PUBLIC ENTERPRISE TESTING CENTER «OMEGA»

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Approved by
Director
PE TC "OMEGA"
_____ Belikov N.I.
December 14, 2011

TEST REPORT No. 11/10
Issue 4

on type approval of COSPAS-SARSAT
Emergency Position Indicating Radio Beacon (EPIRB)

Model **Tron 60S**
Manufacturer **Jotron AS, Norway**

Volume 1

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** **Title** **Phone** **E-mail**	 Oyvind L. Eggen Systems Designer +47 33 13 97 00 oyvind.eggen@jotron.com
Test commencement date	16.02.2011
Test completion date	05.10.2011
Test reports shall be delivered to:	Jotron AS (for submission to COSPAS-SARSAT Secretariat for consideration) — copy 1 PE TC “Omega” — copy 2

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Introduction
Present Test Report consists of: 1. Test Report No.11/10 Volume 1, Issue 4 <Jotron_Tron60S_11-10_Vol.1_Iss.4.pdf> 2. Test Report No.11/10 Volume 2, Issue 4 <Jotron_Tron60S_11-10_Vol.2_Iss.4.pdf>

Report Issue History		
No	**Data of issue**	**Report reissue reason**
1	12.08.2011	The initial issue
2	10.10.2011	a. History of beacon software upgrade is amended (p.5). b. Tests A.2.1 and A.2.3 (Current measurements only) were repeated and results are updated in Annex 1 and Annex 2 accordingly. c. Test A.2.5 in conf. 8 was conducted additionally and report is amended in Annex 4.
3	25.11.2011	a. Minor editorial errata are fixed b. Application for Cospas-Sarsat type approval is updated
4	14.12.2011	Minor editorial errata are fixed

1. EQUIPMENT UNDER TEST

Category	Emergency Position Indicating Radio Beacon (EPIRB) 406 MHz COSPAS–SARSAT
Type	EPIRB Float-free
Model	Tron 60S
Class	Class 2 (operating temperature range -20 ºC to +55 ºC)
Serial numbers [1]	00100, 00102
Destination	Alarm message transmission of distressed accident vessels, aircrafts and other objects via COSPAS-SARSAT satellites system
Beacon SW version [2]	v1.04

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

[2] - the final version of beacon SW is indicated. Tested SW version is shown for every test accordingly. Details of software changes are presented in Section "Software change description" of Test Report 11/9 vol.2 iss.2 p.89.

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 beacon acquired position within 50 sec after 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	Ref. to D.3.d.3 of IEC 61097-2.
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. SUBMITTED DOCUMENTATION

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[1] - referring to Test Report 11/10 Vol.2 Iss.2.

3. TEST PURPOSE

Test purpose is to confirm compliance of EPIRB model Tron 60S with the Cospas-Sarsat 406 MHz Beacon Type Approval Standard (C/S T.007) and the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001).

4. TEST CONDITIONS AND METHODS

Procedure, conditions and methods of testing correspond to requirements and methods of C/S T.001 (Issue 3 – Revision 11 October 2010) and C/S T.007 (Issue 4 – Revision 5 October 2010) standards.

5. TEST PROGRAM [1]

No.	Test name	Requirements item of standard C/S T.001	Methods item of standard C/S T.007
1.	Performance measurements at normal temperature	4.2.1, 2.2, 2.3	Annex A section A.2.1
2.	Performance measurements at maximum declared temperature	4.2.1, 2.2, 2.3	Annex A section A.2.1
3.	Performance measurements at minimum declared temperature	4.2.1, 2.2, 2.3	Annex A section A.2.1
4.	Self-test mode	4.5.4	Annex A section A.3.6
5.	Current measurements and analysis [2]	4.5.1	Annex A section A.2.3
6.	Beacon coding software	3.2, Annex A	Annex A section A.2.8, A.3.1.4
7.	Satellite qualitative test	2.1.3, Annex A section A.2.5	Annex A section A.2.5

[1] - Test program has been agreed with Secretariat beforehand, considering that tests
- thermal shock test,
- temperature gradient,
- operating lifetime at minimum temperature and
- beacon antenna test

should be referred to Test Report 11/9 (beacon model Tron60GPS).

[2] - Current measurement as a part of operating lifetime at minimum temperature test (A.2.3) has been agreed with Secretariat for beacon model Tron60S beforehand, considering that the whole lifetime test should be referred to Test Report 11/9 (beacon model Tron60GPS).

6. TEST SHEDULE

No.	Test name	Date
1.	Performance measurements at normal temperature	30.09.2011
2.	Performance measurements at maximum declared temperature	03.10.2011
3.	Performance measurements at minimum declared temperature	30.09.2011
4.	Self-test mode	30.09.2011-03.10.2011
5.	Current measurements and analysis [1]	03.10.2011
6.	Beacon coding software	12.07.2011
7.	Satellite qualitative test	18.07.2011, 05.10.2011

[1] - Current measurement as a part of operational lifetime at minimum temperature test (A.2.3) has been agreed with Secretariat for beacon model Tron60S beforehand, considering that the whole lifetime test should be referred to Test Report 11/9 (beacon model Tron60GPS).

7. TEST RESULT

No.	Test name	Results Pass/Fail
1.	Performance measurements at normal temperature	Pass
2.	Performance measurements at maximum declared temperature	Pass
3.	Performance measurements at minimum declared temperature	Pass
4.	Self-test mode	Pass
5.	Current measurements and analysis [1]	Pass
6.	Beacon coding software	Pass
7.	Satellite qualitative test	Pass

[1] - Current measurement as a part of operational lifetime at minimum temperature test (A.2.3) has been agreed with Secretariat for beacon model Tron60S beforehand, considering that the whole lifetime test should be referred to Test Report 11/9 (beacon model Tron60GPS).

8. APPLICATION FOR A COSPAS-SARSAT 406 MHz BEACON TYPE APROVAL CERTIFICATE

G.1 INFORMATION PROVIDED BY THE BEACON MANUFACTURER

Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Jotron AS
Beacon Model	Tron 60S
Other Model Names	

Beacon Type and Operational Configurations

Beacon Type	**Beacon used while:**	**Tick where appropriate**
EPIRB	Floating in water or on deck or in a safety raft	X
PLB	On ground and above ground	
	On ground and above ground and floating in water	
ELT Survival	On ground and above ground	
	On ground and above ground and floating in water	
ELT Auto Fixed	Fixed ELT with aircraft external antenna	
ELT Auto Portable	In aircraft with an external antenna	
	On ground, above ground, or in a safety raft with an integrated antenna	
ELT Auto Deployable	Deployable ELT with attached antenna	
Other (specify)		

Beacon Characteristics

Characteristic	**Specification**
Operating frequency	406.037MHz
Operating temperature range	Tmin =-20 Tmax=+55 degree C
Operating lifetime	48 hours

Characteristic	Specification
Battery chemistry	Lithium/Iron Disulfide (Li/FeS_2)
Battery cell model name, size and number of cells	L91, AA, 8 cells
Battery cell manufacturer	Energizer
Battery pack manufacturer and part number	UAB Jotron, Lithuania, X-83095
Battery pack replacement period	5 years
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon
Oscillator part name and number	Rakon E4520LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	YES
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Intergral combined antenna for 406MHz 121,5MHz and low duty-cycle light at the top
Antenna manufacturer	SHANGHAI KEWL C. Ltd., China
Antenna part name and number	Complete Antenna, X-83088
Navigation device type (Internal, External or None)	None
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	N/A
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	N/A
Navigation device capable of supporting global coverage (Yes, No or N/A)	N/A
For Internal Navigation Devices - Geodetic reference system (WGS 84 or GTRF) - GNSS receiver cold start forced at every beacon activation (Yes or No) - Navigation device manufacturer - Navigation device model name and part Number - GNSS system supported (e.g. GPS, GLONASS, Galileo)	

Characteristic	Specification	
For External Navigation Devices - Data protocol for GNSS receiver to beacon interface - Physical interface for beacon to navigation device - Electrical interface for beacon to navigation device - Part number of the external navigation interface device (if applicable) - Navigation device model and manufacturer (if beacon designed to use specific devices)		
Self-Test Mode Characteristics:	Self-Test Mode	Optional GNSS Self-Test Mode
- Self-test has separate switch position (Yes or No)	Yes	
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes	
- Self-test activation can cause an operational mode transmission (Yes or No)	No	
- Self-test causes a single beacon self-test message burst only regardless of how long the self-test activation mechanism applied (Yes or No)	Yes	
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	Number of Strobe light flashes. One flash=OK	
- Self-test can be activated from beacon remote activation points (Yes or No)	No	
- Self-test performs an internal check and indicates that RF power emitted at 406 MHz and 121.5 MHz if beacon includes a 121.5 MHz homer (Yes or No)	Yes	
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	Yes, 121.5MHz	
- Self-test can be activated directly at beacon (Yes or No)	Yes	
- List of Items checked by self-test	Supported in product manuals	
- Self-test transmission burst duration (440 or 520 ms)	440ms	
- Self-test format bit ("0" or "1")	"0"	
- Maximum duration of self-test	6 seconds if OK	

Characteristic	Specification	
- Maximum number of GNSS Self Tests (beacons with internal navigation devices only)	N/A	N/A
- Self-test results in transmission of a single burst, irrespectively of the test result (Yes or No)	N/A	
- Maximum number of self-tests during battery pack replacement period	N/A	N/A

Message Coding Protocols:	(x)	Tick the boxes below against the intended protocol options
User Protocol (tick where appropriate)	X	Maritime with MMSI
	X	Maritime with Radio Call Sign
	X	EPIRB Float Free with Serial Number
		EPIRB Non Float Free with Serial Number
	X	Radio Call Sign
		Aviation
		ELT with Serial Number
		ELT with Aircraft Operator and Serial Number
		ELT with Aircraft 24-bit Address
		PLB with Serial Number
		National (Short Message Format)
		National (Long Message Format)
Standard Location Protocol (tick where appropriate)		EPIRB with MMSI
		EPIRB with Serial Number
		ELT with 24-bit Address
		ELT with Aircraft Operator Designator
		ELT with Serial Number
		PLB with Serial Number
National Location Protocol (tick where appropriate)		National Location: EPIRB
		National Location: ELT
		National Location: PLB
User Location Protocol (tick where appropriate)		Maritime with MMSI
		Maritime with Radio Call Sign
		EPIRB Float Free with Serial Number
		EPIRB Non Float Free with Serial Number
		Radio Call Sign
		Aviation
		ELT with Serial Number
		ELT with Aircraft Operator and Serial Number
		ELT with Aircraft 24-bit Address
		PLB with Serial Number

Characteristic	Specification
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121,5MHz
-Homer Transmit Power	17 dBm +/-3dB
-Homer Transmitter Duty Cycle	96 %
-Duty Cycle of Homer Swept Tone	37 %
Beacon includes a strobe light (Yes or No)	Yes
- Strobe light intensity	>0.75cd
- Strobe light flash rate	21 per minute
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)	Yes
Other ancillary devices (e.g. voice transceiver, remote control, external audio and light indicators, external activation device). List details on a separate sheet if insufficient space to describe.	N/A
Beacon includes automatic activation mechanism (Yes or No) Specify type of automatic beacon activation mechanism	Yes Sea water contacts
Beacon includes software or hardware features and functions not listed above and non-related to 406 MHz (Yes or No) List features and use a separate sheet if insufficient space	No

Dated: 23.11.11 Signed: Stig Erik Helland / R&D Director, Stig Erik Helland

(Name, Position and Signature of Beacon Manufacturer Representative)

9. CONCLUSION

INFORMATION PROVIDED BY THE COSPAS-SARSAT ACCEPTED TEST FACILITY

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

Date of Submission for Testing: **February 9, 2011**

Applicable C/S Standards:

Document	Issue	Revision
C/S T.001	3	11
C/S T.007	4	5

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

* - according to test program in section 5 page 8 of the test report 11/10.

Dated November 24, 2011 Signed 

V. Kovalenko
Department manager

TABLE F.1: OVERALL SUMMARY OF 406 MHZ TRON60S BEACON TEST RESULTS

Parameters to be Measured		Range of Specification	Units	Test Results			Com-ments
				T_{min} (-20°C)	T_{amb} (20 °C)	T_{max} (55 °C)	
1. Power Output							Annex 1 (v1.04)[1]
– transmitter power output		35-39	dBm	36.57	36.27-36.40	36.03 - 36.05	Note 1
– power output rise time		<5	ms	0.04 - 0.10	0.04 - 0.10	0.04 - 0.10	
– power output 1 ms before burst		<-10 dBm	√[1]	√	√	√	
2. Digital Message	Bits number						Annex 1 (v1.04)
– bit sync	1-15	15 bits "1"	√	√	√	√	Note 2
– frame sync	16-24	"000101111"	√	√	√	√	
– format flag	25	1 bit	bit value	0	0	0	
– protocol flag	26	1 bit	bit value	1	1	1	
– identification / position data	27-85	59 bit	√	√	√	√	
– BCH code	86-106	21 bits	√	√	√	√	
– emerg. code / nat. use / supplem. data	107-112	6 bits	bit value	010000	010000	010000	
– additional data / BCH (if applicable)	113-144	32 bits	√	—	—	—	
– position error (if applicable)		<5	km	—	—	—	N/A
3. Digital Message Generator							Annex 1 (v1.04)
– repetition rate T_R:							
• average T_R		48.5-51.5	sec	50.23	50.35	49.79	
• min T_R		$47.5 \le T_R \le 48.0$	sec	47.64	47.69	47.60	
• max T_R		$52.0 \le T_R \le 52.5$	sec	52.49	52.38	51.75	
• standard deviation		0.5-2.0	sec	1.93	1.65	1.43	
– bit rate:							
• min f_b		≥396	bit/sec	399.61	399.64	399.69	
• max f_b		≤404	bit/sec	399.75	399.83	399.84	
– total transmission time:							
• short message		435.6-444.4	ms	439.90 - 439.95	439.90 - 439.95	439.90 - 439.95	
• long message		514.8-525.2	ms	—	—	—	
– unmodulated carrier:							
• min T_1		≥158.4	ms	160.49	160.50	160.49	
• max T_1		≤161.6	ms	160.55	160.55	160.54	
– first burst delay		≥47.5	sec	53.74-54.05	53.16-54.01	53.27 - 53.99	

Note 1. Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted in the data presented in the Summary Table. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75.

