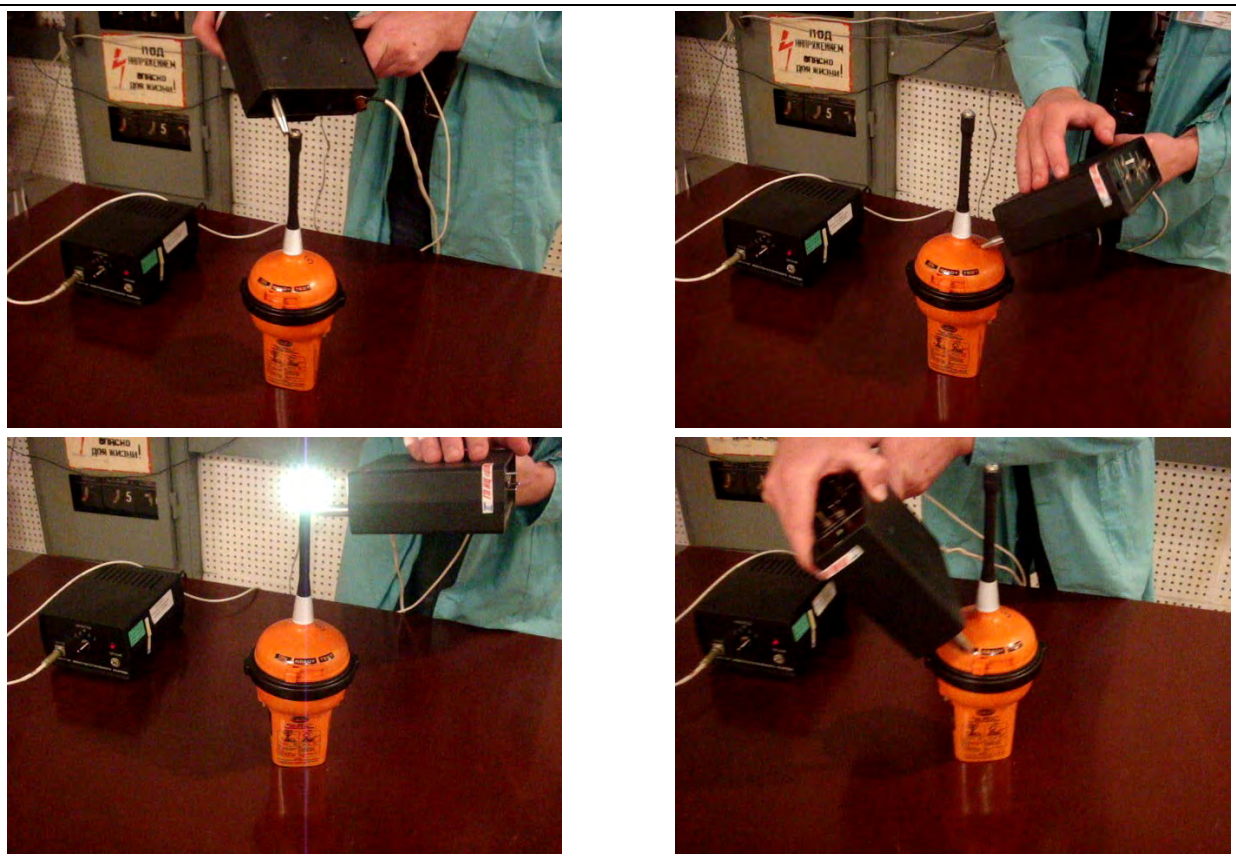

Figure 12.2 - Site for Test of Immunity to Electrostatic Discharge (EUT#1)

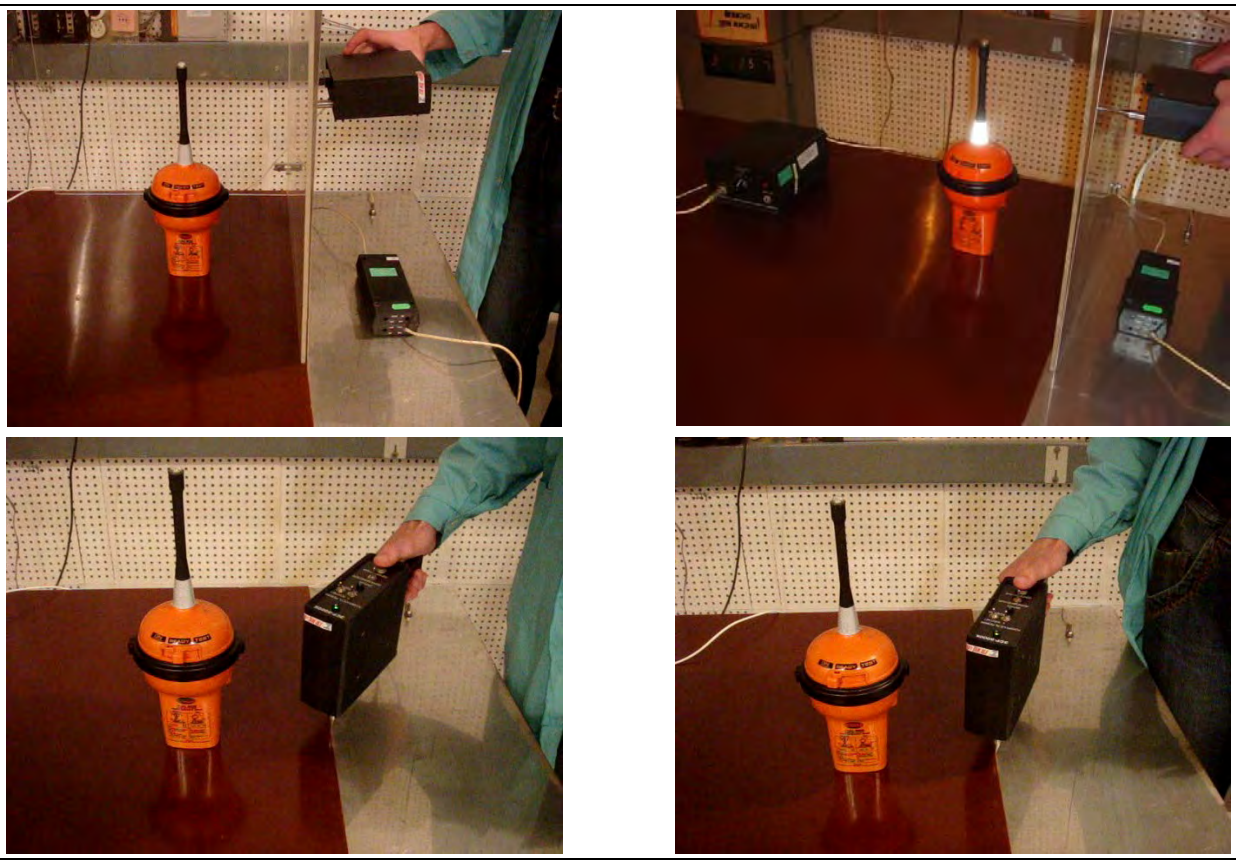

Figure 12.3 – Site for Test of Immunity to Electrostatic Discharge (EUT#2)

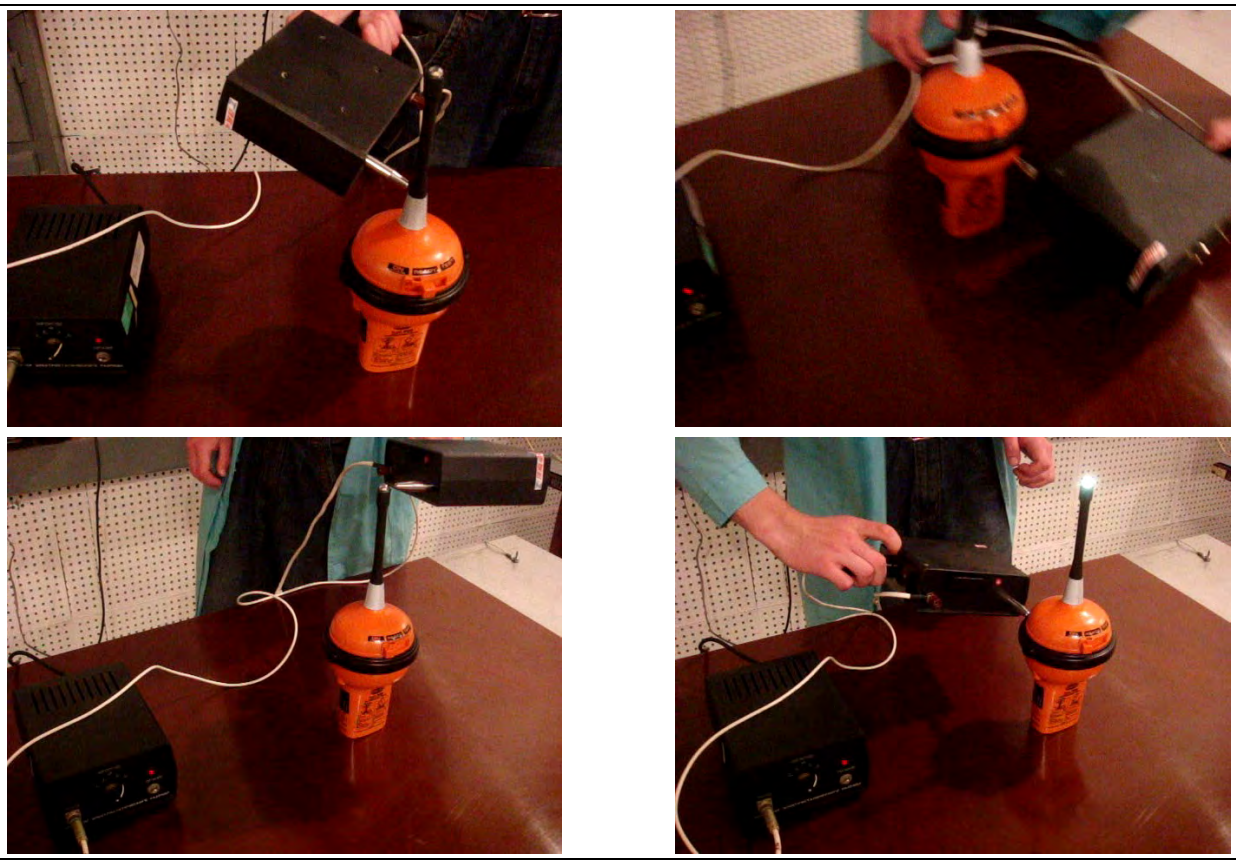

Figure 12.4 – Site for Test of Immunity to Electrostatic Discharge (EUT#2)

TEST EQUIPMENT

No	Name	Type, model	Ser. No	Calibration Due date
1	Electrostatic discharge simulator	ЭСР 8000К	5	04.2012
2	Beacon tester	ВТ-611М	1005	06.2011

ANNEX 13
PREVENTION TO INADVERTENT ACTIVATION

Equipment under Test : EPIRB Tron 60GPS s/n 00104 with release mechanism FB-60
SW version: 1.04
Test Date: 27.10.2011
Test Conditions:

- Ambient temperature: 7 ºC
- Relative air humidity: 59 %
- Atmospheric pressure: 765 mm/Hg
- Duration of exposure by water stream: 5 min
- Test duration: 1 hour

TEST PROGRAM

No	Test name	Requirements	Methods
1	Prevention to inadvertent activation	A.2.1, 5.3.1 IEC 61097-2	5.5.1.1 IEC 61097-2

TEST DESCRIPTION

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.

TEST RESULT

Passed

TEST DETAILS

EPIRB was not released from its release mechanism nor was automatically activated as a result of the water from the hose stream.