Note 2. Only the first burst after beacon activated has frame synchronization pattern as in the self-test message. All further bursts are normal operation messages.

[1] - Beacon software version is indicated in parentheses.

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb} (20 °C)	T_{max} (55 °C)	
4. Modulation						Annex 1 (v1.04)
– biphase-L		√	√	√	√	
– rise time	50-250	μsec	139.25 - 142.31	148.17 - 153.18	128.70 - 130.05	
– fall time	50-250	μsec	130.57 - 132.24	138.43 - 140.53	133.64 - 135.28	
– phase deviation: positive	+(1.0 to 1.2)	radians	1.08 to 1.13	1.08 to 1.12	1.05 to 1.08	
– phase deviation: negative	-(1.0 to 1.2)	radians	-1.09 to -1.14	-1.12 to -1.15	-1.13 to -1.16	
– symmetry measurement	≤0.05	√	√	√	√	
5. 406 MHz Transmitted Frequency						Annex 1 (v1.04)
– nominal value	406.036 - 406.038	MHz	406.036999- 406.037000	406.036981- 406.036993	406.036950 - 406.036953	
– short-term stability	$\leq 2\times10^{-9}$	/100 ms	1.67E-10 to 2.38E-10	1.16E-10 to 1.76E-10	1.19E-10 to 2.09E-10	
– medium-term stability slope	(-1 to +1) $\times10^{-9}$	/min	-2.86E-11 to 1.58E-11	-7.66E-10 to 8.58E-11	-9.09E-11 to - 4.15E-11	
– medium-term stability residual frequency variation	$\leq 3\times10^{-9}$		8.72E-11 to 1.89E-10	7.39E-11 to 2.55E-10	6.01E-11 to 1.06E-10	
6. Spurious Emissions into 50 Ohms (406.0 – 406.1 MHz)[1]	C/S T.001 mask	√	√ Annex 1.3	√ Annex 1.1	√ Annex 1.2	
7. 406 MHz VSWR Check						Annex 1 (v1.04)
– nominal transmitted frequency	406.036 - 406.038	MHz	406.036998	406.036980	406.036949	
– modulation rise time	50-250	μsec	139.94 - 142.40	150.91 - 154.10	127.58 - 128.46	
– modulation fall time	50-250	μsec	131.26 - 132.61	139.59 - 140.72	135.12 - 136.23	
– modulation phase deviation +φ	+(1.0 to 1.2)	radians	1.10 to 1.13	1.09 to 1.12	1.05 to 1.08	
– modulation phase deviation -φ	-(1.0 to 1.2)	radians	-1.08 to -1.11	-1.11 to -1.13	-1.12 to -1.15	
– modulation symmetry measurement	≤0.05	√	√	√	√	
– digital message	correct	√	√	√	√	

[1] Include spectral plots of the 406.0-406.1 MHz band showing the transmit signal and the emission mask as defined in document C/S T.001.

Parameters to be Measured	Range of Specification	Units	Test Results			Comments
			T_{min} (-20 °C)	T_{amb} (20 °C)	T_{max} (55 °C)	
8 (a). Self-test Mode						Annex 1 (v1.04)
– frame sync	"011010000"	√	√	√	√	
– format flag	1/0	bit value	0	0	0	
– single radiated burst	≤440/520 (±1%)	ms	439.85	439.90	439.90	
– default position data (if applicable)	must be correct	√	√	√	√	
– description provided		√	√	√	√	Vol.2 Iss.4 p.38
– design data provided on protection against repetitive self-test mode transmissions		√	√	√	√	Vol.2 Iss.4 p.73
– single burst verification	must be one burst	√	√	√	√	
– provides for 15 Hex ID	must be correct	√	√	√	√	
– 121.5 MHz RF power (if applicable)	verify that RF power is emitted	√	√	√	√	
– 406 MHz RF power	verify that RF power is emitted	√	√	√	√	

Parameters to be Measured	Range of Specification	Units	Test Results	Comments
10. Current measurements and analysis			Table F-E.1, Table F-E.2	Annex 2 Note 1 (v1.04)
12. Oscillator Aging (data provided)	C/S T.001	kHz	1.281	Vol.2 Iss.4 p.68
13. Protection Against Continuous Transmission description provided	<45	sec	4.5	Vol.2 Iss.4 p.66
14. Satellite Qualitative Test				
- conf. 5. Water ground plane.	15 Hex ID provided by LUT and position within 5 km 80% of time	√	6 satellite passes successful solutions ratio 100% with location error ≤ 5 km	Annex 4.1
- conf. 8. Above ground plane.	- // -	√	6 satellite passes successful solutions ratio 100% with location error ≤ 5 km	Annex 4.2
16. Beacon Coding Software				Annex 3 (v1.04)
- sample message provided for each coding option of the applicable coding types	correct	√	√	Per Table F-D.1
- sample self-test message provided for each coding option of the applicable coding types	correct	√	√	Per Table F-D.1

Note 1. Current measurements as a part of operating lifetime at minimum temperature test (A.2.3) has been agreed with Secretariat for beacon model Tron60S beforehand, considering that the whole lifetime test should be referred to Test Report 11/9 (beacon model Tron60GPS).

Senior Engineer  A.V.Baydachniy

ANNEX 1.

ELECTRICAL AND FUNCTIONAL PERFORMANCE MEASUREMENTS AT CONSTANT TEMPERATURE

(According to C/S T.007 – section A.2.1)

Electrical and Functional Tests at Constant Temperature

Test procedure

The tests were performed after the beacon under test, while turned off, has stabilized for a 2 hours at laboratory ambient temperature, at the specified minimum operating temperature and at the maximum operating temperature correspondingly. Except of testing in the self-test mode (per paragraph A.3.6 T.007), the beacon was allowed to operate for 15 minutes before measurements started.

Note 1. Only the first burst after beacon activated has frame synchronization pattern as in the self-test message. All further bursts are normal operation messages.

Note 2. Matching network was used during measurements. Measured values of output power presented in tables and graphs of this Annex does not account inserted losses unless other is noted. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted in the data presented in the Summary Table. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

The list of parameters

Parameter tested	Operating temperature		
	20 °C	55 °C	-20 °C
	page No		
Transmitter power output			
Transmitter power output	25	39	53
Maximum and minimum value of output power during operating	24	38	52
Output power rise time	25	39	53
Power output 1 ms before burst	24	38	52
Messages			
Message contents	26	40	54
Digital message generator			
First burst delay	27	41	55
Average repetition rate and standard deviation	**27**	41	55
Minimal and maximal value of digital message generator parameters	24	38	52
Modulation			
Modulation index	28	42	56
Modulation rise and fall times	28	42	56
View of modulation 3 first bit message	28	42	56
Maximum and minimum value during operating	24	38	52
Transmitted frequency			
Nominal value	30	44	58
Medium /short term frequency stability	30	44	58
Maximum and minimum value during operating	24	38	52
Spurious emissions			
Spurious emissions	32	46	60
VSWR test			
Transmitter nominal frequency	33	47	61
Digital message content	34	48	62
The modulation parameters	33	47	61
Self-test mode			
Duration of the burst	35	49	63
Digital message content (frame synchronization, format flag)	36	50	64
The Output power, frequency of the self- test burst	35	49	63

ANNEX 1.1

PERFORMANCE MEASUREMENTS AT NORMAL TEMPERATURE

(According to C/S T.007 – section A.2.1)

Model: Tron60S
Serial number: 00100
Beacon SW: 1.04
Test Date: 30.09.2011

Test conditions:

- Ambient laboratory temperature: 21 °C;
- Relative air humidity: 46 %.
- Atmospheric pressure: 757 mm/Hg;
- Beacon environment temperature during test: 20 °C.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F 4C9418618618668A26F19 0

Test duration 2:00:20	Bursts received 145	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.036	406.038	406.036981	406.036981	406.036993
+Phase deviation, rad	1.00	1.20	1.08	1.09	1.12
-Phase deviation, rad	-1.00	-1.20	-1.15	-1.14	-1.12
Phase time rise, us	50.00	250.00	148.17	150.30	153.18
Phase time fall, us	50.00	250.00	138.43	139.79	140.53
***Power, dBm**	35	39	35.67	35.67	35.80
Power rise, ms	0.00	0.00	0.04	0.04	0.10
Power output 1 ms before burst, dBm		-10		-33.91	
Bit Rate, bps	396.00	404.00	399.64	399.83	399.83
Asymmetry, %	0.00	5.00	0.59	0.83	0.91
CW Preamble, ms	158.40	161.60	160.50	160.55	160.55
Total burst duration, ms	514.80	525.20	439.90	439.95	439.95
Slope	-1.00E-09	1.00E-09	-7.66E-10	-8.68E-11	-8.58E-11
Residual variations	0.00E-09	3.00E-09	7.39E-11	1.25E-10	2.55E-10
Short term variations	0.00E-09	2.00E-09	1.16E-10	1.31E-10	1.76E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499162	**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		

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted in the data presented in the Summary Table. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).
Example of the calculation of a real output power measured by beacon tester without RF losses:
The beacon tester measures the output power equal 35.67 dBm.
Value of RF losses at 406 MHz equal 0.6 dB is added to the maximum output power measured by beacon tester:
35.67 dBm + 0.6 dB = 36.27 dBm.
Calculated value of 36.27 dBm is the real beacon output power and it is included in Table F.1 of this Test Report.

a) Transmitter Power Output (according to C/S T.007 – section A.3.2.2).

- **Transmitter Power Output Level (A.3.2.2.1)**

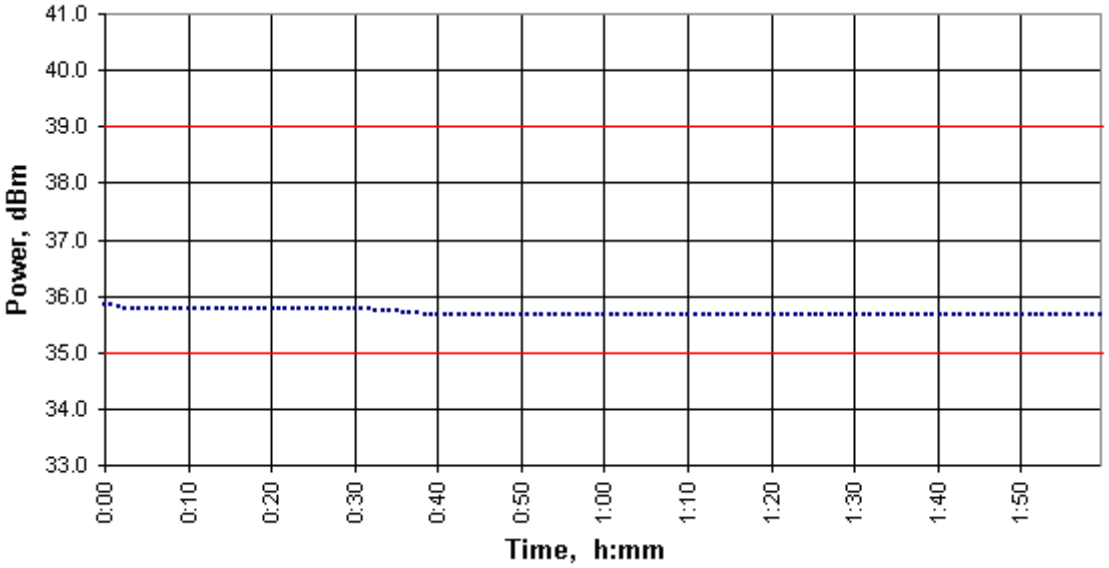


Figure 1.1. 1 – Transmitter power during test

- **Transmitter Power Output Rise Time (A.3.2.2.2)**

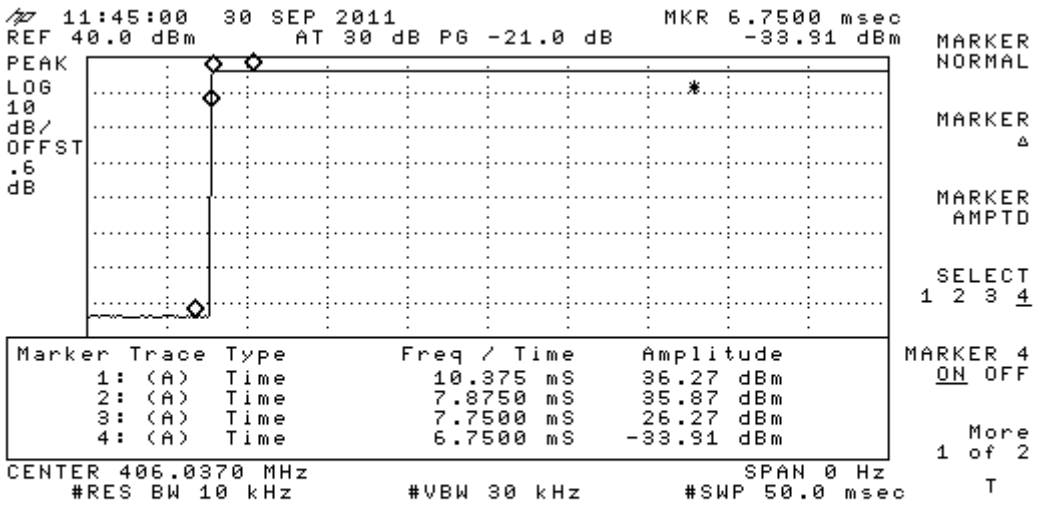


Figure 1.1. 2 – Transmitter power output rise *

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted on the plot. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

b) Message Coding (according to C/S T.007 - A.3.1.4)

Bursts received	145
BCH error	0
Self test message	0
Full HEX message	FFFE2F 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

c) Digital message generator (according to C/S T.007 – section A.3.1)

- **Repetition Period (A.3.1.1)**

406 MHz Transmitter Parameters	Limits		Measured
	min	max	
Average repetition period, s	48.50	51.50	50.35
Standard deviation	0.5	2.0	1.65
Minimum of Rep. period, s	47.5	48.0	47.69
Maximum of Rep. period, s	52.0	52.5	52.38
Differences of Rep. period, s	4		4.68

- **Measurement of time interval from the moment of beacon activation till the first (operating) burst**

	Time interval, sec	
	from the moment of beacon activation till the first self test burst in operation mode	from the moment of beacon activation till the first operation burst
1st measurement	2.31	53.16
2d measurement	2.19	54.01
3d measurement	2.26	53.59
Minimum value	**2.19**	**53.16**
Maximum value	**2.31**	**54.01**

d) Data Encoding and Modulation (according to C/S T.007 – section A.3.2.3)

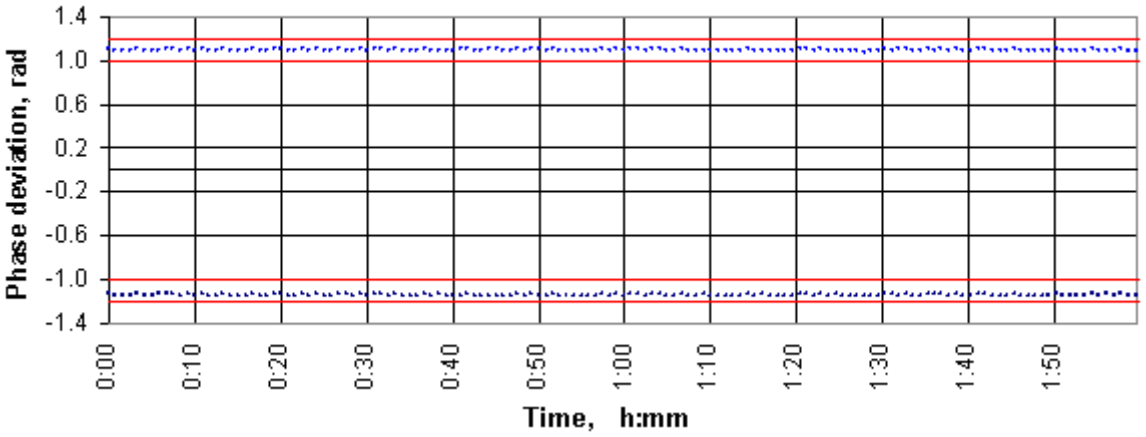
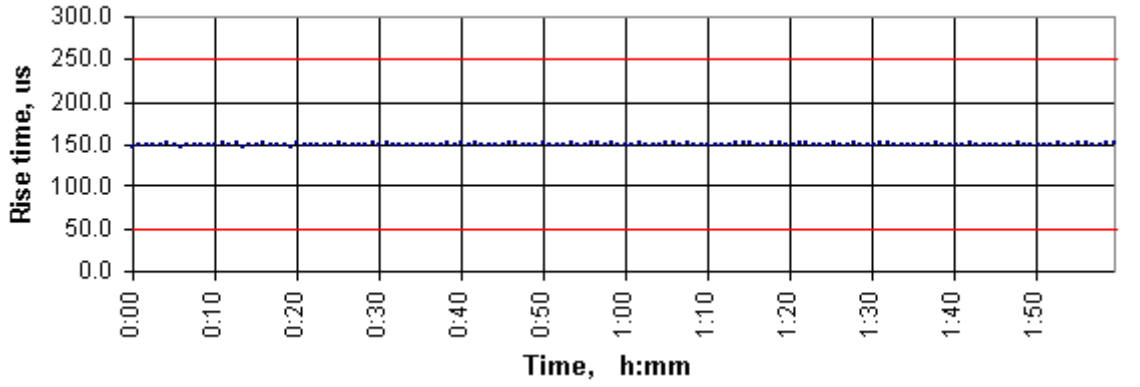


Figure 1.1. 3 – Modulation index



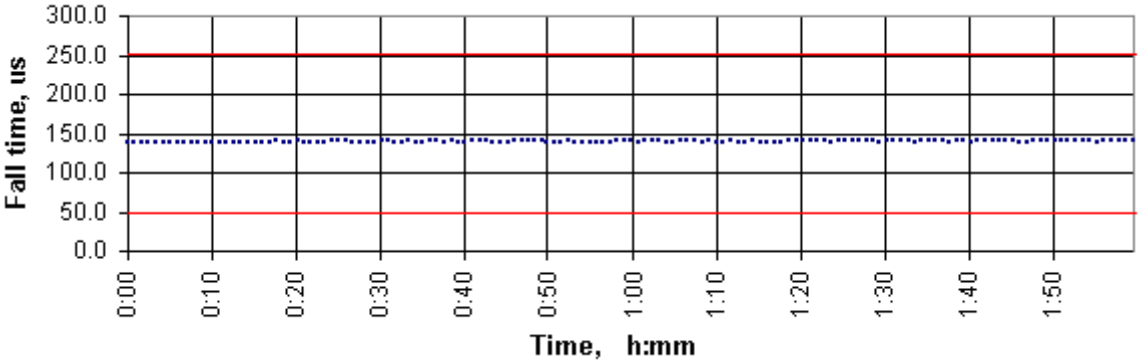


Figure 1.1. 4 – Modulation rise and fall times

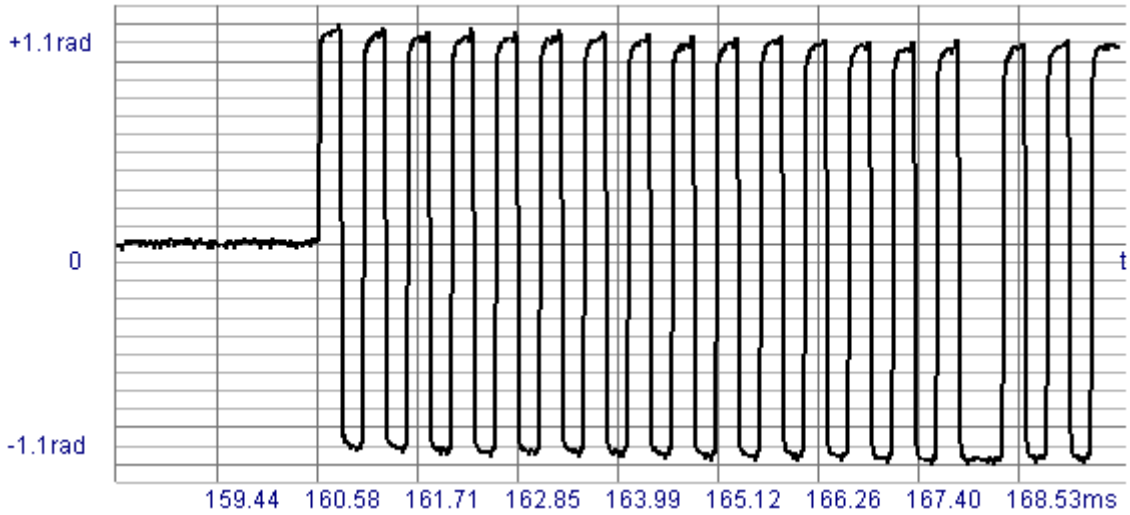


Figure 1.1. 5 – Modulation symmetry of the bi-phase demodulated signal

e) Transmitted Frequency (according to C/S T.007 – section A.3.2.1)