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

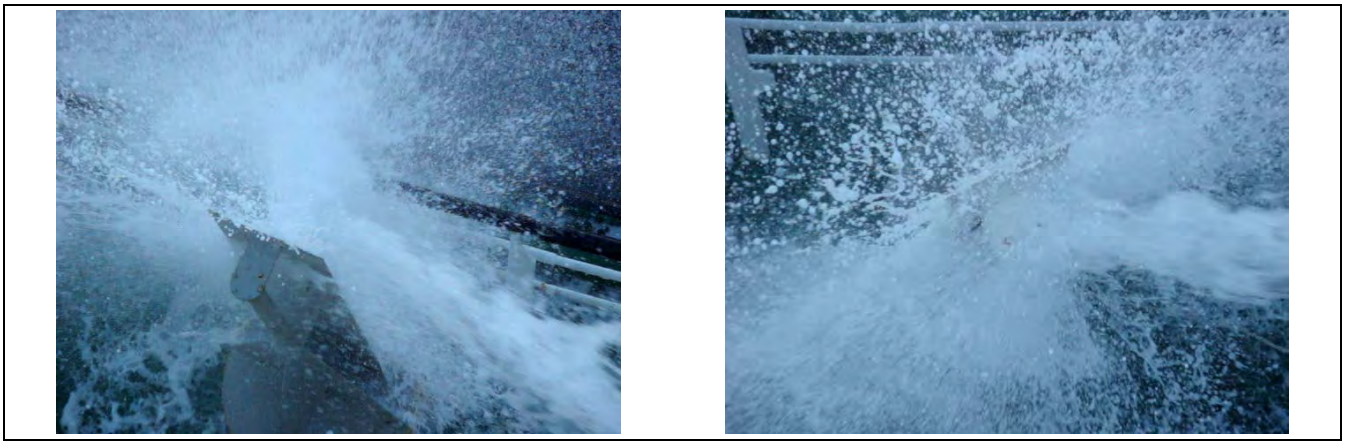

Figure 13.2 - The water strikes EUT in an arc of 180°.

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

Parameter	Conclusion
EUT is fitted with adequate means to prevent inadvertent activation an deactivation	Passed
EUT was not released from release mechanism. EUT was not inadvertently activated.	Passed

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 14
SOLAR RADIATION TEST

Equipment under Test: EPIRB(s) Tron60GPS / Tron60S with release mechanism FB-60
Serial No.: not applicable
Test Date: 11.11.2011

TEST PROGRAM

Item	Test name	Requirements	Methods
1	Solar radiation test	A.2.7 IEC 61097-2, 8.10.4 IEC 60945	8.10.3 IEC 60945

TEST DESCRIPTION

Test was waived as manufacturer had been submitted evidence that materials employed in the equipment satisfy the test. All of submitted documents listed below are included in this Annex.

No	Name	Contents	Author	Page
1	Information On Previous Testing (Solar and Oil Resistance)	Type approval of COSPAS-SARSAT 406 MHz Beacon Tron60S/GPS	Jotron AS	93
2	Information On Previous Testing (Solar and Oil Resistance)	Type approval of FB60 float free bracket for Tron60S/GPS	Jotron AS	95
3	Ticona Product Data Datasheet	Data sheet for HOSTAFORM S 9364	Ticona	97
4	PTS Technical Information	Specification for Thermoprene	Plastic Technologic Service	100

TEST RESULT

Waived

Jotron AS
Jotron UK Ltd
Jotron Phontech AS
Jotron Consultas AS
Jotron Asia Pte. Ltd.
Jotron USA, Inc.
UAB Jotron

To whom it may concern

Tjodalyng: 08.11.11

Information On Previous Resting (Solar Radiation and Oil Resistance)

Re.: type approval of COCPAS-SARSAT 406 MHz Beacon Tron60S/GPS

This letter is to advise that items in our above mentioned EPIRB Tron60S/GPS are produced in materials complying with regulations given by international standard IEC 60945 Global maritime distress and safety systems in regards to solar, oil, and corrosion resistance.

Item #	Description	Material	Exposed to solar radiation	Wavered (proven by use on existing maritime GMDSS products)
83088	Antenna (overmould)	TPE (Thermoprene-75A10_9007)	Yes	No
85862	Equator belt	POM (Hostaform S9364)	Yes	No
83077	Lens	PC	Yes	Yes
83074	Main Housing	PC GF	Yes	Yes
83075	Battery housing	PC GF	Yes	Yes
83098	Pull Tab	POM	Yes	Yes
86563	Lanyard Coil	PA6	No	Yes
85654	Spring	Stainless steel	No	Yes
83096	Seawater contact	Brass TP	No	Yes

Enclosed documentation (typical applications for use) for materials in items not wavered.

Jotron AS
Jotron UK Ltd.
Jotron Phontech AS
Jotron Consultas AS
Jotron Asia Pte. Ltd.
Jotron USA, Inc.
UAB Jotron

Items wavered on basis of long term use in misc. accepted maritime GMDSS products as our Tron 40S/GPS, Tron SART 20 and S-VDR, MED approved by BSH.

This equipment has proven itself most capable of withstanding subjection to a severe maritime environment since 1997, and we have delivered more than 40.000 units to the marked. So far we have not discovered any corrosion problems causing malfunction of the equipment. Based on use of the same material combination above and enclosed documentation of the material used in the body, we request acceptance, by way of waiver to tests laid out within EN60945 clauses 8.10 and 8.11, covering resistance to solar radiation and oil resistance.

For and behalf of
Jotron AS

Bjørn Rishovd
Certification Manager

Jotron AS
Jotron UK Ltd.
Jotron Phontech AS
Jotron Consultas AS
Jotron Asia Pte. Ltd.
Jotron USA. Inc.
UAB Jotron

To whom it may concern

Tjodalyng: 02.11.11

Information On Previous Resting (Solar Radiation and Oil Resistance)

Re.: type approval of FB60 float free bracket for Tron60S/GPS

This letter is to advise that items in our above mentioned bracket FB60 are produced in materials complying with regulations given by international standard IEC 60945 Global maritime distress and safety systems in regards to solar, oil, and corrosion resistance.

Item #	Description	Material	Exposed to solar radiation	Wavered (proven by use on excisting maritime GMDSS products)
85619	Front Cover	ASA	Yes	Yes
85618	Rear Cover	ASA	Yes	Yes
80187	Damper washer	POM	Yes	Yes
80184	Plastic bolt	POM	Yes	Yes
85220	Snap lock	PA6	No	Yes
85617	Catapult	PA6 GF	No	Yes
85736	Release spring	Stainless steel	No	Yes
85818	Vibration damper	TPE	No	Yes
85819	Sleeve	Brass, NP	No	Yes

Items wavered on basis of long term use in misc. accepted maritime GMDSS products as our FB-4, 5 and 6 bracket for Tron 40S/GPS, MED approved by DNV and BSH.

Jotron AS
Jotron UK Ltd.
Jotron Phontech AS
Jotron Consultas AS
Jotron Asia Pte. Ltd.
Jotron USA, Inc.
UAB Jotron

This equipment has proven itself most capable of withstanding subjection to a severe maritime environment since 1997, and we have delivered more than 15.000 units to the marked. So far we have not discovered any corrosion problems causing malfunction of the equipment. Based on use of the same material combination above and enclosed documentation of the material used in the body, we request acceptance, by way of waiver to tests laid out within EN60945 clauses 8.10 and 8.11, covering resistance to solar radiation and oil resistance.

For and behalf of
Jotron AS

Bjørn Rishovd
Certification Manager

Ticona Product Data Datasheet

HOSTAFORM S 9364 | Impact Modified

high performance impact modified

Description

Preliminary Data Sheet

Hostaform® acetal copolymer grade S 9364 is highly impact modified grade for demanding applications. Hostaform® S 9364 provides a significant improvement in impact strength and flexibility over standard impact modified grades such as Hostaform® S 9063 and S 9064.

Physical Properties	Value	Unit	Test Standard
Density	**1370**	kg/m³	ISO 1183
Melt volume rate (MVR)	**3.5**	cm³/10min	ISO 1133
MVR test temperature	**190**	°C	ISO 1133
MVR test load	**2.16**	kg	ISO 1133
Mold shrinkage - parallel	**1.8**	%	ISO 294-4
Mold shrinkage - normal	**1.3**	%	ISO 294-4
Water absorption (23°C-sat)	**0.8**	%	ISO 62
Humidity absorption (23°C/50%RH)	**0.25**	%	ISO 62
Mechanical Properties	**Value**	**Unit**	**Test Standard**
Tensile modulus (1mm/min)	**1650**	MPa	ISO 527-2/1A
Tensile stress at yield (50mm/min)	**43**	MPa	ISO 527-2/1A
Tensile strain at yield (50mm/min)	**16.0**	%	ISO 527-2/1A
Flexural modulus (23°C)	**1550**	MPa	ISO 178
Charpy impact strength @ 23C	**NB**	KJ/m²	ISO 179/1eU
Charpy impact strength @-30C	**NB**	KJ/m²	ISO 179/1eU
Charpy notched impact strength @ 23°C	**21.0**	KJ/m²	ISO 179/1eA
Charpy notched impact strength @-30°C	**10.0**	KJ/m²	ISO 179/1eA
Thermal Properties	**Value**	**Unit**	**Test Standard**
Melting temperature (10°C/min)	**166**	°C	ISO 11357-1,-2,-3
DTUL @ 1.8 MPa	**75**	°C	ISO 75-1, -2
Coeff. of linear therm expansion (parallel)	**1.2**	E-4/°C	ISO 11359-2
Coeff. of linear therm expansion (normal)	**1.1**	E-4/°C	ISO 11359-2
Test Specimen Production	**Value**	**Unit**	**Test Standard**
Processing conditions acc. ISO	**9988-2**		Internal
Processing and Delivery Form	**Value**	**Unit**	**Test Standard**
Injection molding	**Yes**		Internal
Profile extrusion	**Yes**		Internal

Other Processing

Injection molding

Pre-processing:

General drying is not necessary due to low moisture absorption of the resin.

In case of bad storage conditions (water contact or condensed water) the use of a recirculating air dryer (100 to 120 °C / max. 40 mm layer / 3 to 6 hours) is recommended.

Max. Water content 0,2 %

Standard injection moulding machines with three phase (15 to 25 D) plasticating screws will fit.

Melt temperature 190-210 °C
Mould temperature 60- 80 °C

Processing:

Standard injection moulding machines with three phase (15 to 25 D) plasticating screws will fit.

Melt temperature 190-210 °C
Mould temperature 60- 80 °C

Post-processing:

Conditioning e.g. moisturizing is not necessary.

Disclaimer

Moreover, there is a need to reduce human exposure to many materials to the lowest practical limits in view of possible adverse effects. To the extent that any hazards may have been mentioned in this publication, we neither suggest nor guarantee that such hazards are the only ones which exist. We recommend that persons intending to rely on such recommendation or use any equipment, processing technique, or material mentioned in this publication should satisfy themselves that they can meet all applicable safety and health standards.

We strongly recommend that users seek and adhere to the manufacturer's or supplier's current instructions for handling each material they use. Please consult the nearest Ticona Sales Office, or call the telephone numbers listed above for additional technical information. Call Customer Services for the appropriate Materials Safety Data Sheets (MSDS) before attempting to process these products.

Product is not intended for use in medical or dental implants.