- **Nominal Value (A.3.2.1.1)**

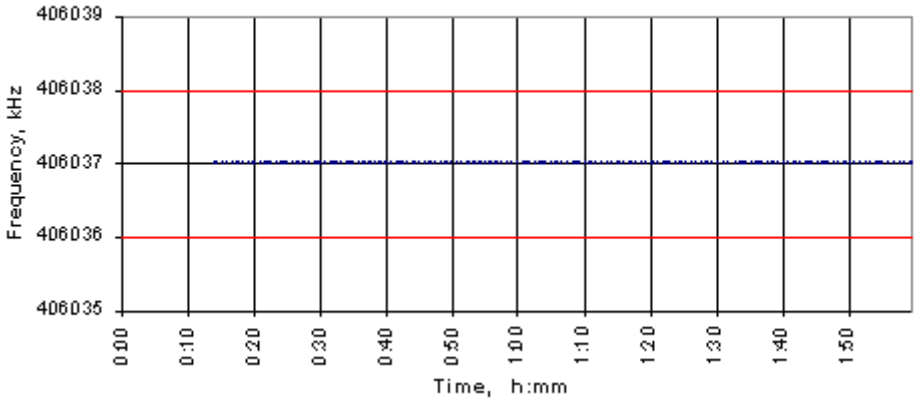


Figure 1.1. 6 – Nominal Value of frequency

- **Short-Term Stability (A.3.2.1.2)**

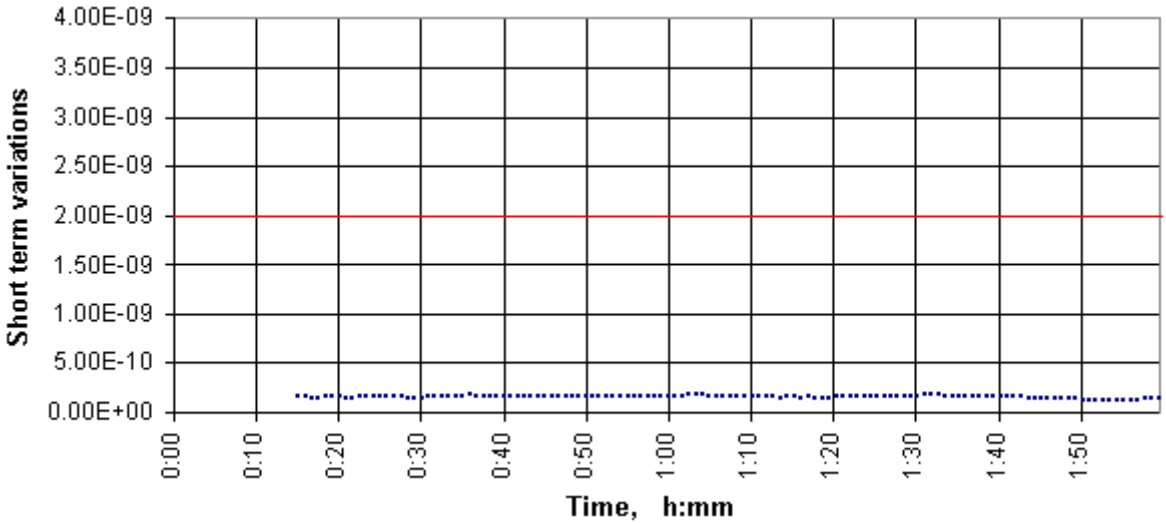


Figure 1.1. 7 – Short-Term Stability

- **Medium-Term Stability (A.3.2.1.3)**

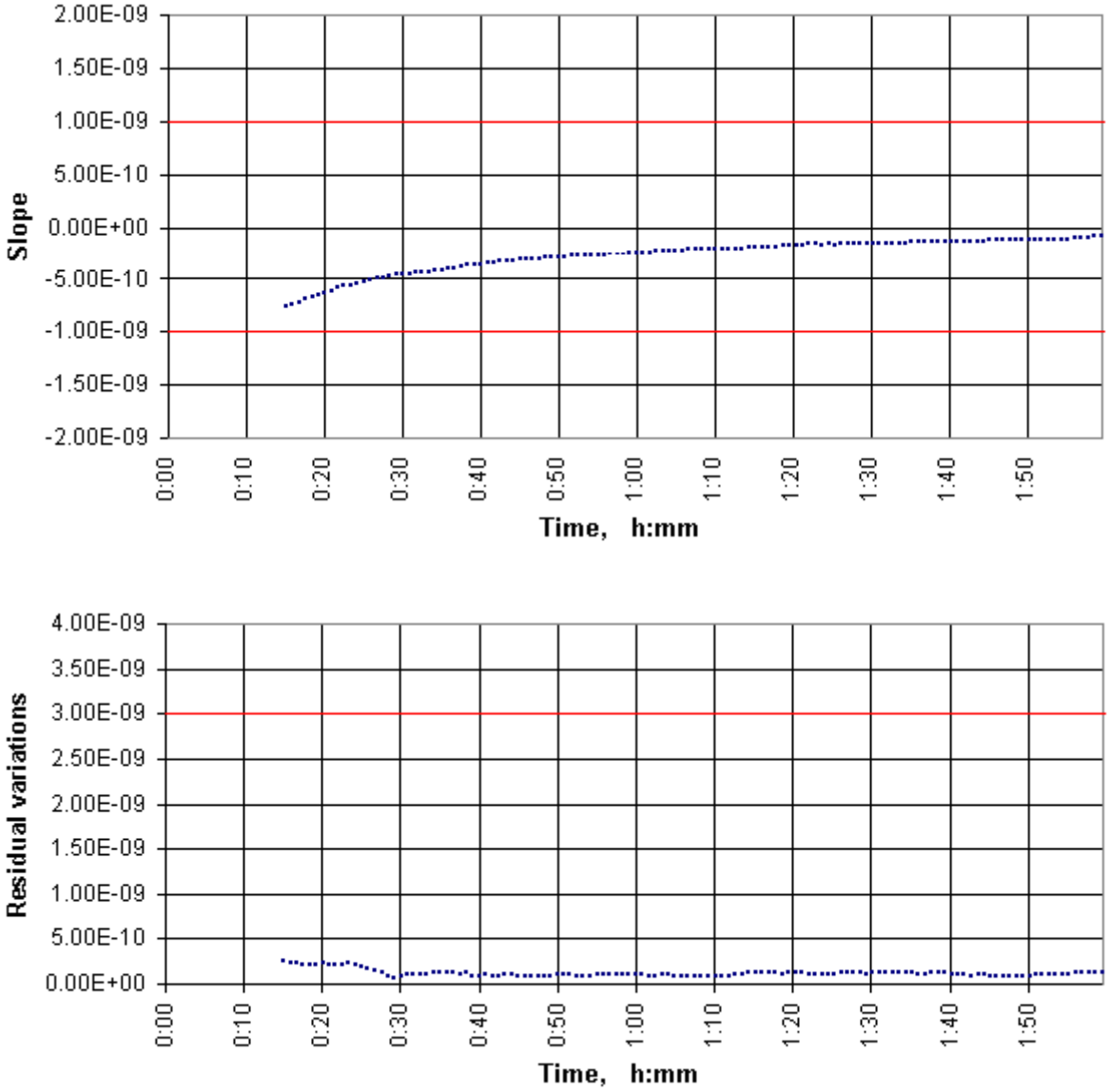


Figure 1.1. 8 – Medium-Term Stability

f) Spurious output (according to C/S T.007 – section A.3.2.2.4)

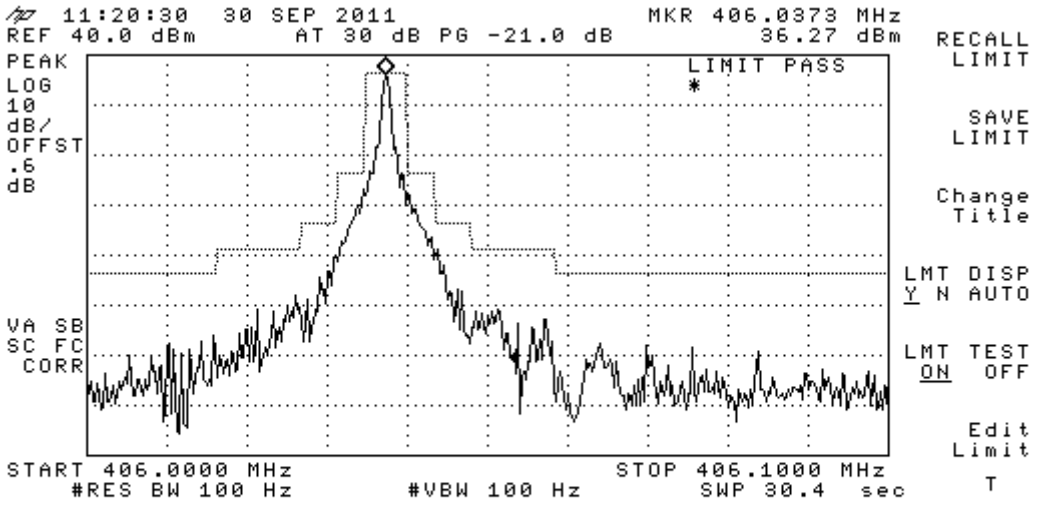


Figure 1.1. 9 – Spurious output *.

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted on the plot. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

g) Voltage Standing-Wave Ratio (according to C/S T.007 – section A.3.3)

Test results.

The transmitter was operating into an open circuit during 5 minutes and then into a short circuit during 5 minutes. Afterwards, the transmitter was operating into a load having a VSWR of 3:1 (pure resistive load. R=17 Ohm), during which time parameters was measured.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F 4C9418618618668A26F19 0

Test duration 0:15:41	Bursts received 20		BCH error 0	Self-Test 0	
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.036	406.038	406.036980	406.036980	406.036980
+Phase deviation, rad	1.00	1.20	1.09	1.11	1.12
-Phase deviation, rad	-1.00	-1.20	-1.13	-1.12	-1.11
Phase time rise, us	50.00	250.00	150.91	152.48	154.10
Phase time fall, us	50.00	250.00	139.59	140.18	140.72
Asymmetry, %	0.00	5.00	0.66	0.78	0.90

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499228	**Low Sweep Frequency, Hz**	385
Power, mW	5.2	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

- **The modulation parameters (A.3.2.3)**

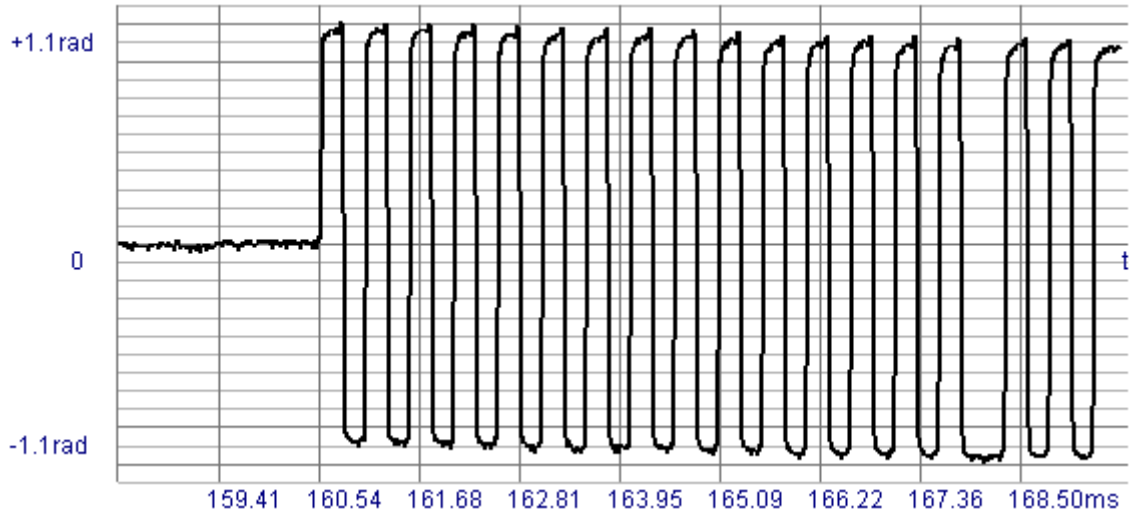


Figure 1.1. 10 – Modulation symmetry of the bi-phase demodulated signal

- **Message Coding (A.3.1.4)**

Bursts received	20
BCH error	0
Self test message	0
Full HEX message	FFFE2F 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

h) Self-test mode (according to C/S T.007 – section A.3.6.)

Test result.

During the self test transmitter emitted only one burst

Table of measured parameters.

Message	
Contents (full)	:FFFED0 4C9418618618668A26F19 0

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, MHz	406.036	406.038		406.036995	
Power, dBm	35	39		35.96	
Total burst duration, ms	514.80	525.20		439.90	
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz			121499354		
Power, mW			31.2		

- **Message Coding (A.3.1.4)**

Bursts received	1
BCH error	0
Self test message	1
Full HEX message	FFFED0 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

ANNEX 1.2

PERFORMANCE MEASUREMENTS
AT MAXIMUM DECLARED TEMPERATURE

(According to C/S T.007 – section A.2.1)

Model: Tron60S
Serial number: 00100
Beacon SW: 1.04
Test Date: 03.10.2011

Test conditions:

- Ambient laboratory temperature: 19 °C;
- Relative air humidity: 46 %.
- Atmospheric pressure: 760 mm/Hg.
- Beacon environment temperature during test: 55 °C;

Table of measured parameters.

Message	
Contents (full)	:FFFE2F 4C9418618618668A26F19 0

Test duration 2:00:47	Bursts received 146	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.036	406.038	406.036950	406.036950	406.036953
+Phase deviation, rad	1.00	1.20	1.05	1.05	1.08
-Phase deviation, rad	-1.00	-1.20	-1.16	-1.16	-1.13
Phase time rise, us	50.00	250.00	128.70	129.01	130.05
Phase time fall, us	50.00	250.00	133.64	134.30	135.28
***Power, dBm**	35	39	35.43	35.45	35.45
Power rise, ms	0.00	5.00	0.04	0.04	0.10
Power output 1 ms before burst, dBm		-10		-33.79	
Bit Rate, bps	396.00	404.00	399.69	399.71	399.84
Asymmetry, %	0.00	5.00	1.64	1.87	1.91
CW Preamble, ms	158.40	161.60	160.49	160.51	160.54
Total burst duration, ms	514.80	525.20	439.90	439.90	439.95
Slope	-1.00E-09	1.00E-09	-9.09E-11	-5.45E-11	-4.15E-11
Residual variations	0.00	3.00E-09	6.01E-11	9.51E-11	1.06E-10
Short term variations	0.00	2.00E-09	1.19E-10	1.64E-10	2.09E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499138	**Low Sweep Frequency, Hz**	385
Power, mW	34.2	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted in the data presented in the Summary Table. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).
Example of the calculation of a real output power measured by beacon tester without RF losses:
The beacon tester measures the maximum output power equal 35.45 dBm.
Value of RF losses at 406 MHz equal 0.6 dB is added to the maximum output power measured by beacon tester:
35.45 dBm + 0.6 dB = 36.05 dBm.
Calculated value of 36.05 dBm is the real beacon output power and it is included in Table F.1 of this Test Report.

a) Transmitter Power Output (according to C/S T.007 – section A.3.2.2).

- **Transmitter Power Output Level (A.3.2.2.1)**

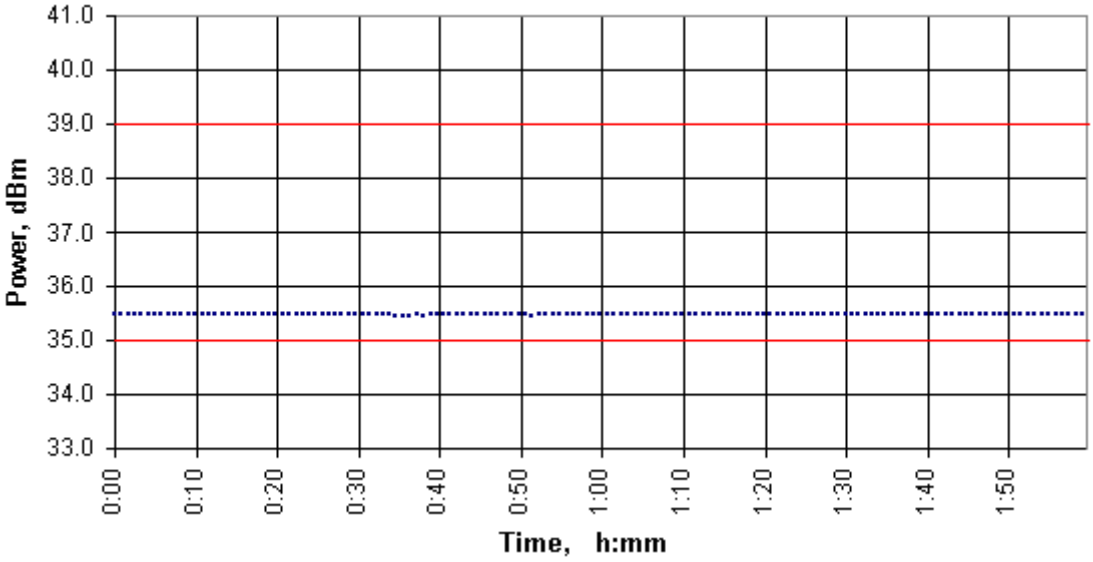


Figure 1.2. 1 – Transmitter power during test

- **Transmitter Power Output Rise Time (A.3.2.2.2)**

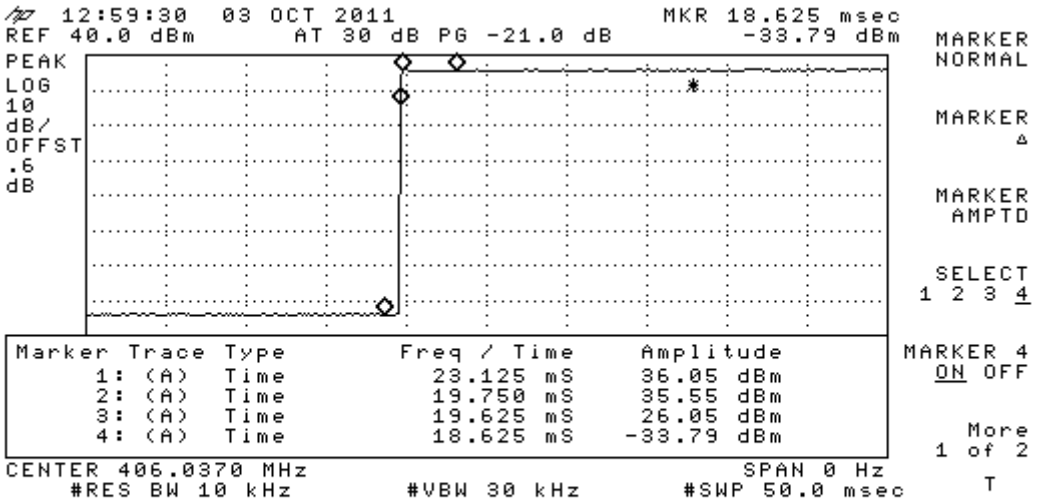


Figure 1.2. 2 – Transmitter power output rise

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted on the plot. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

b) Message Coding (according to C/S T.007 - A.3.1.4)

Bursts received	146
BCH error	0
Self test message	0
Full HEX message	FFFE2F 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

c) Digital message generator (according to C/S T.007 – section A.3.1)

- **Repetition Period (A.3.1.1)**

406 MHz Transmitter Parameters	Limits		Measured
	min	max	
Average repetition period, s	48.50	51.50	49.79
Standard deviation, s	0.5	2.0	1.43
Minimum of Rep. period, s	47.5	48.0	47.60
Maximum of Rep. period, s	52.0	52.5	51.75
Differences of Rep. period, s	4		4.14

- **Measurement of time interval from the moment of beacon activation till the first (operating) burst**

	Time interval, sec	
	from the moment of beacon activation till the first self test burst in operational mode	from the moment of beacon activation till the first (operating) burst
1st measurement	2.29	53.62
2d measurement	2.23	53.99
3d measurement	2.25	53.27
Minimum value	**2.23**	**53.27**
Maximum value	**2.29**	**53.99**

d) Data Encoding and Modulation (according to C/S T.007 – section A.3.2.3)

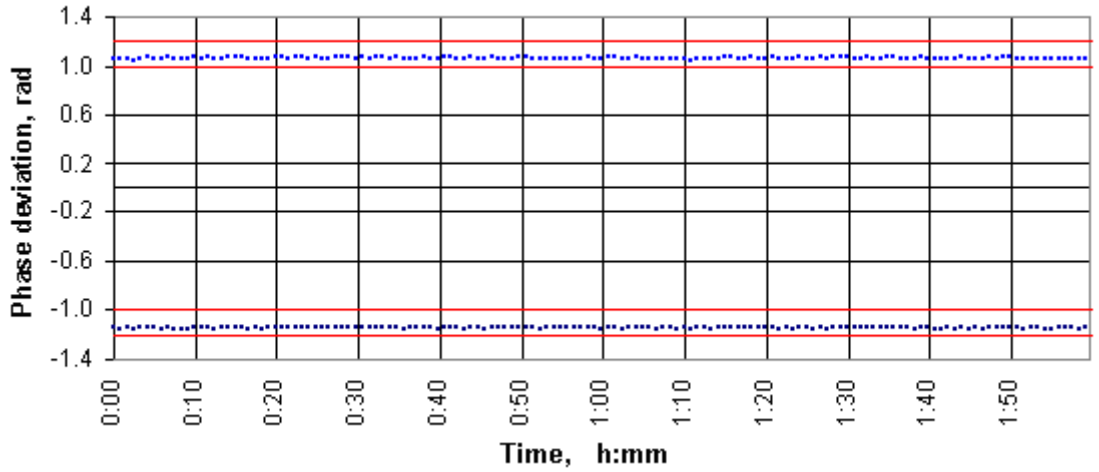


Figure 1.2. 3 – Modulation index

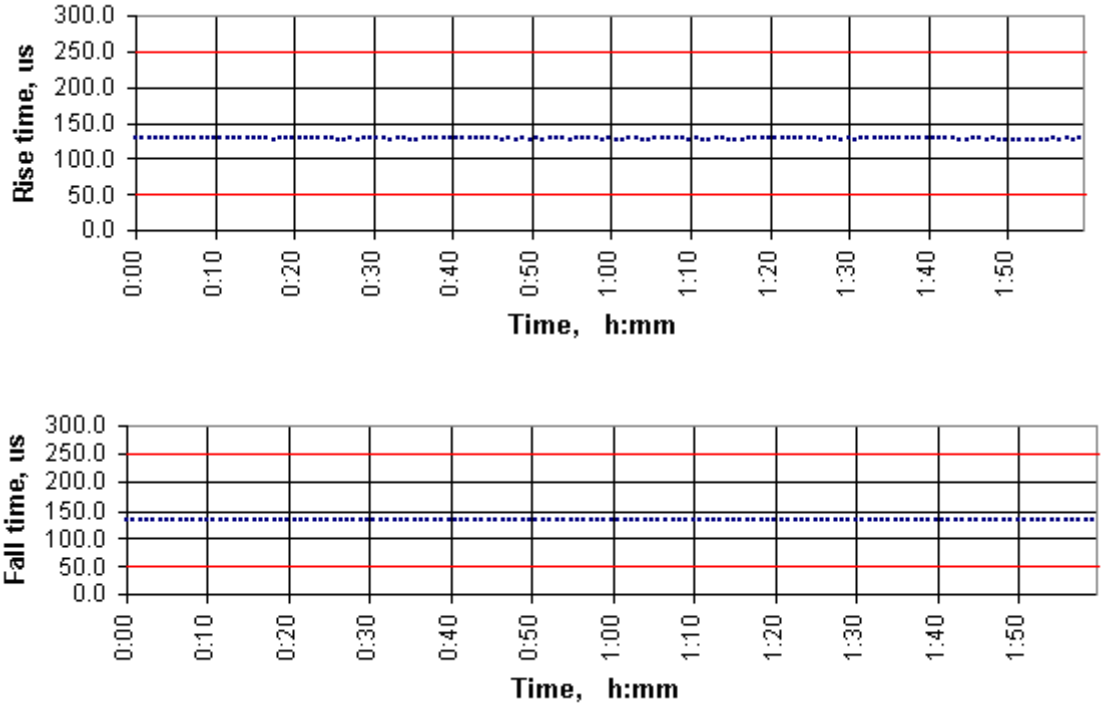


Figure 1.2. 4 – Modulation rise and fall times

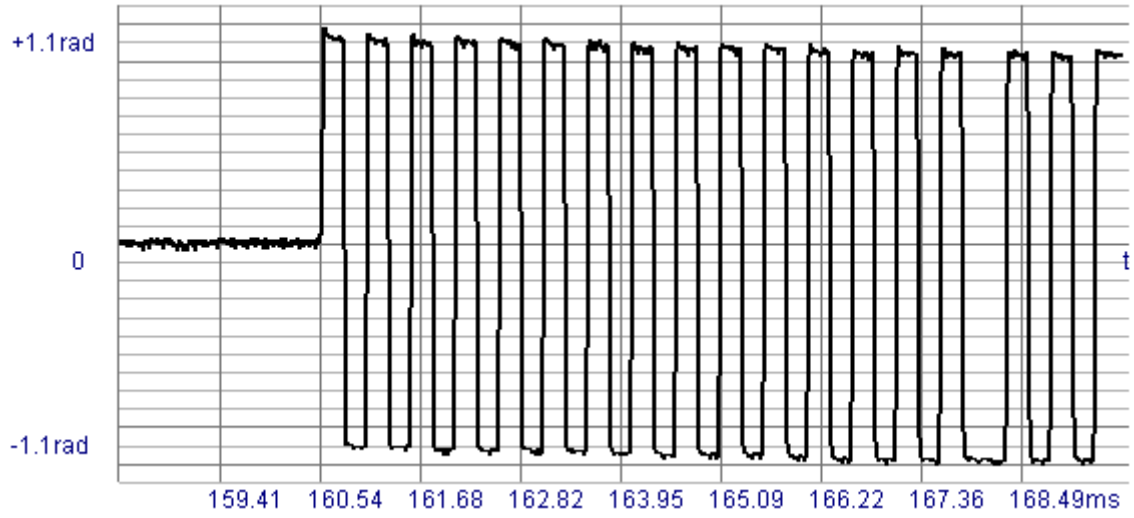


Figure 1.2. 5 – Modulation symmetry of the bi-phase demodulated signal

e) Transmitted Frequency (according to C/S T.007 – section A.3.2.1)