Ticona

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PTS-MARKETING TECHNICAL INFORMATION

PTS-THERMOPRENE-75A10 * 9007 schwarz

02.11.2004

TPV-75 ShA, haftmod. f. POM, PB

PROPERTIES	UNIT	STANDARD	VALUES
Hardness	Shore A	ISO 868	78
	Shore D	ISO 868	
Density	g/cm³	ISO 1183	1,07
Tensile Strength (md/pmd)	MPa	ISO 527-1/-2	5/4
Modulus 10% (md/pmd)	MPa	ISO 527-1/-2	1,7/1,4
Modulus 50% (md/pmd)	MPa	ISO 527-1/-2	3,2/2,8
Modulus 100% (md/pmd)	MPa	ISO 527-1/-2	4,0/3,4
Modulus 300% (md/pmd)	MPa	ISO 527-1/-2	-/-
Elongation at Break (md/pmd)	%	ISO 527-1/-2	220/190
Tear Strength (md/pmd)	kN/m	ISO 34-1 B	14/26
Rebound elasticity	%	DIN 53 512	54
Mould-shrinkage (md/pmd) (test-plate 150*100*2 mm)	%	PTS	2,2/2,0
Compression Set	%	ISO 815	6mm/25%
- 70 h 23°C			27
- 24 h 70°C			44
- 24 h 100°C			56
- 24 h 120°C			
After-shrinkage/hot air (md/pmd) (test-plate 150*100*2 mm)	%	PTS	
- 24 h 70°C			0,2/0,1
- 24 h 100°C			0,6/0,2
- 24 h 120°C			1,0/0,2

PrintDate: 22.03.2010

PTS-MARKETING **TECHNICAL INFORMATION**

PTS-THERMOPRENE-75A10 * 9007 schwarz

TPV-75 ShA, haftmod. f. POM, PB

02.11.2004

PTS-THERMOPRENE 75A10*9007 is an adhesion modified TPV-EPDM+PP with a harndess of about 75 Shore A, especially developed for hard-soft-moldings which require adhesion to HOSTAFORM polyacetal (POM).

With multi-injection molding process, hard soft moldings out of POM an PTS-THERMOPRENE 75A10*9007 with good adhesion can be manufactured. The adhesion to impact modified POM grades like HOSTAFORM S9064 and HOSTAFORM S9244 is quite better than the adhesion to standard HOSTAFORM C9021. For molding process we recommend to use turning molds or core back molds instead of overmolding of so called cold inserts.

proccessing temperature	:	220-250°C
mould temperature	:	30-50 °C
injection speed	:	medium/high
back pressure	:	approx. 10-15 bar
pre-drying	:	3h / 80°C dry air

The viscosity of PTS-UNIPRENE is shear rate-dependent. Therefore injection speed and pressure have much a greater influence on flow than melt temperature.

flow spiral test:
Spirale: 5mm x 1,5mm
melt temperature 220°C, mold temperature 30°C, injection rate:1 sec.
(without holding pressure)

injection pressure/bar	400	600	800	1000	1200
flow path / mm	145	199	259	313	364

ANNEX 15
OIL RESISTANCE TEST

Equipment under Test: EPIRB Tron60GPS with release mechanism FB-60
Serial No.: 00104
Test Date: 21.10.2011
Test Conditions:

- Ambient temperature at open area test site: 19.2 ^{O}C
- Temperature of oil: 19.2…19.3 ^{O}C
- Relative air humidity: 70 %
- Atmospheric pressure: 755 mm/Hg
- Test duration: 4 hours
- Measurement duration: 30 min

TEST PROGRAM

No	Test name	Requirements	Methods
1	Oil resistance test	A.2.8, 3.3.7, 3.5.1 e) IEC 61097-2; 8.11.4 IEC 60945	5.17.10 of IEC 61097-2, 8.11 of IEC 60945

TEST DESCRIPTION

The EUT was immersed at a temperature of 19 °C ± 5 °C for 3 h in a mineral oil.
The following oil was used: ASTM oil No. 1 with following specification:

- aniline point: 120 °C ± 5 °C;
- flashpoint: 240 °C minimum;
- viscosity: (10 … 25) cSt at 99 °C.

After the test, the EUT was cleaned in accordance with the manufacturer's instructions and then subjected to a performance check and an examination with the naked eye.

TEST RESULT

Passed

TEST DETAILS

Figure 15.1 - EUT immersing in a tank with oil.

Figure 15.2 - EUT after oil resistance test

Figure 15.3 - EUT after oil resistance test

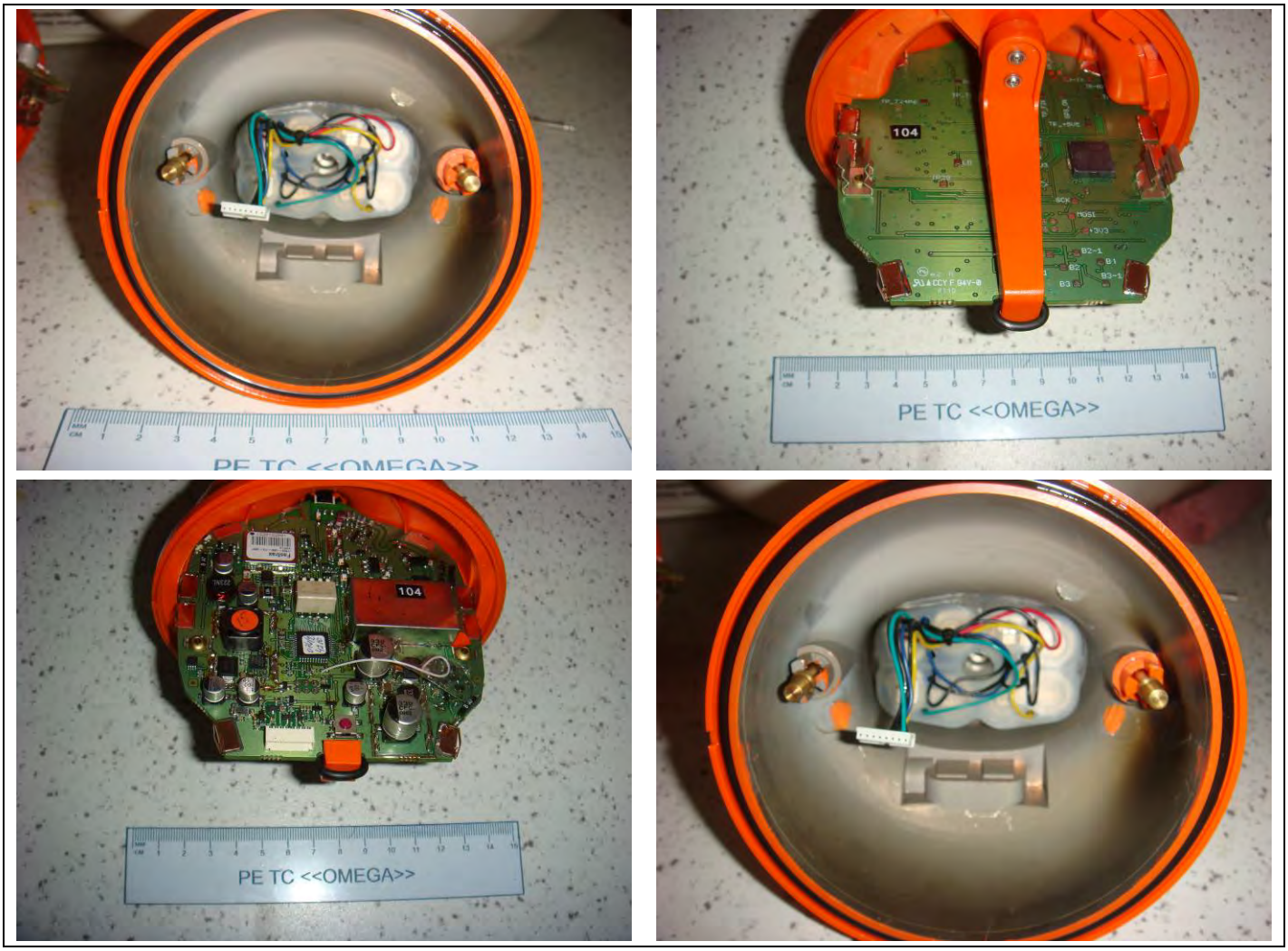

Figure 15.4 - EUT inside after oil resistance test

No signs of damage such as shrinking, cracking, swelling, dissolution or change of mechanical characteristics were detected while EUT examined with a naked eye after test.

Summary table of performance check at the end of the test

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037200
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Beacon tester	BT-611	1005	06.2012
2	Thermometer	Center-309	100074/1	05.2012

ANNEX 16
STABILITY AND BUOYANCY TEST

Test Procedure: Buoyancy test
Equipment under Test: EPIRB Tron60GPS
Serial No.: 00104
Test Date: 21.06.2011
Test Conditions:

– Ambient temperature at open area test site: 26 ^{O}C
– Relative air humidity: 47 %
– Atmospheric pressure: 755 mm/Hg
– Test duration: 25 min
– Measurement duration: 25 min

TEST PROGRAM

No	Test name	Requirements	Methods
1	Stability and buoyancy test	A.2.3, 3.3.2 b) IEC 61097-2	5.3.2.2 IEC 61097-2

TEST DESCRIPTION

EUT was, when rotated to a horizontal position, submerged in fresh water just below the surface, and then released.

The reserve buoyancy of EUT was determined by following method: EUT was submerged and buoyancy force was measured with scale. Then buoyancy force was divided by the weight of unit.

TEST RESULT

Passed

TEST RESULT

When released from submersed in horizontal position, EUT passed through an upright position within 2 s.

In calm fresh water EUT floats upright with the base of the antenna 65 mm above the water-line.

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 result is presented in table below.

Parameters	Range of Specification	Test results
High of antenna base above the water-line	> 40 mm	65 mm
Stability	< 2 s	1.3 s
Reserve buoyancy	> 5 %	41 %

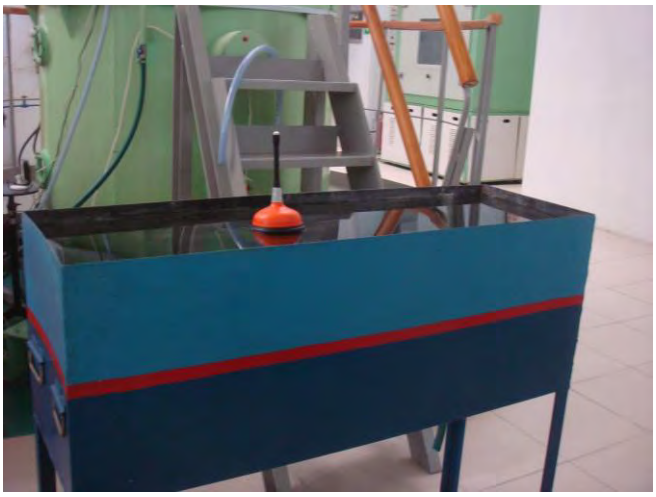

Figure 16.1 - Buoyancy test

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

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
COMPASS SAFE DISTANCE

Test Procedure: Compass safe distance
Equipment under Test: EPIRB Tron60GPS s/n 00101 with release mechanism FB-60
Test Date: 25.06.2011
Test conditions:

– Ambient temperature at open area test site: 27 ^{O}C
– Relative air humidity: 58 %
– Atmospheric pressure: 753 mm/Hg
– Test duration: 2 hours
– Measurement duration: 2 hours
– Measured horizontal earth magnetic field: 19.75 μT

TEST PROGRAM

No	Test name	Requirements	Methods
1	Compass safe distance	A.2.6 IEC 61097-2, 4.5.3 EC 60945	5.20 IEC 61097-2, 11.2 IEC 60945

TEST DESCRIPTION

Each unit of the EUT was tested in the position and attitude relative to the compass at which the error produced at the compass is a maximum, provided the item was fitted in this way.