- **Nominal Value (A.3.2.1.1)**

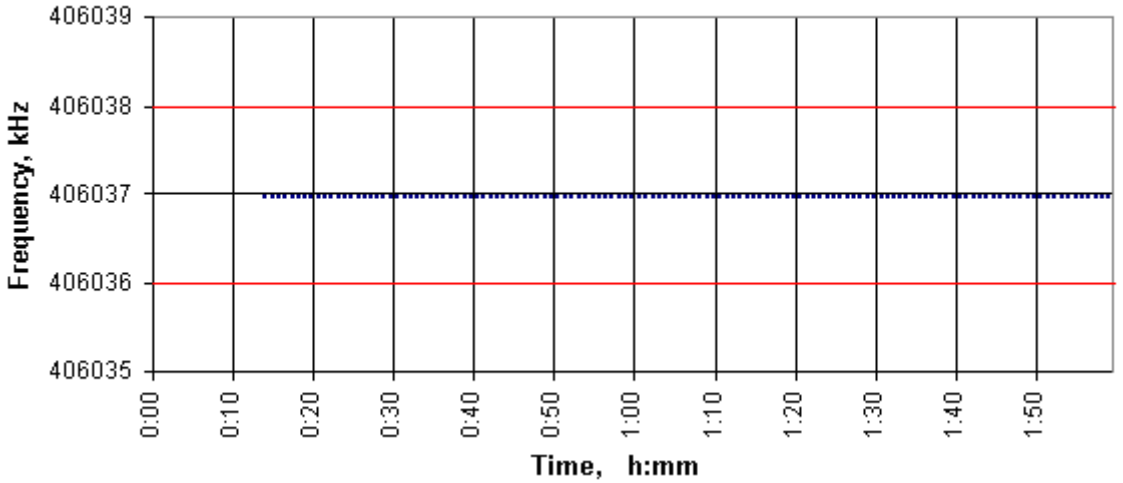


Figure 1.2. 6 – Nominal Value of frequency

- **Short-Term Stability (A.3.2.1.2)**

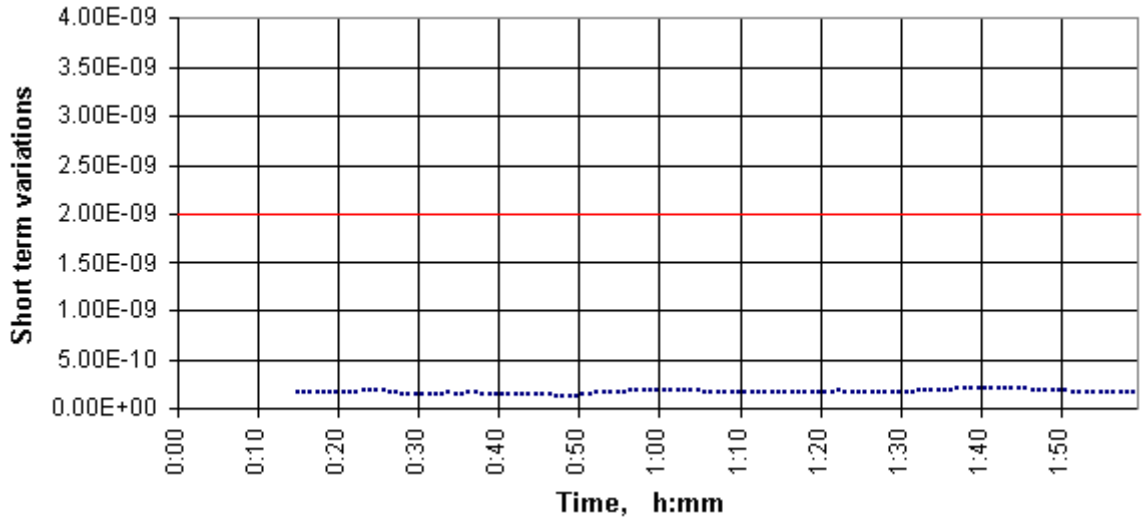


Figure 1.2. 7 – Short-Term Stability

- **Medium-Term Stability (A.3.2.1.3)**

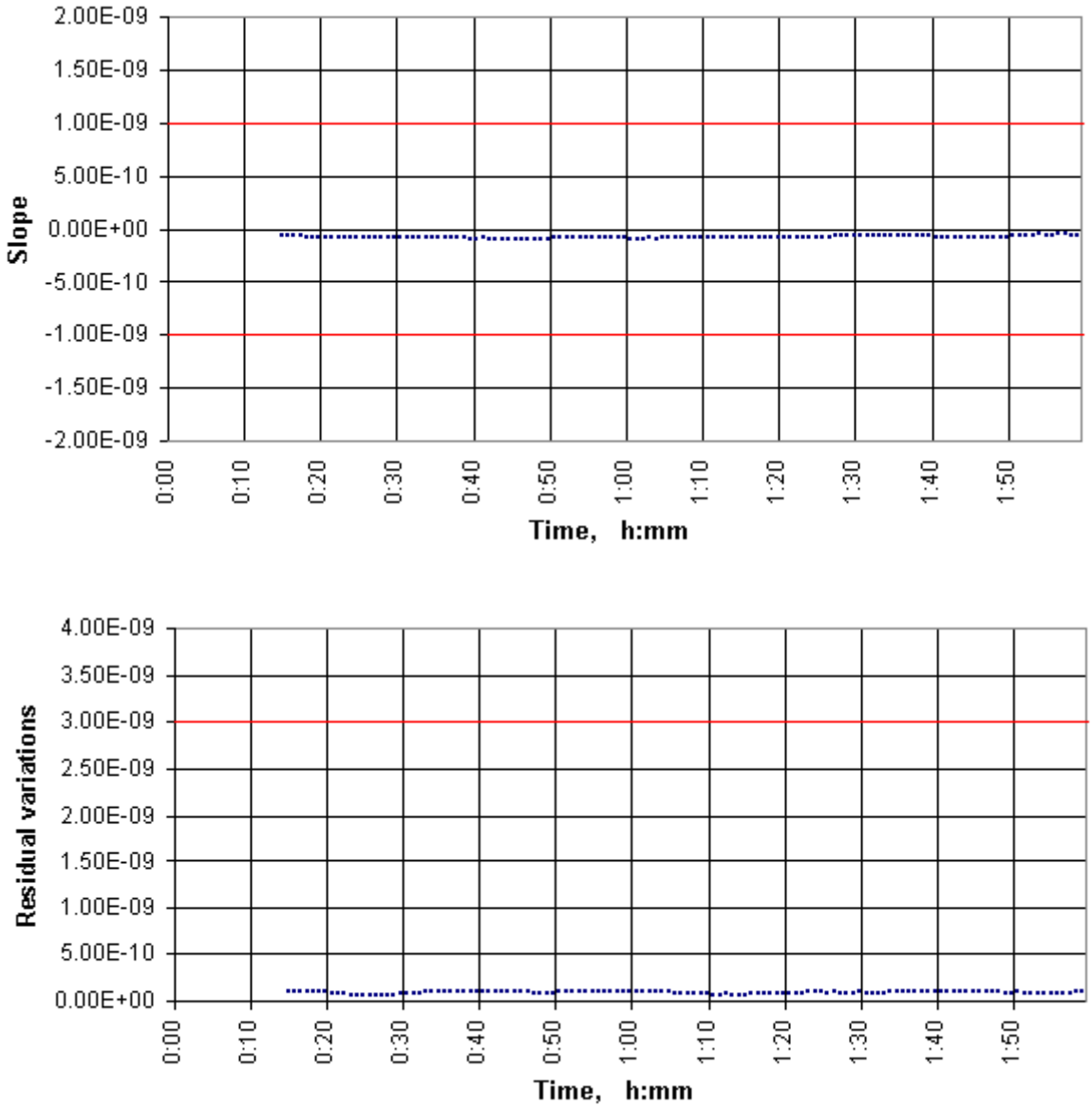


Figure 1.2. 8 – Medium-Term Stability

f) Spurious output (according to C/S T.007 – section A.3.2.2.4)

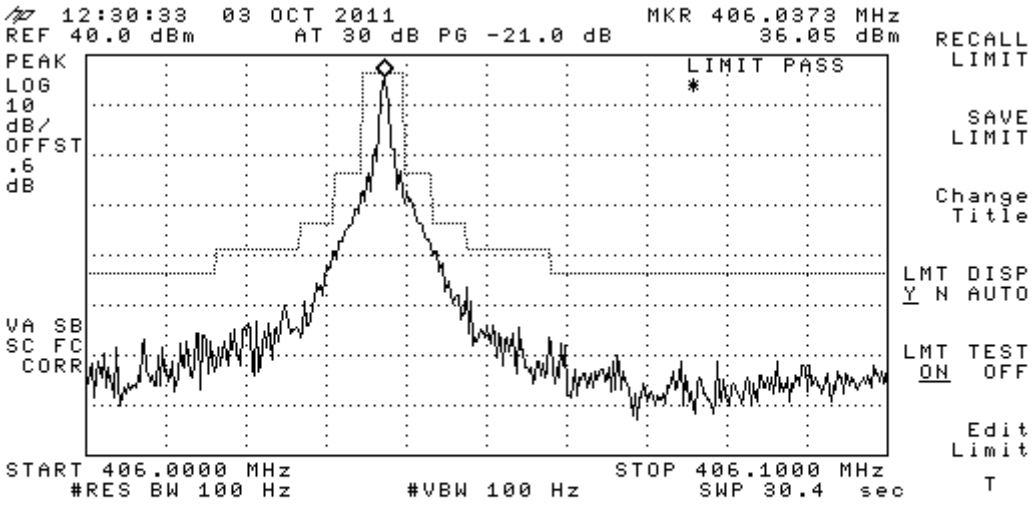


Figure 1.2. 9 – Spurious output *.

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted on the plot. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

g) Voltage Standing-Wave Ratio (according to C/S T.007 – section A.3.3)

Test results.

The transmitter was operating into an open circuit during 5 minutes and then into a short circuit during 5 minutes. Afterwards, the transmitter was operating into a load having a VSWR of 3:1 (pure resistive load. R=17 Ohm), during which time parameters was measured.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F 4C9418618618668A26F19 0

Test duration 0:15:42	Bursts received 20		BCH error 0	Self-Test 0	
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.036	406.038	406.036949	406.036949	406.036949
+Phase deviation, rad	1.00	1.20	1.05	1.07	1.08
-Phase deviation, rad	-1.00	-1.20	-1.15	-1.13	-1.12
Phase time rise, us	50.00	250.00	127.58	128.25	128.46
Phase time fall, us	50.00	250.00	135.12	135.93	136.23
Asymmetry, %	0.00	5.00	1.35	1.44	1.59

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499254	**Low Sweep Frequency, Hz**	385
Power, mW	5.9	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

- **The modulation parameters (A.3.2.3)**

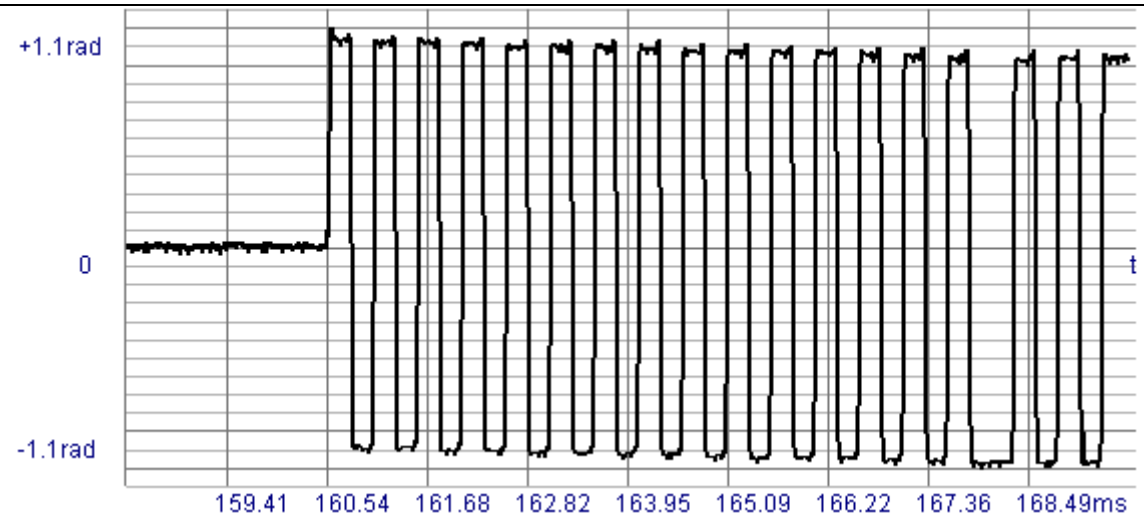


Figure 1.2. 10 – Modulation symmetry of the bi-phase demodulated signal

- **Message Coding (A.3.1.4)**

Bursts received	20
BCH error	0
Self test message	0
Full HEX message	FFFE2F 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

h) Self-test mode (according to C/S T.007 – section A.3.6.)

Test result.

During the self test transmitter emitted only one burst

Table of measured parameters.

Message	
Contents (full)	:FFFED0 4C9418618618668A26F19 0

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, MHz	406.036	406.038		406.036947	
Power, dBm	35	39		35.65	
Total burst duration, ms	514.80	525.20		439.90	
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz			121499217		
Power, mW			34.2		

- **Message Coding (A.3.1.4)**

Bursts received	1
BCH error	0
Self test message	1
Full HEX message	FFFED0 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

ANNEX 1.3

PERFORMANCE MEASUREMENTS AT MINIMUM DECLARED TEMPERATURE

(According to C/S T.007 – section A.2.1)

Model: Tron60S
Serial number: 00100
Beacon SW: 1.04
Test Date: 30.09.2011

Test conditions:

- Ambient laboratory temperature: 22 °C;
- Relative air humidity: 48 %.
- Atmospheric pressure: 757 mm/Hg.
- Beacon environment temperature during test: -20 °C.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F 4C9418618618668A26F19 0

Test duration 2:00:39	Bursts received 146	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.036	406.038	406.036999	406.036999	406.037000
+Phase deviation, rad	1.00	1.20	1.08	1.09	1.13
-Phase deviation, rad	-1.00	-1.20	-1.14	-1.13	-1.09
Phase time rise, us	50.00	250.00	139.25	141.30	142.31
Phase time fall, us	50.00	250.00	130.57	131.26	132.24
***Power, dBm**	35	39	35.97	35.97	35.97
Power rise, ms	0.00	0.00	0.04	0.04	0.10
Power output 1 ms before burst, dBm		-10		-33.40	
Bit Rate, bps	396.00	404.00	399.61	399.74	399.75
Asymmetry, %	0.00	5.00	0.27	0.32	0.61
CW Preamble, ms	158.40	161.60	160.49	160.54	160.55
Total burst duration, ms	514.80	525.20	439.90	439.95	439.95
Slope	-1.00E-09	1.00E-09	-2.86E-11	-7.38E-12	1.58E-11
Residual variations	0.00E-09	3.00E-09	8.72E-11	1.33E-10	1.89E-10
Short term variations	0.00E-09	2.00E-09	1.67E-10	2.22E-10	2.38E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499469	**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		

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted in the data presented in the Summary Table. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).
Example of the calculation of a real output power measured by beacon tester without RF losses:
The beacon tester measures the maximum output power equal 35.97 dBm.
Value of RF losses at 406 MHz equal 0.6 dB is added to the maximum output power measured by beacon tester:
35.97 dBm + 0.6 dB = 36.57 dBm.
Calculated value of 36.57 dBm is the real beacon output power and it is included in Table F.1 of this Test Report.

a) Transmitter Power Output (according to C/S T.007 – section A.3.2.2).

- **Transmitter Power Output Level (A.3.2.2.1)**

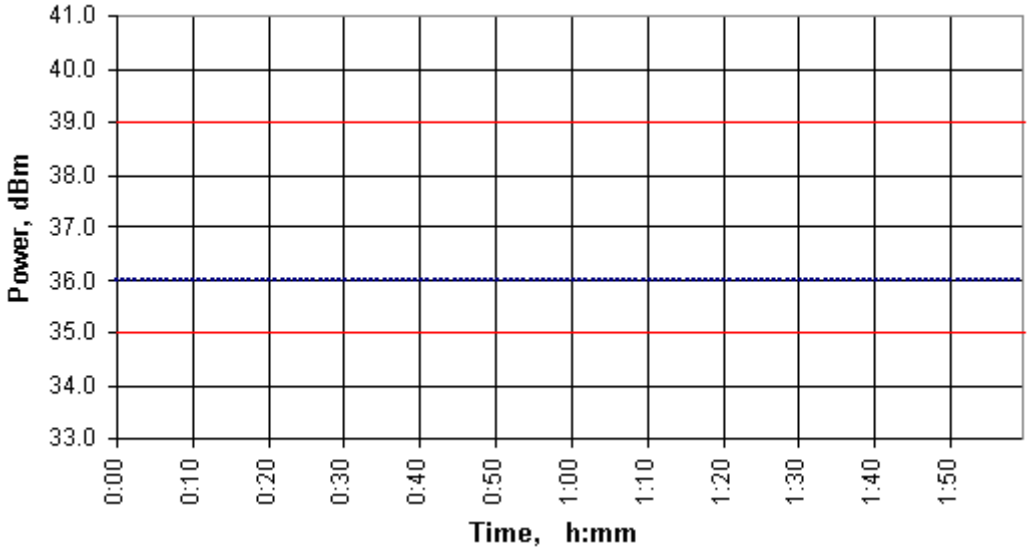


Figure 1.3. 1– Transmitter power during test

- **Transmitter Power Output Rise Time (A.3.2.2.2)**

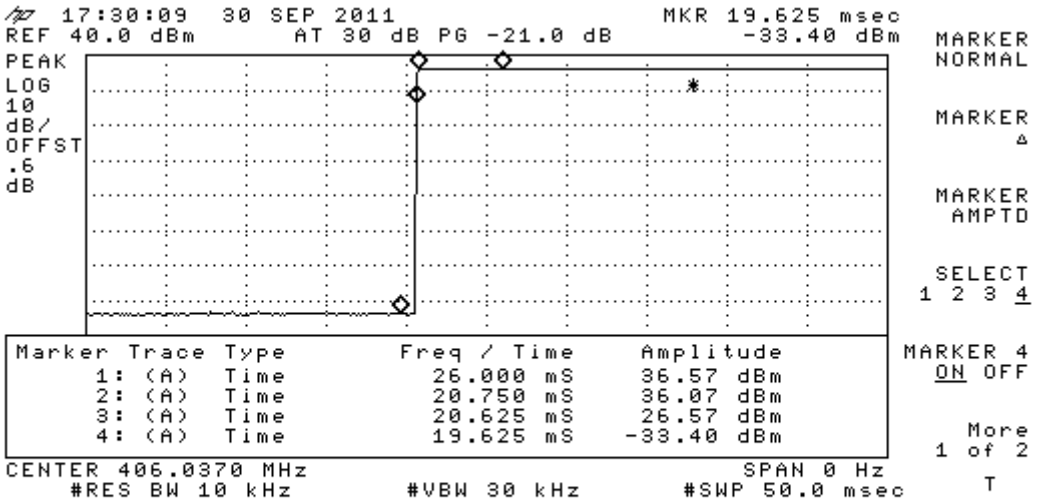


Figure 1.3. 2 – Transmitter power output rise

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted on the plot. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

b) Message Coding (according to C/S T.007 - A.3.1.4)