The compass-safe distance of any unit of the EUT was defined as the distance between the nearest point of the unit and the centre of the compass at which it was not produce a deviation in the standard compass of more than 5.4°/H, where H is the horizontal component of the magnetic flux density in μT at the place of testing. For the steering compass, the standby steering compass and the emergency compass, the permitted deviation is 18°/H, H being defined as above.

EPIRB was tested:

a) in the magnetic condition in which it is received with the EPIRB in READY mode;
b) after normalizing with the EPIRB in READY mode;
c) EPIRB activated.

Normalizing means a procedure to maximize the homogeneity of the magnetic flux in the EUT by placing it in Helmholtz coils.

In each of the above tests, the unit was rotated to determine the direction in which it produces the maximum deviation.

TEST RESULT

Safe distance to compass is 85 cm.

TEST DETAILS

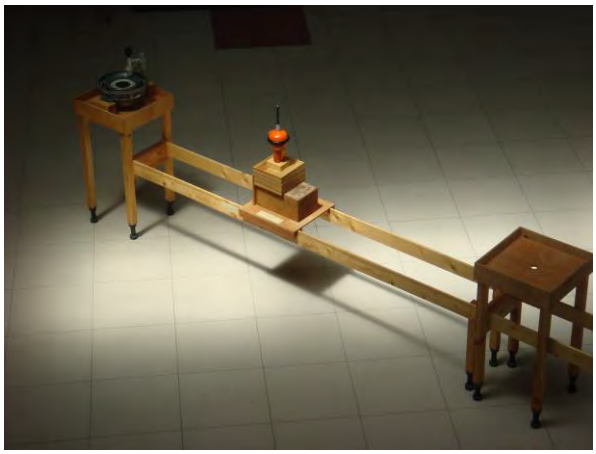

Figure 17.1 – Test installation.

Figure 17.2 – Changing the position EPIRB Tron60GPS around the horizontal and vertical axis. Maximum deviation search.

Figure 17.3 – Changing the position EPIRB Tron 60GPS around the horizontal and vertical axis. Maximum deviation search.

Figure 17.4 – Defining a safe distance from the EPIRB Tron60GPS in vertical position to the main ship's magnetic compass in operational mode. Distance is 0.58 m.

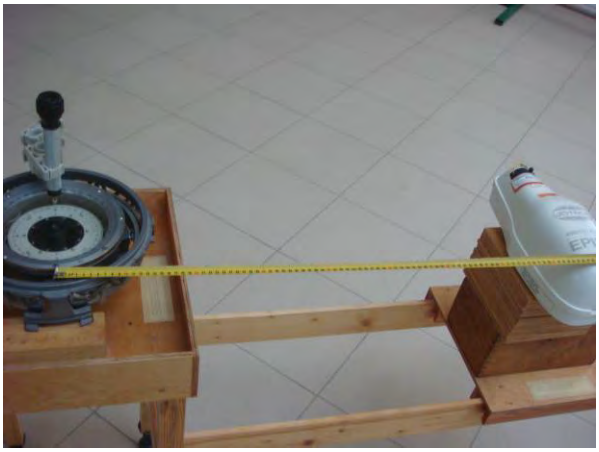

Figure 17.5 – Defining a safe distance from the EPIRB Tron60GPS in stand-by mode inside of release mechanism to the main ship's magnetic compass. Distance is 0.83 m.

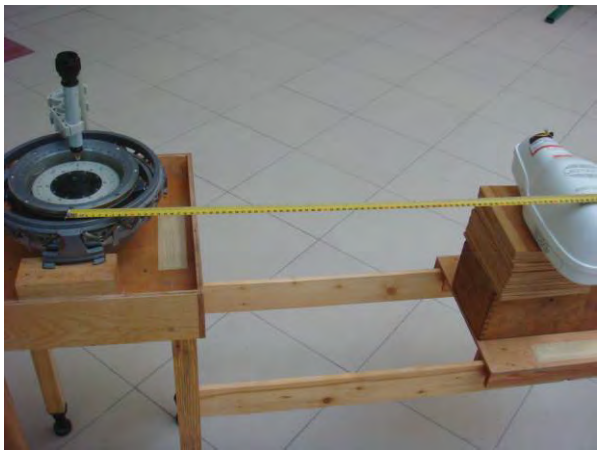

Figure 17.6 – Defining a safe distance from the EPIRB Tron60GPS in activated mode inside of release mechanism FB-60 to the main ship's magnetic compass. Distance is 0.83 m.

Greatest measured distance is 0.83 m. Distance rounded up to the nearest 50 mm is 85 cm.

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Uncompensated magnetic compass	-	101555	05.2013
2	Tape measure	SH5016	620168	03.2012
3	Magnetometer	HB0599A	12010701	09.2011

ANNEX 18
FLOAT-FREE ACTIVATION TEST

Test Procedure: Test for Float Free Arrangements
Equipment under Test: EPIRB Tron 60GPS with release mechanism FB-60
Serial No.: 00104
Test Date: 20.06.2011
Test conditions:

– Ambient temperature at open area test site: 26 °C
– Relative air humidity: 58 %
– Atmospheric pressure: 755 mm/Hg
– Maximum extreme temperature: 70 °C
– Minimal extreme temperature: -30 °C
– Water temperature in hydrostatic tank : 20 °C
– NaCl salt concentration in a water: 0.1%
– Test duration: 10 hours
– Measurement duration: 90 minutes

TEST PROGRAM

No	Test name	Requirements	Methods
1	Tests for float-free arrangements	3.2 d), 3.2 e) IEC 61097-2	5.2.1 IEC 61097-2
2	Automatic release test at 4m depth at any orientation	3.5.1 a) IEC 61097-2	5.2.1 IEC 61097-2
3	Test for salt water activation	3.3.3 a) IEC 61097-2	5.3.3.1 IEC 61097-2

TEST DESCRIPTION

The satellite EPIRB installed in the automatic release mechanism was submerged in water at normal temperature. The test at normal temperature was performed six times with the EUT rotated each time as follows:

- normal mounting position
- rolling 90° to starboard;
- rolling 90° to port;
- pitching 90° bow down;
- pitching 90° stern down;
- upside-down position.

Test was repeated at extreme temperature in normal mounting position.

The depth of activation equivalent to value of water pressure when EPRIRB was released is noted.

An inspection test for mechanical deterioration and water ingress was carried out after each release of the satellite EPIRB from release mechanism. Performance check was carried out on completion all of the tests.

Then test for float-free arrangement in combination with test for salt water activation was carried out.

TEST RESULT

Passed.

TEST RESULT

Figure 18.1 – Total view of test hydrostatic tank and test equipment.

Figure 18.2 - View EUT before activation test

a) normal mounting position

Figure 18.3 – Immersion of EUT in the normal mounting position

Figure 18.4 – EPIRB floated after immersion in the normal mounting position

Figure 18.5 – View of automatic release mechanism in performance position at the moment of activation

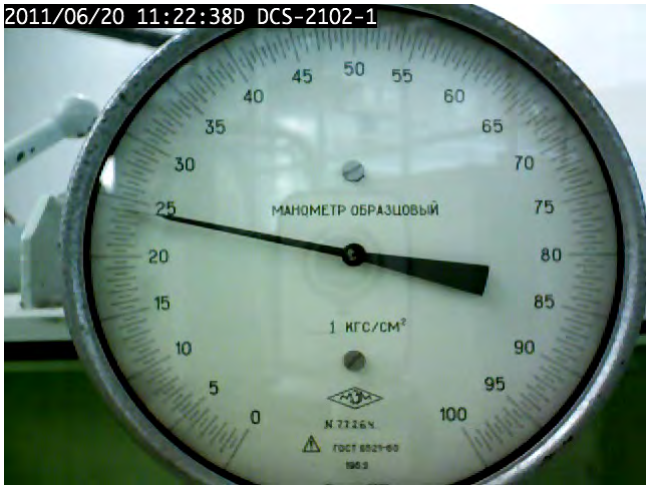

Figure 18.6 – Indicator of the activation depth 2.45 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

b) upside-down position

Figure 18.7 – Immersion in the upside-down position

Figure 18.8 – EPIRB floating after immersion in the upside-down position

Figure 18.9 – View of automatic release mechanism in performance upside down position at the moment of activation

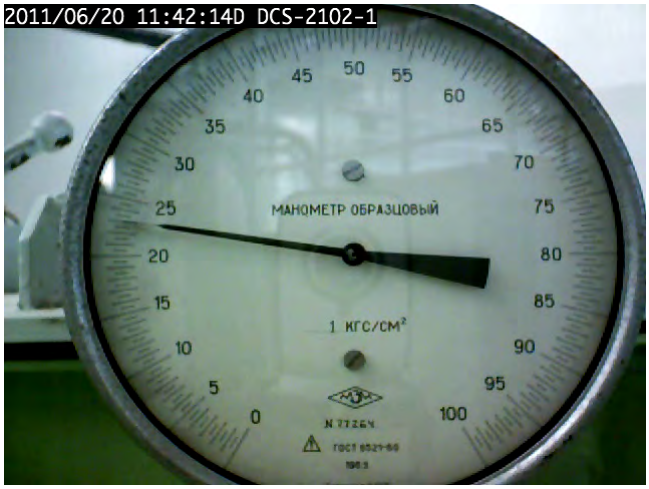

Figure 18.10 – Indicator of the activation depth 2.30 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

c) rolling 90° to starboard position

Figure 18.11 – Immersion in the rolling 90° to starboard position

Figure 18.12 – EPIRB floating after immersion in the rolling 90° to starboard position

Figure 18.13 – View of automatic release mechanism in Rolling 90° starboard position at the moment of activation

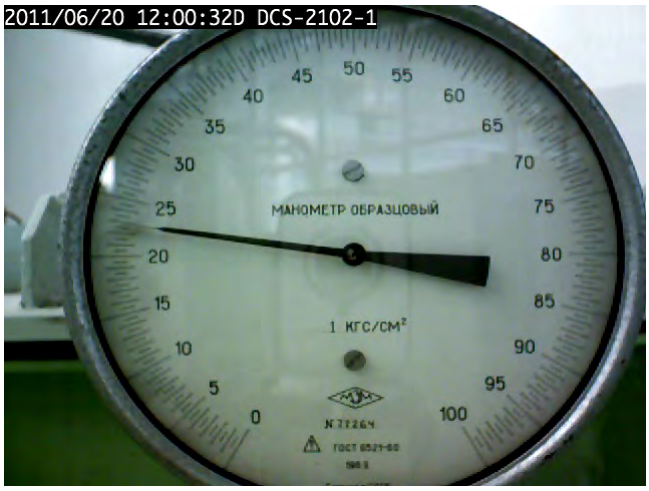

Figure 18.14 – Indicator of the activation depth 2.30 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

d) rolling 90° to port position

Figure 18.15 – Immersion in the rolling 90° to port position

Figure 18.16 – EPIRB floating after immersion in the rolling 90° to port position

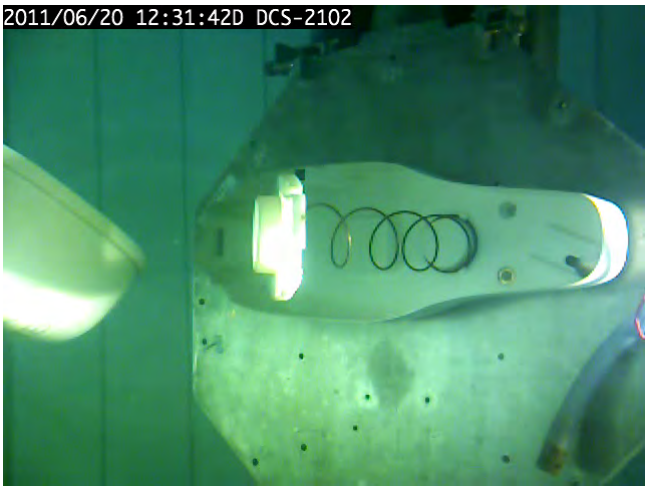

Figure 18.17 – View of automatic release mechanism in Rolling 90° port position at the moment of activation