Bursts received	146
BCH error	0
Self test message	0
Full HEX message	FFFE2F 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

c) Digital message generator (according to C/S T.007 – section A.3.1)

- **Repetition Period (A.3.1.1)**

406 MHz Transmitter Parameters	Limits		Measured
	min	max	
Average repetition period, s	48.50	51.50	50.23
Standard deviation	0.5	2.0	1.93
Minimum of Rep. period, s	47.5	48.0	47.64
Maximum of Rep. period, s	52.0	52.5	52.49
Differences of Rep. period, s	4		4.84

- **Measurement of time interval from the moment of beacon activation till the first (operating) burst**

	Time interval, sec	
	from the moment of beacon activation till the first self test burst in operational mode	from the moment of beacon activation till the first (operating) burst
1st measurement	2.27	54.05
2d measurement	2.16	53.74
3d measurement	2.22	53.88
Minimum value	**2.16**	**53.74**
Maximum value	**2.27**	**54.05**

d) Data Encoding and Modulation (according to C/S T.007 – section A.3.2.3)

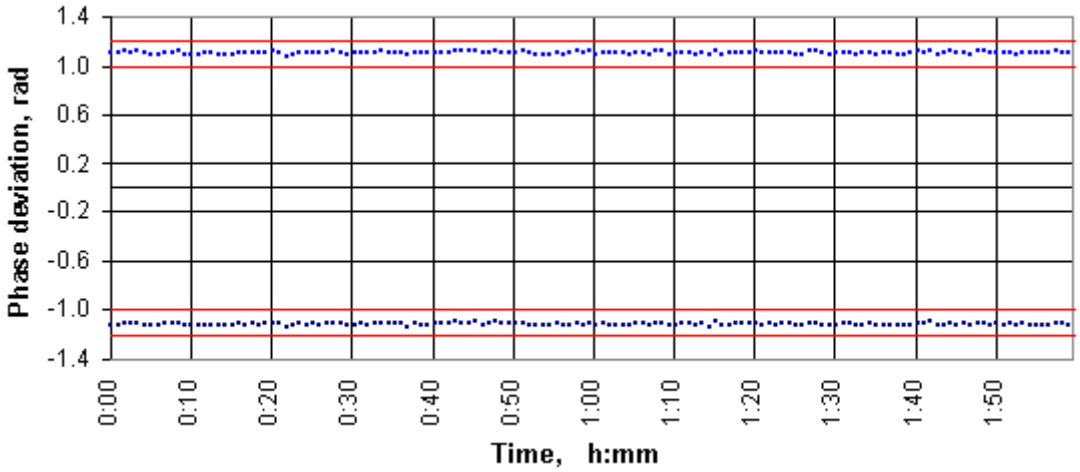


Figure 1.3. 3 – Modulation index

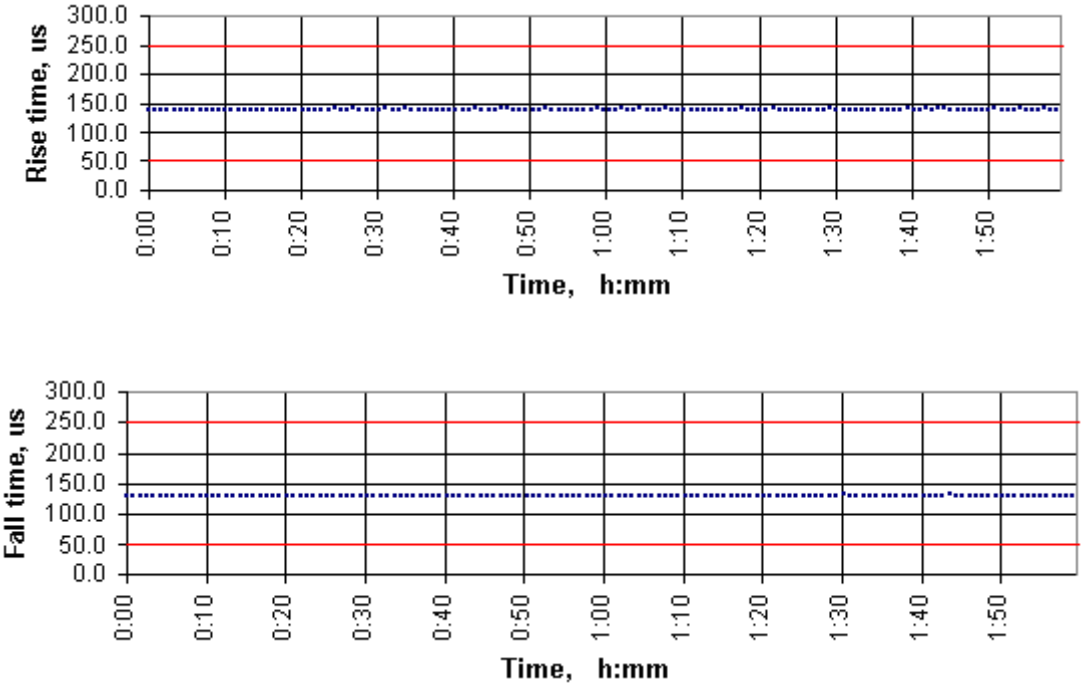


Figure 1.3. 4– Modulation rise and fall times

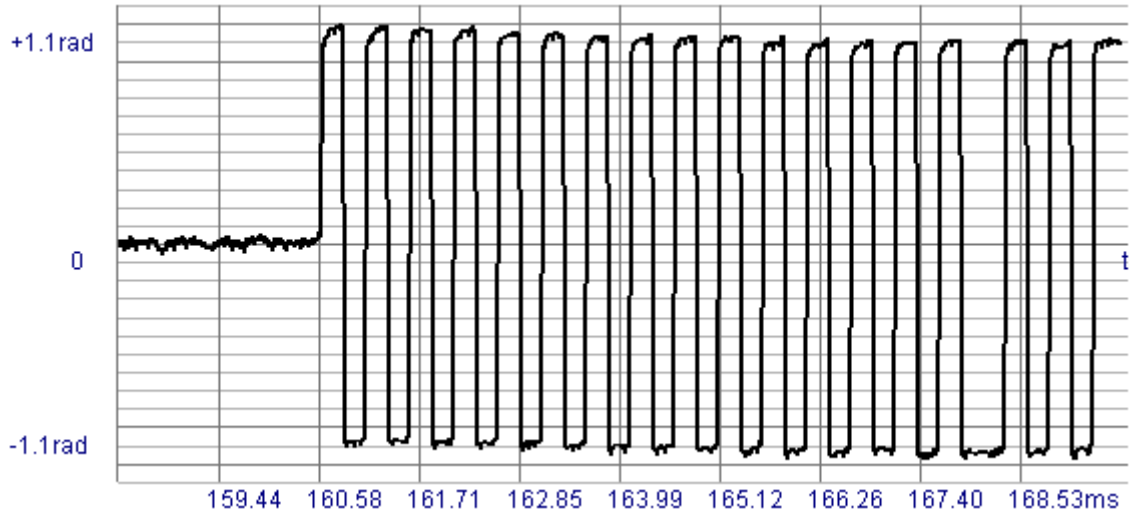


Figure 1.3. 5– Modulation symmetry of the bi-phase demodulated signal

e) Transmitted Frequency (according to C/S T.007 – section A.3.2.1)