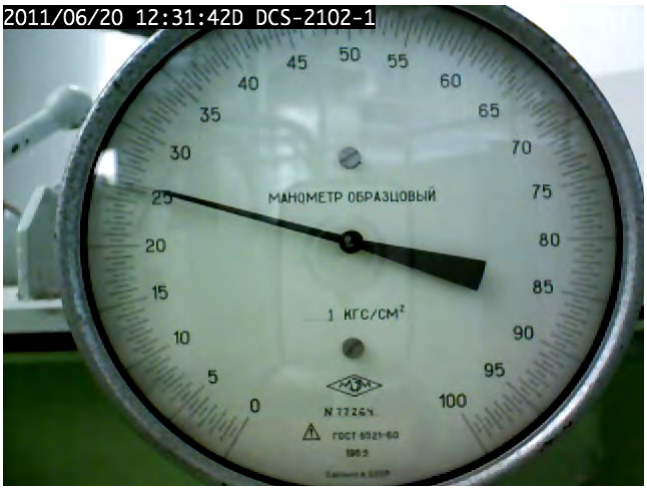

Figure 18.18 – Indicator of the activation depth 2.55 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

e) pitching 90° bow down

Figure 18.19 – Immersion in the pitching 90° bow down position

Figure 18.20 – EPIRB floating after immersion in the pitching 90° bow down position

Figure 18.21 – View of automatic release mechanism in Rolling 90° bow down position at the moment of activation

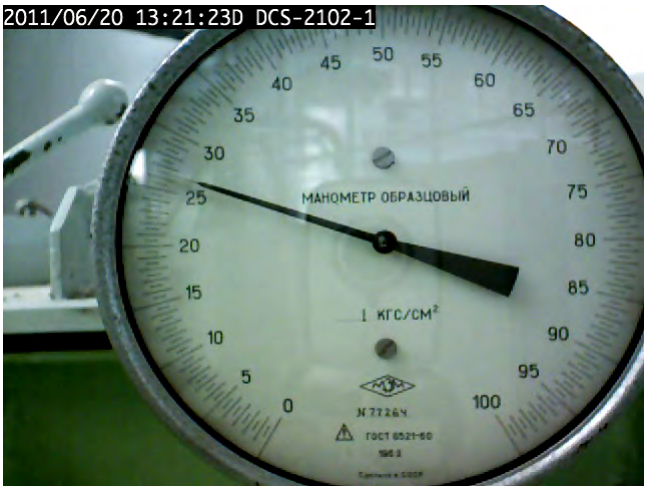

Figure 18.22 – Indicator of the activation depth 2.65 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

f) pitching 90° stern down

Figure 18.23 – immersion in the pitching 90° stern down position

Figure 18.24 – emersion after immersion in the pitching 90° stern down position

Figure 18.25 – View of automatic release mechanism in Rolling 90° stern down position at the moment of activation

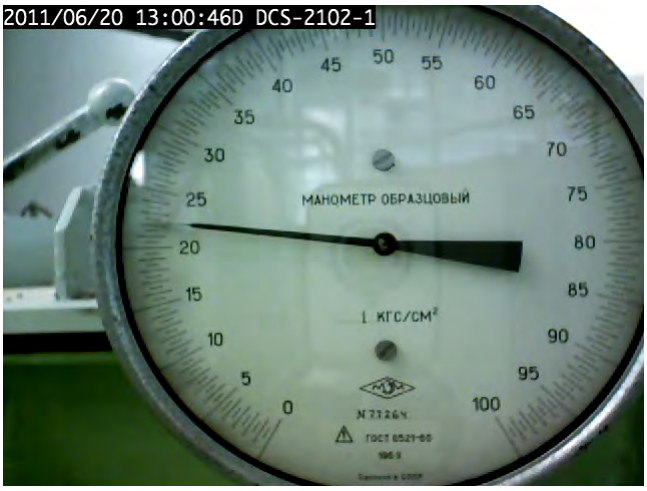

Figure 18.26 – Indicator of the activation depth 2.25 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

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

Figure 18.27 – Immersion in the normal mounting position after exposure of EPIRB at minimum temperature -30 °C

Figure 18.28 – EPIRB emersion after immersion in the normal mounting position after exposure -30 °C

Figure 18.29 – View of automatic release mechanism in performance position at the moment of activation

Figure 18.30 – Indicator of the activation depth 2.85 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

EPIRB Tron 60GPS with release mechanism FB-60 maximum stowage temperature +70 ºC

Figure 18.31 – Immersion in the normal mounting position after exposure at temperature +70 °C

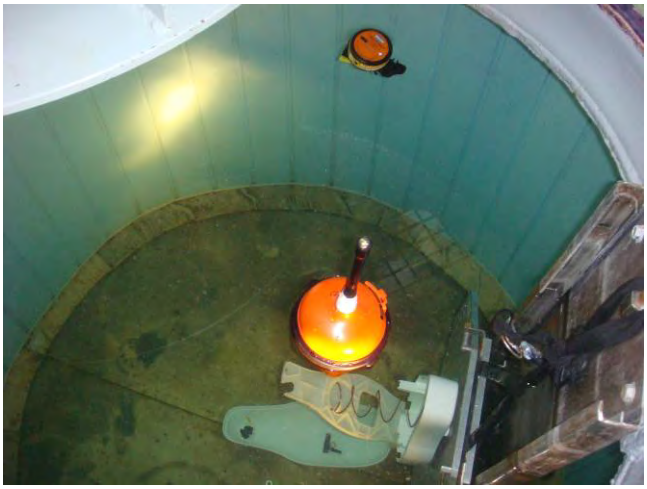

Figure 18.32 – Emersion after immersion in the normal mounting position after exposure at temperature +70 °C

Figure 18.43 – View of automatic release mechanism in performance position at the moment of activation

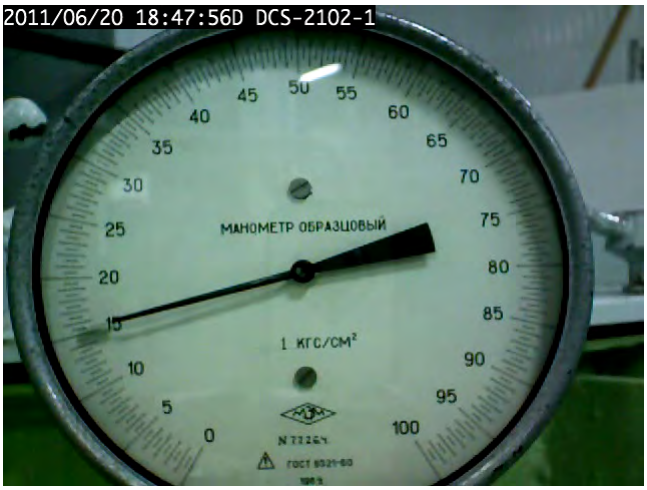

Figure 18.44 – Indicator of the activation depth 1.55 meters

No mechanical deterioration and no water ingress were detected after EPIRB released.

Equivalent depth of activation

No	EUT position	Temperature	Depth activation	Conclusion
1	normal mounting position	ambient	2.45 m	Passed
2	upside-down position	ambient	2,30 m	Passed
3	rolling 90° to starboard position	ambient	2,30 m	Passed
4	rolling 90° to port position	ambient	2.55 m	Passed
5	pitching 90° bow down position	ambient	2.65 m	Passed
6	pitching 90° stern down position	ambient	2.25 m	Passed
7	normal mounting position	minimum	2.85 m	Passed
8	normal mounting position	maximum	1.55 m	Passed

Summary table of performance check at the end all of the tests

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037006
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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 19
CORROSION (SALT MIST) TEST

Equipment under Test: Tron 60GPS s/n 00104 with release mechanism FB-60
SW version: 1.01
Test Date: 18.01.2011 - 22.01.2011
Test Conditions:

- Ambient temperature at open area test site: 2 ºC
- Relative air humidity: 56-57 %.
- Atmospheric pressure: 759-762 mm/Hg
- Test duration: 99.25 hours
- Measurement duration: 30 minutes

TEST PROGRAM

No	Test name	Requirements	Method
1	Corrosion (salt mist) test	A.2.9 IEC 610977-2, A7.0 RTCM 11000.2	A7.0 RTCM 11000.2

TEST DESCRIPTION

Before exposing to salt fog EUT was conditioned at a temperature of 35 °C ± 2 °C for 2 hours. After this conditioning and with the ambient temperature maintained at 35 ºC, salt fog was added and maintained at the saturation point for 48 hours.

The salt fog had been prepared from a 5% ± 1% salt (NaCl) solution.

After exposure to salt fog, the EUT was permitted to dry at room temperature (20 °C ± 5 °C) for 24 hours before being exposed to another period of 12 hours of salt fog exposure at 35 °C. Upon completion of this exposure and after a 12 hour drying period at room temperature, the exterior of both EPIRB and release mechanism was inspected for corrosion, peeling paint, and other signs of deterioration and the aliveness test conducted.

TEST RESULT

Passed

TEST DETAILS

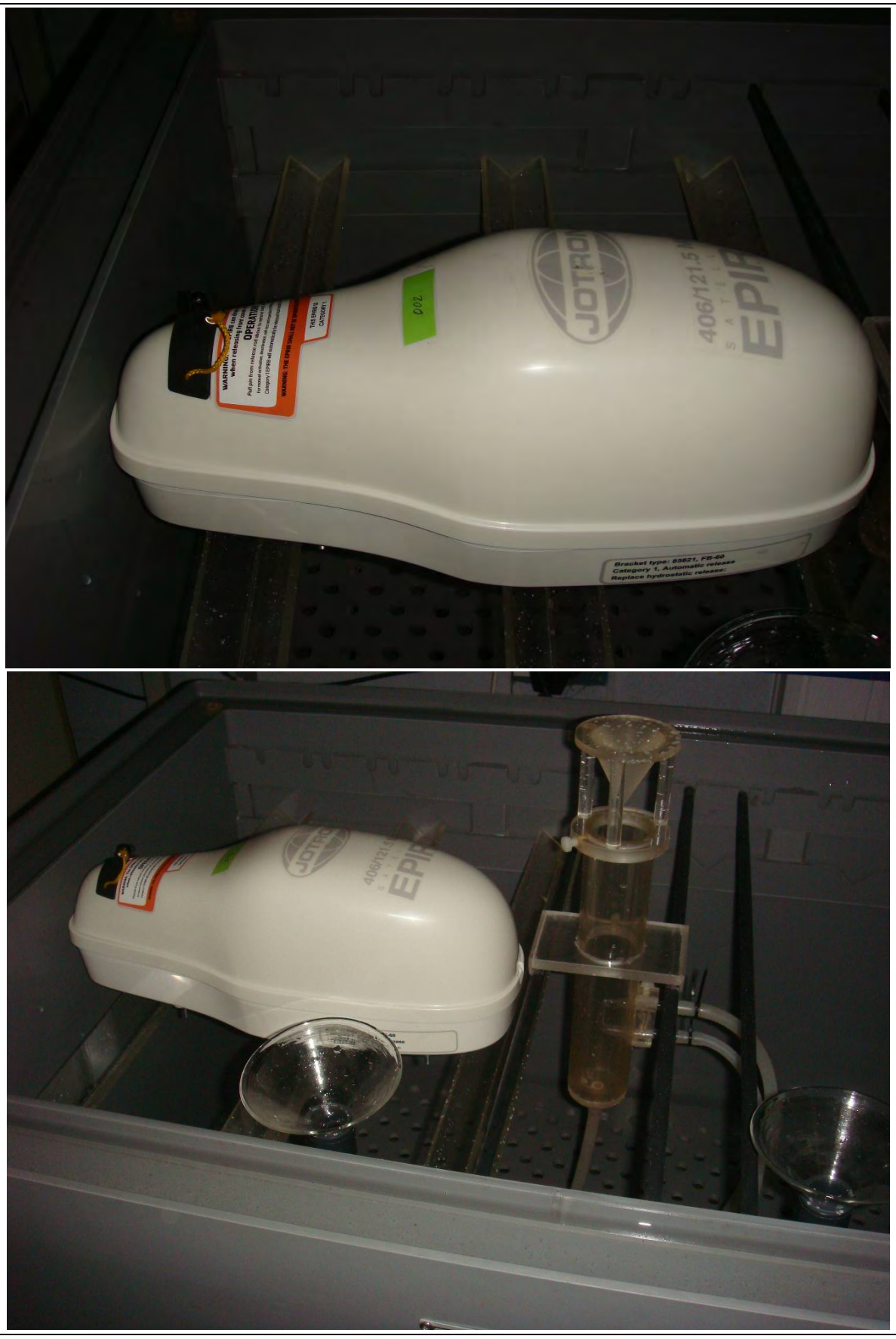

Figure 19.1 - View EUT before of the salt fog test

Figure 19.2 - View EUT before of the salt fog test

Figure 19.3 – Temperature setup of salt solution

Figure 19.4 – View of EUT in salt fog chamber

Figure 19.5 - View exterior inspection of EUT upon completion of the salt fog test

Summary table of performance check

No	Parameter	Measured value
1	Activating the satellite EPIRB	activated
2	The 406 MHz transmitted frequency	406.037044
3	The 406 MHz digital message	FFFE2F 8C92F423F07FDFFB2BF03 783E0F66C
4	15 HEX ID	1925E847E0FFBFF
5	Homing Transmitter output	present

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 20
SIGNAL LIGHT TEST

Equipment under Test: EPIRB Tron 60GPS
Serial No.: 00104
Test Date: 23.06.2011 – 24.06.2011
Test conditions:

– Ambient temperature at open area test site: 19..21 ^{O}C
– Relative air humidity: 53 %
– Atmospheric pressure: 749 mm/Hg
– Low extreme temperature: -20 °C
– High extreme temperature: 55 ^{O}C
– EPIRB is ON with test protocol message
– Test duration: 5 hours
– Measurement duration: 2 hours

TEST PROGRAM

No	Test name	Requirements	Method
1	Low-duty cycle light test	A.2.10, 3.3.3 c) IEC 61097-2	5.3.3.3 IEC 61097-2

TEST DESCRIPTION

The effective luminous intensity, flash duration and flash rate were checked at the normal temperature and at the high and low extreme temperatures. The effective luminous intensity was defined by the following formula as indicated in IMO Resolution MSC.81(70) - Testing of lifesaving appliances, 10.4.9:

$$\frac{\int_{t_1}^{t_2} j \cdot dt}{0.2 + (t_2 - t_1)}$$

where
j the instantaneous intensity;
0.2 the Blondel-Rey constant;
$t_2 - t_1$ the time limits of integration in seconds at which the intensity is j or greater.

The effective luminous intensity was at least an arithmetic mean of 0.5 cd over the entire upper hemisphere as determined below.

The flash rate was 20 to 30 times per minute.

The flash duration was 10^{-2} s.

The effective luminous intensity was measured at 49 points over the upper hemisphere of the satellite EPIRB.

The satellite EPIRB was floated in a container of fresh water to determine its waterline, which was marked on the body of the satellite EPIRB and used as the baseline for the following tests.

This line represents the 0° elevation plane used as a reference point for the following measurements.

The arithmetic mean effective luminous intensity of all 49 points was at least 0.50 cd. No points had an effective luminous intensity of less than 0.2 cd.

TEST RESULT

Passed.

TEST DETAILS

Figure 20.1 – 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 -55°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

	Elevation								
Azimuth	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

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-800	280707	02.2012
3	Rotation and inclination device	RD-360/90	01	05.2013

ANNEX 21
121.5 MHZ HOMING DEVICE TESTS

Equipment Under Test (EUT): EPIRB Tron 60GPS s/n 00101
Software release: 1.04
Test Date:20.06.2011-22.06.2011
Test Conditions:
– Ambient temperature: 20…22 °C
– Atmospheric pressure: 751..756 mm/Hg
– Relative air humidity: 45.7..49.2 %

No	Test name	Requirements IEC 61097-2	Method IEC 61097-2
1	Carrier frequency	D.3 a)	D.4.1
2	Peak effective radiated power	D.3 b)	D.4.2
3	Off ground plane radiated power test		D.4.3
4	Transmitter duty cycle	D.3 c)	D.4.4
5	Modulation frequency and sweep repetition rate	D.3 d) 2)	D.4.5.1
6	Modulation duty cycle	D.3 d) 3)	D.4.5.2
7	Modulation factor	D.3 d) 4)	D.4.5.3

TEST RESULT
Passed

1. Carrier frequency test

TEST DESCRIPTION

The carrier frequency test was performed with a spectrum analyzer. The carrier frequency measured at temperatures: -20°C (minimum operating), 22°C (ambient) and 55°C (maximum operating).

TEST RESULT

Passed

TEST DETAILS

Parameters	Temperature	Range	Units	Test Results
Carrier frequency	minimum	121500 ± 50	kHz	121500.5
Carrier frequency	ambient	121500 ± 50	kHz	121498.5
Carrier frequency	maximum	121500 ± 50	kHz	121498.5

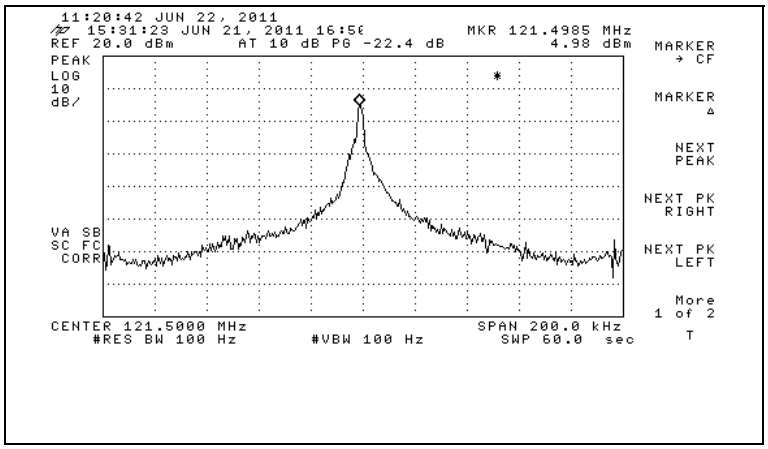

Figure 21.1 – Screenshot of Carrier Frequency Test Result at the minimum operating temperature

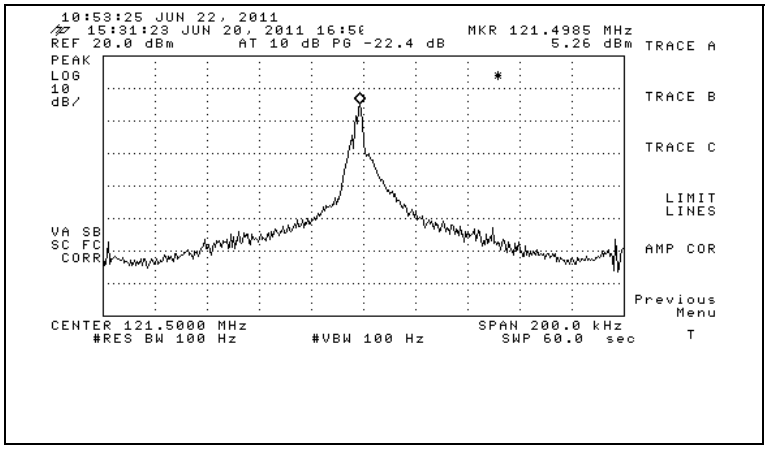

Figure 21.2 – Screenshot of Carrier Frequency Test Result at the ambient temperature

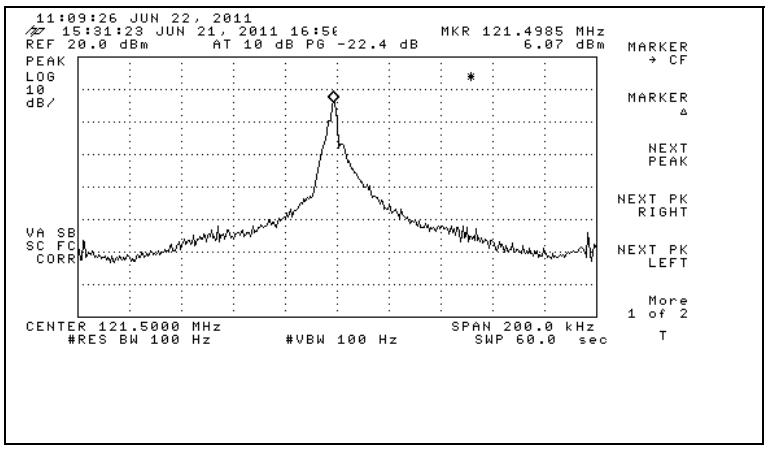

Figure 21.3 – Screenshot of Carrier Frequency Test Result at the maximum operating temperature

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KTK-800	280707	02.2012
2	Spectrum analyzer	HP8593E	3831U02306	07.2012

2. Peak Effective Radiated Power

TEST DESCRIPTION

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 was noted and remained fixed for the rest of the test. The rest 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:

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

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).

TEST RESULT

Passed

TEST DETAILS

Results of Peak Effective Radiated Power

Azimuth	Elevation Angle: 15° (at maximum antenna gain)				
	P_{REC}, dBm	G_{REC}, dBm	L_C, dB	L_P, dB	*PERP*, mW
0°	-35.4	-14.82	1.729	34.428	36.12
30°	-35.6	-14.82	1.729	34.428	34.49
60°	-35.7	-14.82	1.729	34.428	33.71
90°	-35.6	-14.82	1.729	34.428	34.49
120°	-35.3	-14.82	1.729	34.428	36.96
150°	-35.7	-14.82	1.729	34.428	33.71
180°	-35.6	-14.82	1.729	34.428	34.49
210°	-35.7	-14.82	1.729	34.428	33.71
240°	-35.5	-14.82	1.729	34.428	35.29
270°	-35.4	-14.82	1.729	34.428	36.12
300°	-35.8	-14.82	1.729	34.428	32.94
330°	-35.6	-14.82	1.729	34.428	34.49

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Antenna	HK116	100345	02.2012
2	Spectrum analyzer	HP8593E	3831U02306	07.2012

3. Off Ground Plane Radiated Power Test

TEST DESCRIPTION

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 was noted and remained fixed for the rest of the test. The rest 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:

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

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).

TEST RESULT

Passed

TEST DETAILS

Peak effective radiated power (distance 10 m, maximum antenna gain at elevation angle 15°)

Azimuth	P_{REC}, dBm	G_{REC}, dBm	L_C, dB	L_P, dB	*PERP*, mW
0°	-35.8	-14.82	1.729	34.428	32.94
90°	-35.6	-14.82	1.729	34.428	34.49
180°	-35.9	-14.82	1.729	34.428	32.19
270°	-35.7	-14.82	1.729	34.428	33.71

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Antenna	HK116	100345	02.2012
2	Spectrum analyzer	HP8593E	3831U02306	07.2012

4. Transmitter duty cycle

TEST DESCRIPTION

The transmitted signal was observed on an oscilloscope at temperatures: -20°C (minimum operating), 22°C (ambient) and 55°C (maximum operating). It was determined that the signal is not interrupted with exception transmission of the 406 MHz signal (maximum duration 1.02 sec)

TEST RESULT

Passed

TEST DETAILS

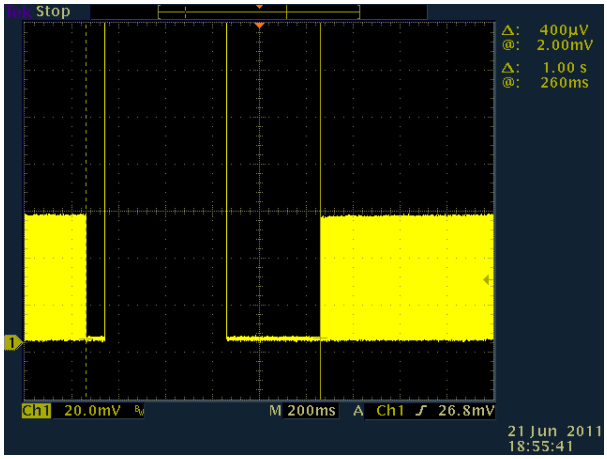

Figure 21.4 – Diagram of transmitter duty cycle test at the minimum operating temperature.

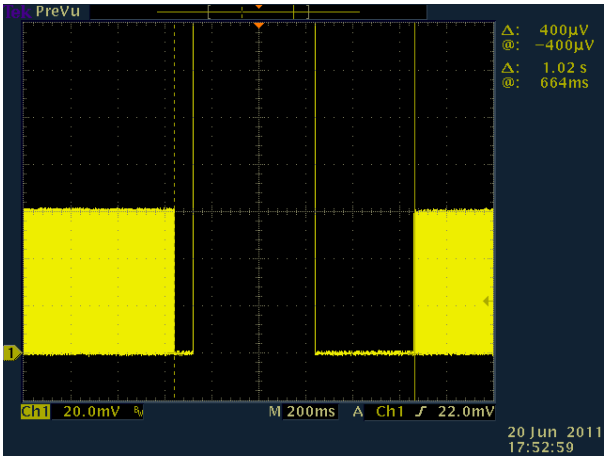

Figure 21.5– Diagram of transmitter duty cycle test at the ambient temperature.

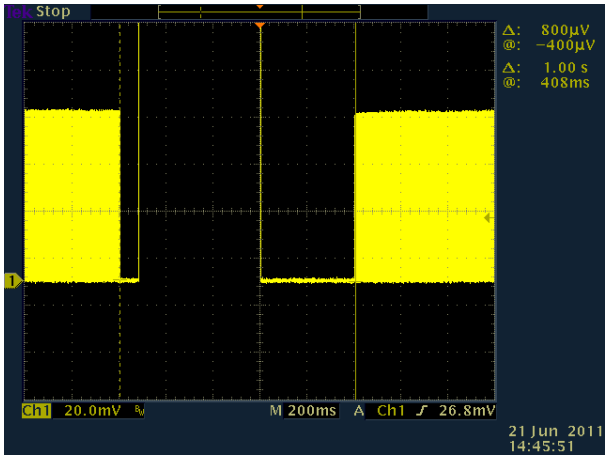

Figure 21.6 – Screenshot of transmitter duty cycle test at the maximum operating temperature.

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KTK-800	280707	02.2012
2	Digital oscilloscope	TDS-3052	B011258	01.2012

5. Modulation characteristics

TEST DESCRIPTION

The modulation envelope was observed and the upper and lower audio-frequency sweep limits and sweep repetition rate was determined. The limits and rate meet the requirements of D.3.d) 2) and D.3.d) 5) respectively.

Modulation duty cycle is the ratio of the positive modulation peak duration to the period of the instantaneous fundamental audio-modulation frequency, observed at the half-amplitude points on the modulation envelope using the embedded feature of by following formula:

$$DutyCycle = \frac{A}{B} \times 100\%,$$

The modulation duty cycle was measured near the start, midpoint, and end of the modulation period.

The modulation factor was defined with respect to the maximum and minimum amplitudes of the modulation envelope by the following formula:

$$ModulationFactor = \frac{A - B}{A + B},$$

TEST RESULT

Passed

TEST DETAILS

Modulation characteristics at minimum operating temperature

Parameter	Range	Unit	Test Results	Comments
Modulation Factor	≥ 85%	%	99	Passed
Low sweep frequency of AM	300	Hz	389	Passed
High sweep frequency of AM	1600	Hz	1323	Passed
Sweep range	>700	Hz	934	Passed
Sweep period of 121,5 MHz	2..4	Hz	2.64	Passed
Duty Cycle	33…55	%	36.76…37.24	Passed

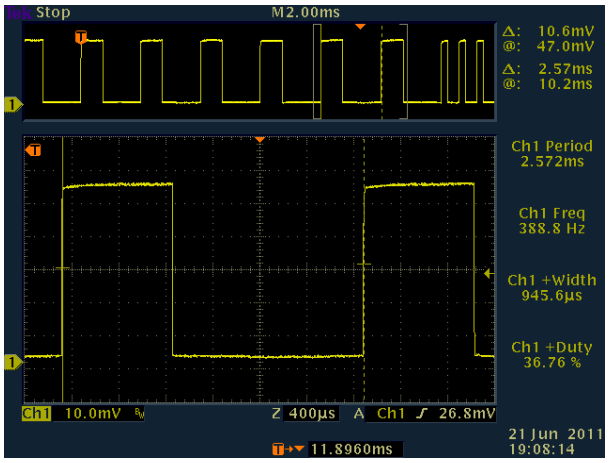

Figure 21.7 – Screenshot of Low Sweep Frequency (389 Hz) at the minimum operating temperature

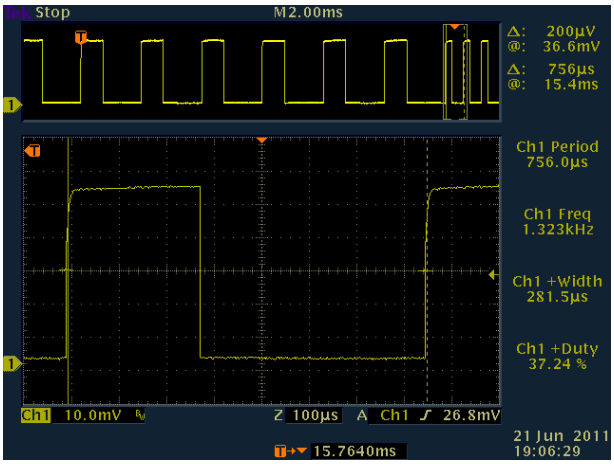

Figure 21.8 – Screenshot of High Sweep Frequency (1.323 kHz) at the minimum operating temperature

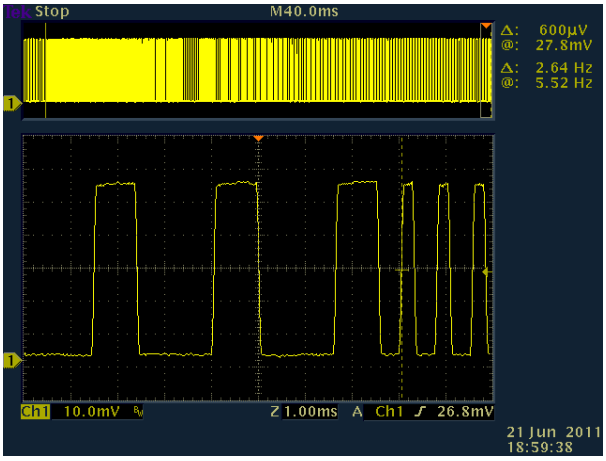

Figure 21.9 – Screenshot of sweep repetition rate at the minimum operating temperature

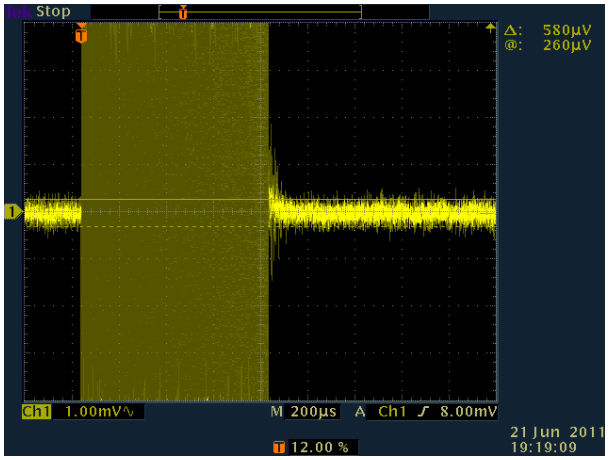

Figure 21.10 – Screenshot of minimum amplitude signal for determination the Modulation Factor at the minimum operating temperature

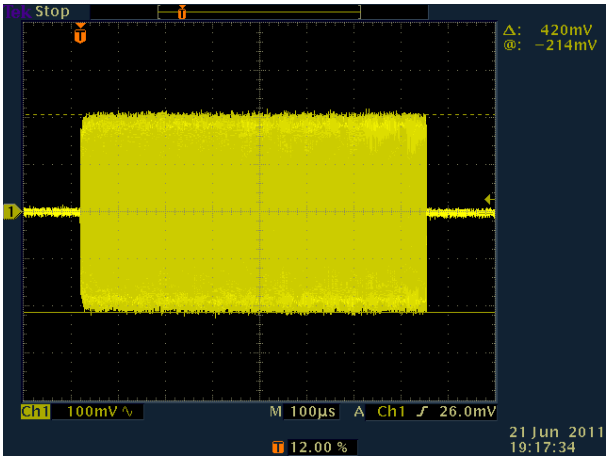

Figure 21.11 – Screenshot of maximum amplitude signal for determination of the Modulation Factor at the minimum operating temperature

Modulation Factor: $\left(\frac{A-B}{A+B}\right)\times 100\% = \left(\frac{420-0.58}{420+0.58}\right)\times 100\% = \left(\frac{419.42}{420.58}\right)\times 100\% = 99\%$

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	
Contents (full)	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C

Figure 21.12 – Results of EPIRB Tron 60GPS Self Test
(before the radio-locating device transmitter test)

Modulation Characteristics at the ambient temperature

Parameter	Range	Unit	Test Results	Comments
Modulation Factor	≥ 85%	%	99	Passed
Low sweep frequency of AM	300	Hz	389	Passed
High sweep frequency of AM	1600	Hz	1323	Passed
Sweep range	>700	Hz	934	Passed
Sweep period of 121,5 MHz	2..4	Hz	2.64	Passed
Duty Cycle	33…55	%	36.83…36.96	Passed

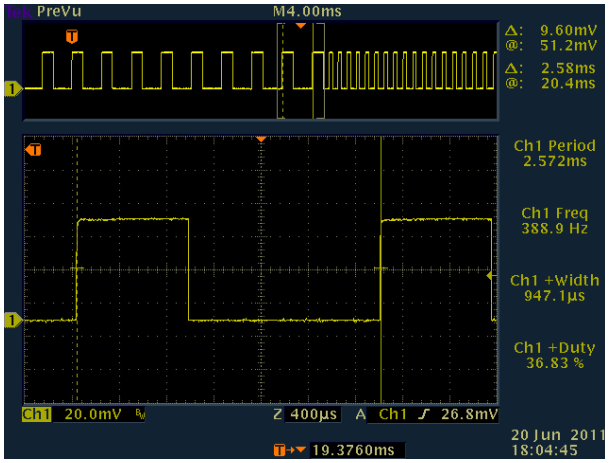

Figure 21.13 – Screenshot of Low Sweep Frequency (389 Hz) at the ambient temperature

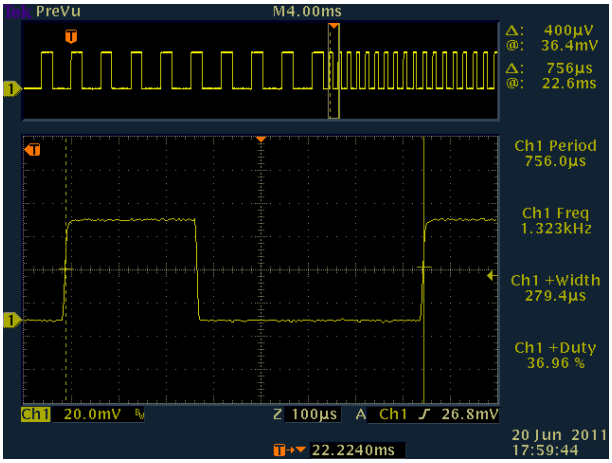

Figure 21.14 – Screenshot of High Sweep Frequency (1.323 kHz) at the ambient temperature

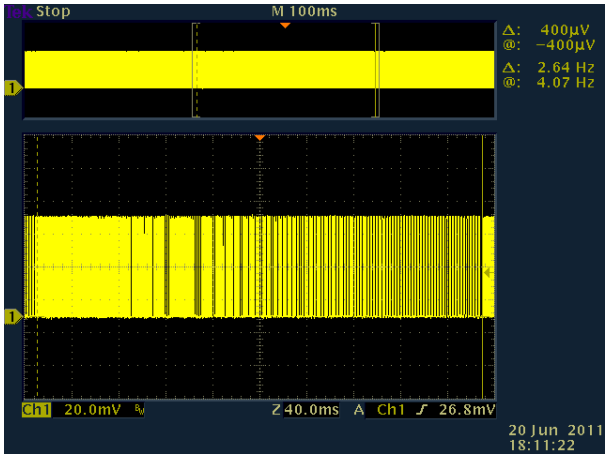

Figure 21.15 – Screenshot of Sweep repetition rate Test Result at the ambient temperature

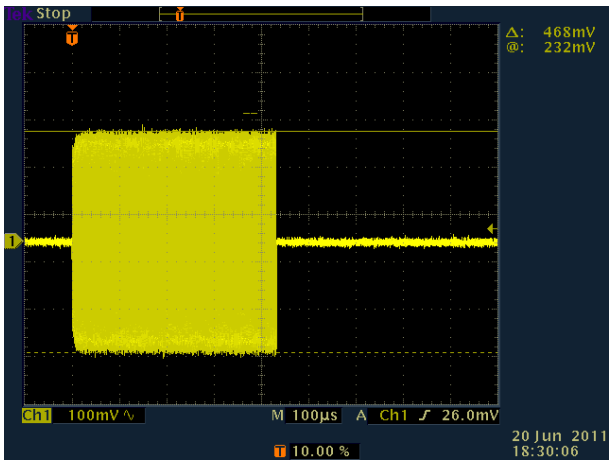

Figure 21.16 – Screenshot of maximum amplitude signal for determination of the Modulation Factor at the ambient temperature

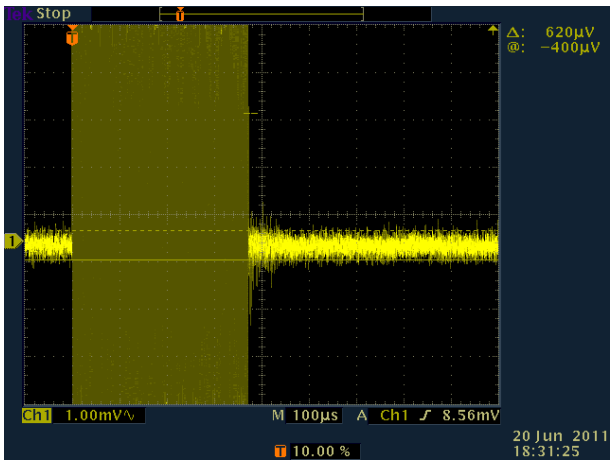

Figure 21.17 – Screenshot of minimum amplitude signal for determination of the Modulation Factor at the ambient temperature

$$\text{Modulation Factor: } \left(\frac{A-B}{A+B}\right)\times 100\% = \left(\frac{468-0.62}{468+0.62}\right)\times 100\% = \left(\frac{467.38}{468.62}\right)\times 100\% = 99\%$$

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	406037.012	0.000
Power, Wt	3.16	7.94	0.00	4.04	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499488	**Low Sweep Frequency, Hz**	385
Power, mW	24.6	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

Message	
Contents (full)	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C

Figure 21.18 – Results of EPIRB Tron 60GPS Self Test (before the auxiliary radio-locating device transmitter test)

Modulation Characteristics at the maximum operating temperature

Parameter	Range	Unit	Test Results	Comments
Modulation Factor	≥ 85%	%	99	Pass
Low sweep frequency of AM	300	Hz,	388	Pass
High sweep frequency of AM	1600	Hz,	1323	Pass
Sweep range	>700	Hz	935	Pass
Sweep period of 121,5 MHz	2..4	Hz,	2.64	Pass
Duty Cycle	33…55	%	36.79…36.94	Pass

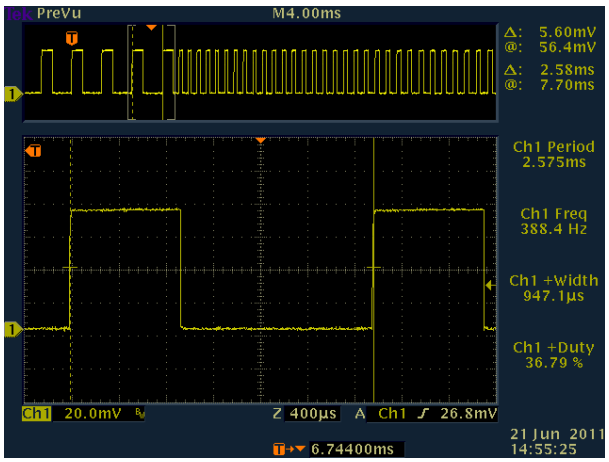

Figure 21.19 – Screenshot of Low Sweep Frequency (388 Hz) at the maximum operating temperature

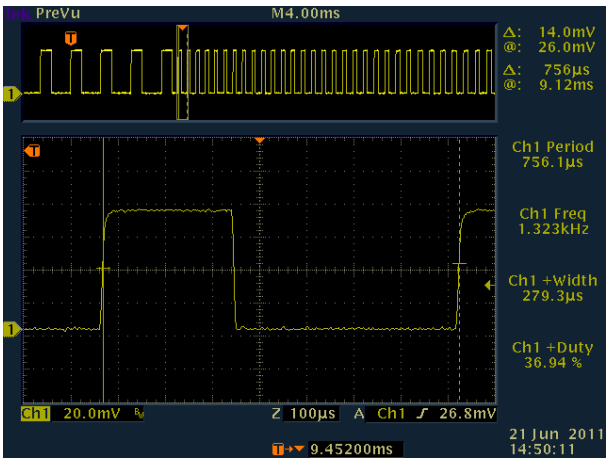

Figure 21.20 – Screenshot of High Sweep Frequency (1.323 kHz) at the maximum operating temperature

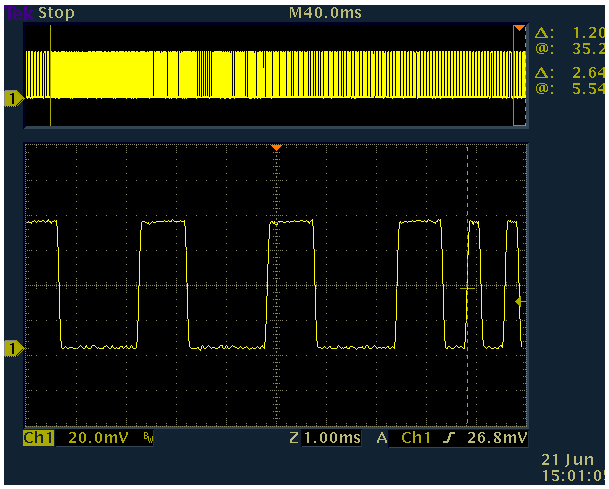

Figure 21.21 – Screenshot of Sweep repetition rate Test Result at the maximum operating temperature

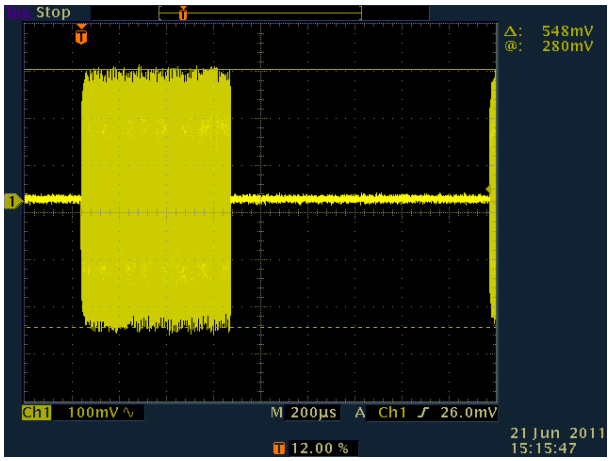

Figure 21.22 – Screenshot of maximum amplitude signal for determination of the Modulation Factor at the maximum operating temperature

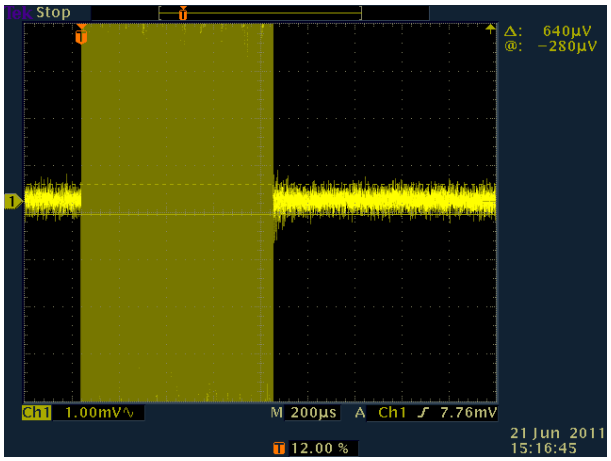

Figure 21.23 – Screenshot of minimum amplitude signal for determination of the Modulation Factor at the maximum operating temperature

$$\text{Modulation Factor: } \left(\frac{A-B}{A+B}\right)\times 100\% = \left(\frac{548-0.64}{548+0.64}\right)\times 100\% = \left(\frac{547.36}{548.64}\right)\times 100\% = 99\%$$

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	406037.050	0.000
Power, Wt	3.16	7.94	0.00	4.13	0.00
Total burst duration, ms	514.80	525.20	0.00	519.95	0.00

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499492	**Low Sweep Frequency, Hz**	385
Power, mW	24.2	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

Message	
Contents (full)	:FFFED0 8C92F423F07FDFFB2BF03 783E0F66C

Figure 21.24 – Results of EPIRB Tron 60GPS Self Test
(before the auxiliary radio-locating device transmitter test)

TEST EQUIPMENT

No	Name of test equipment	Type, model	ser. No	Calibration Due date
1	Climatic chamber	KTK-800	280707	02.2012
2	Digital oscilloscope	TDS-3052	B011258	01.2012