- **Nominal Value (A.3.2.1.1)**

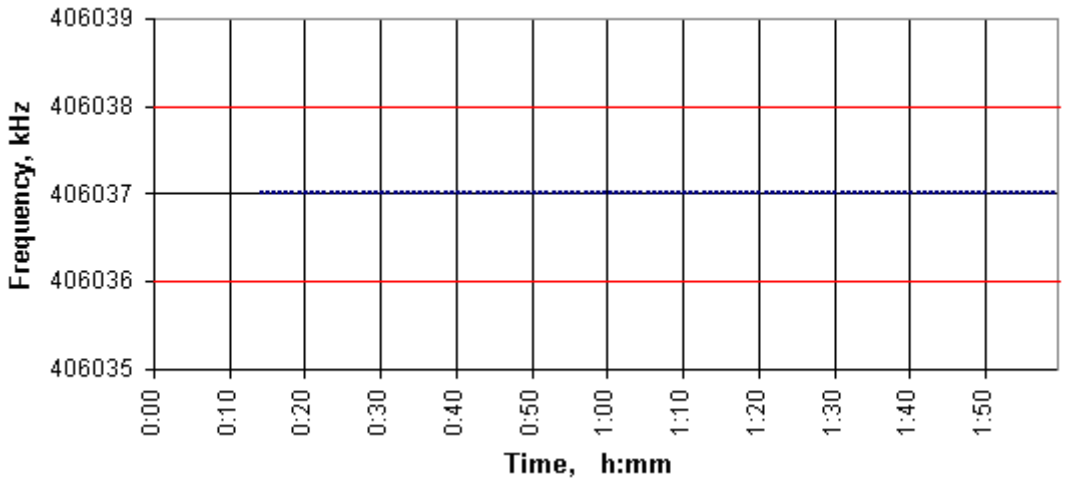


Figure 1.3. 6 – Nominal Value of frequency

- **Short-Term Stability (A.3.2.1.2)**

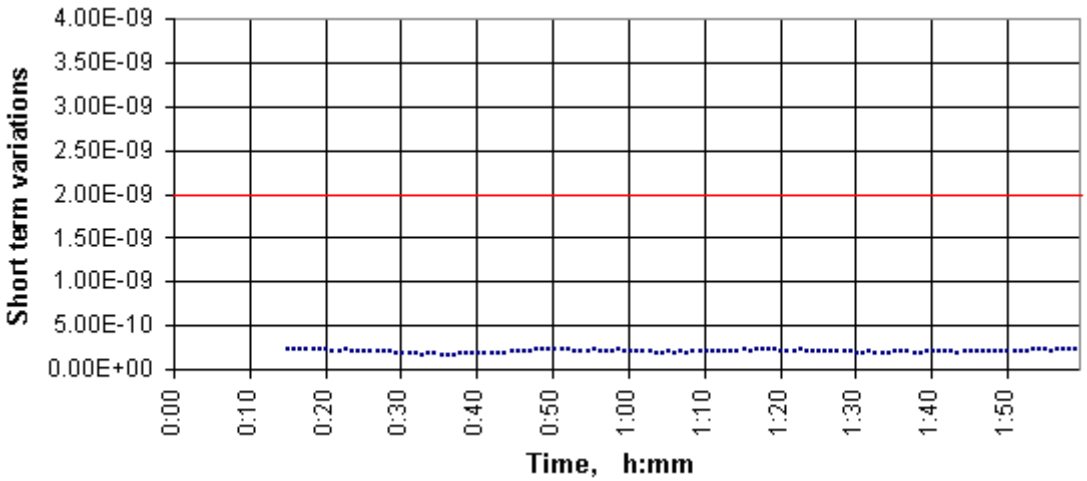


Figure 1.3. 7 – Short-Term Stability

- **Medium-Term Stability (A.3.2.1.3)**

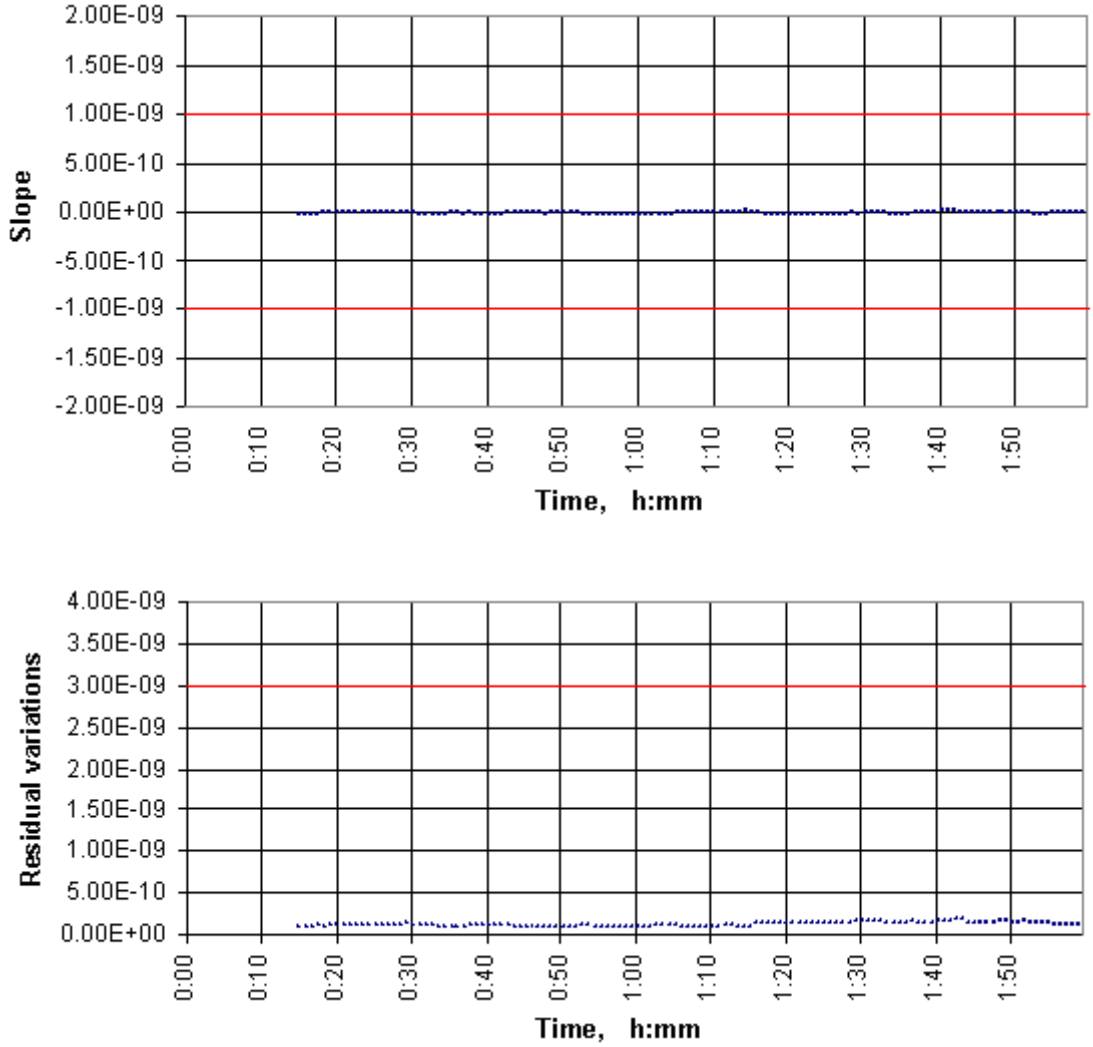


Figure 1.3. 8 – Medium-Term Stability

f) Spurious output (according to C/S T.007 – section A.3.2.2.4)

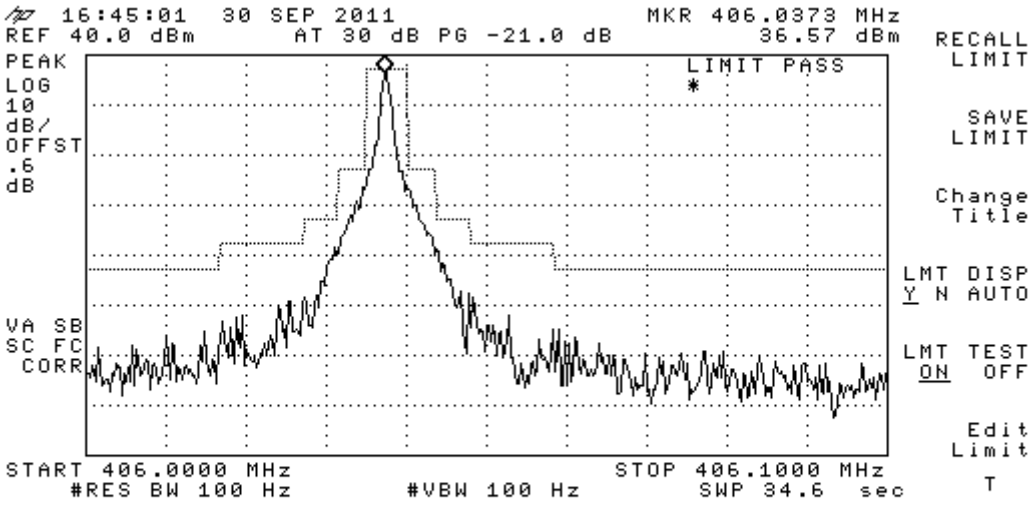


Figure 1.3. 9 – Spurious output. *

* - Matching network was used during measurements. RF losses 0.6 dB at 406 MHz and 2.4 dB at 121 MHz inserted by matching network are accounted on the plot. Manufacturer informed test facility about RF losses of the matching network in the official statement (Vol.2 Iss.4 p.75).

g) Voltage Standing-Wave Ratio (according to C/S T.007 – section A.3.3)

Test results.

The transmitter was operating into an open circuit during 5 minutes and then into a short circuit during 5 minutes. Afterwards, the transmitter was operating into a load having a VSWR of 3:1 (pure resistive load. R=17 Ohm), during which time parameters was measured.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F 4C9418618618668A26F19 0

Test duration 0:15:38	Bursts received 20	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.036	406.038	406.036998	406.036998	406.036998
+Phase deviation, rad	1.00	1.20	1.10	1.12	1.13
-Phase deviation, rad	-1.00	-1.20	-1.11	-1.09	-1.08
Phase time rise, us	50.00	250.00	139.94	142.40	142.40
Phase time fall, us	50.00	250.00	131.26	131.84	132.61
Asymmetry, %	0.00	5.00	0.36	0.52	0.63

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499456	**Low Sweep Frequency, Hz**	385
Power, mW	4.0	**High Sweep Frequency, Hz**	1333
Sweep Period, sec	0.4	**Sweep Range, Hz**	948
Modulation Index, %	100		

- **The modulation parameters (A.3.2.3)**

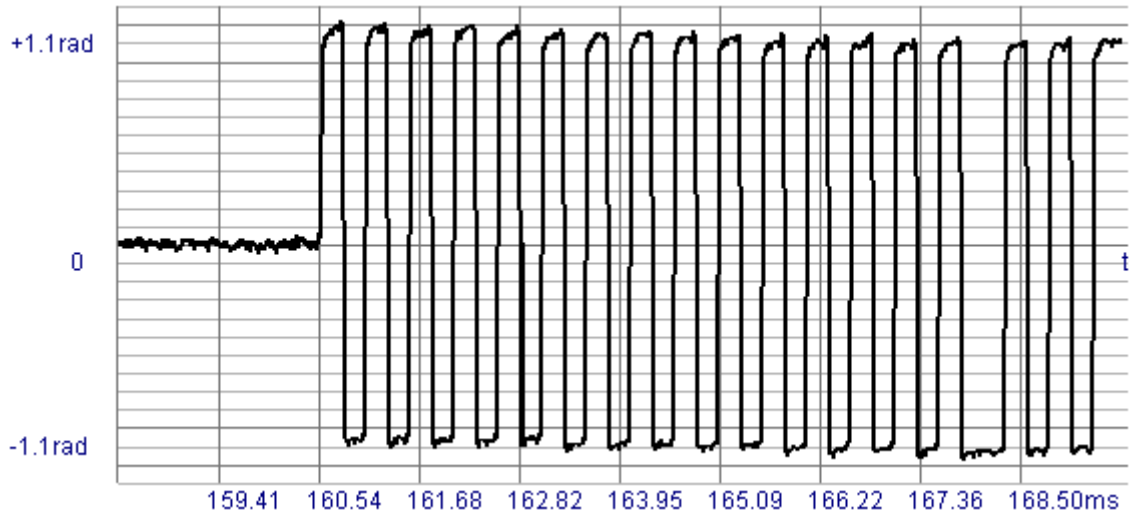


Figure 1.3. 10– Modulation symmetry of the bi-phase demodulated signal

- **Message Coding (A.3.1.4)**

Bursts received	20
BCH error	0
Self test message	0
Full HEX message	FFFE2F 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

h) Self-test mode (according to C/S T.007 – section A.3.6.)

Test result.

During the self test transmitter is emitted only one burst

Table of measured parameters.

Message	
Contents (full)	:FFFED0 4C9418618618668A26F19 0

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, MHz	406.036	406.038		406.037008	
Power, dBm	35	39		36.16	
Total burst duration, ms	514.80	525.20		439.85	
121.5 MHz Transmitter Parameters					
Carrier Frequency, Hz			121499367		
Power, mW			24.7		

- **Message Coding (A.3.1.4)**

Bursts received	1
BCH error	0
Self test message	1
Full HEX message	FFFED0 4C9418618618668A26F19 0

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	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

ANNEX 2.

CURRENT MEASUREMENTS AND ANALYSIS

(According to C/S T.007 – section A.2.3)

Model: Tron60S
Serial number: 00100
Beacon SW: 1.04
Test Date: 03.10.2011

Current measurements as a part of operational lifetime at minimum temperature test (A.2.3) has been agreed with Secretariat for beacon model Tron60S beforehand. Load on the battery for model Tron60S is not greater than the load measured for Tron60GPS and presented in Test Report 11/9 Vol.1 Iss.4 accordingly.

Beacon manufacturer provided operating currents and pre-test battery discharge calculations (see vol.2 iss.4 p.12). Information was verified in test laboratory with measurement result reported in Table F-E.1 below.

Table F-E.1: Beacon Operating Current

Beacon Operating Modes	Mode: Manually selectable or Automatic	Measurement interval, sec	Average Current, mA	Peak Current, mA
Stand-by	Manually / automatically	60	0.0005	0.0005
Self-test	Manually	5.77	103.78	1017
On (homer transmitter on)	Manually / automatically	52.38	29.05	1061

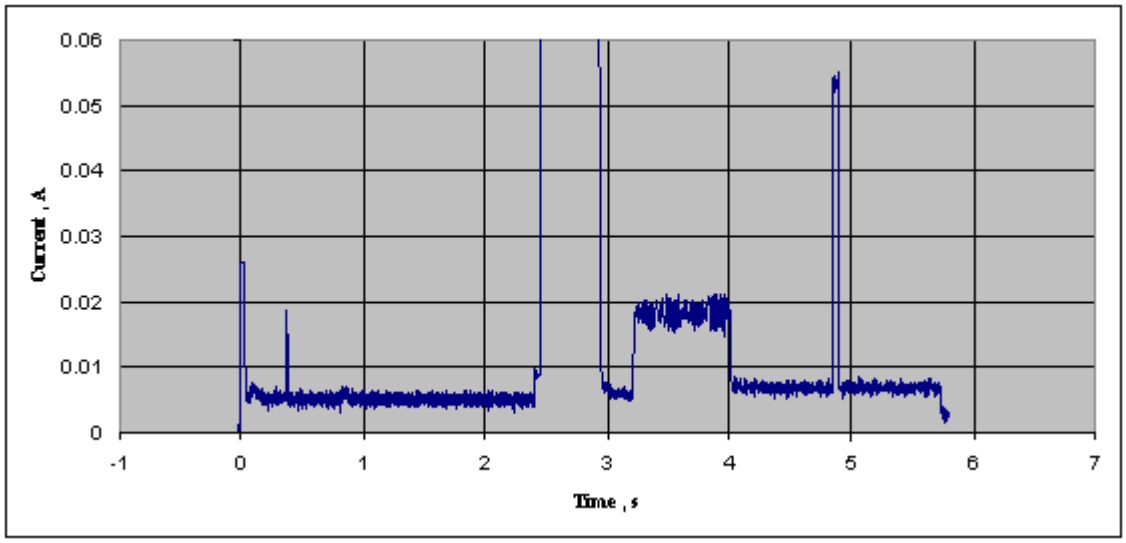


Fig. 2. 1 Current during self-test

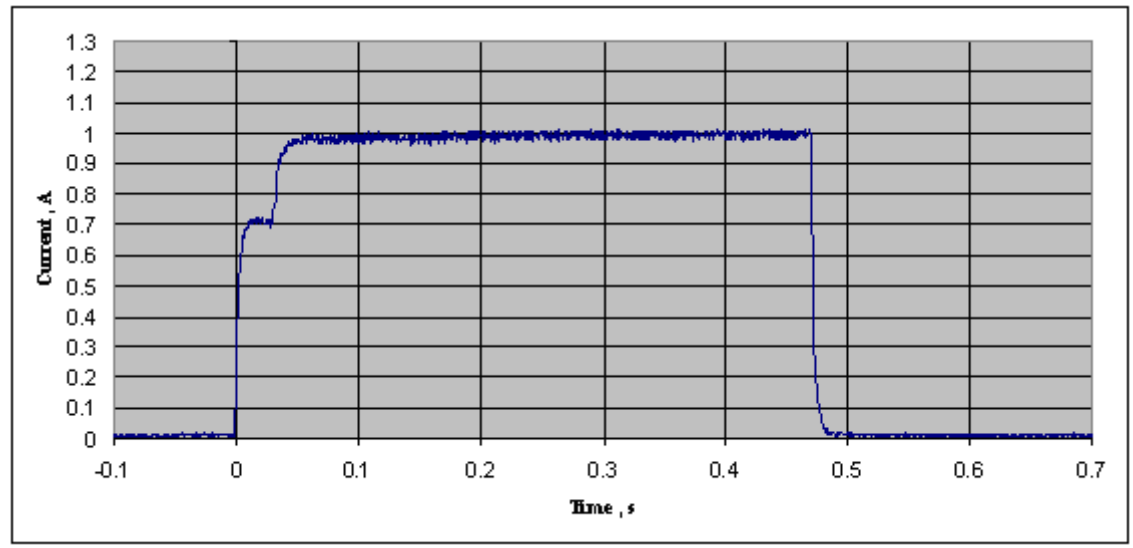


Fig. 2. 2 Demonstrate maximum current during the 406 burst

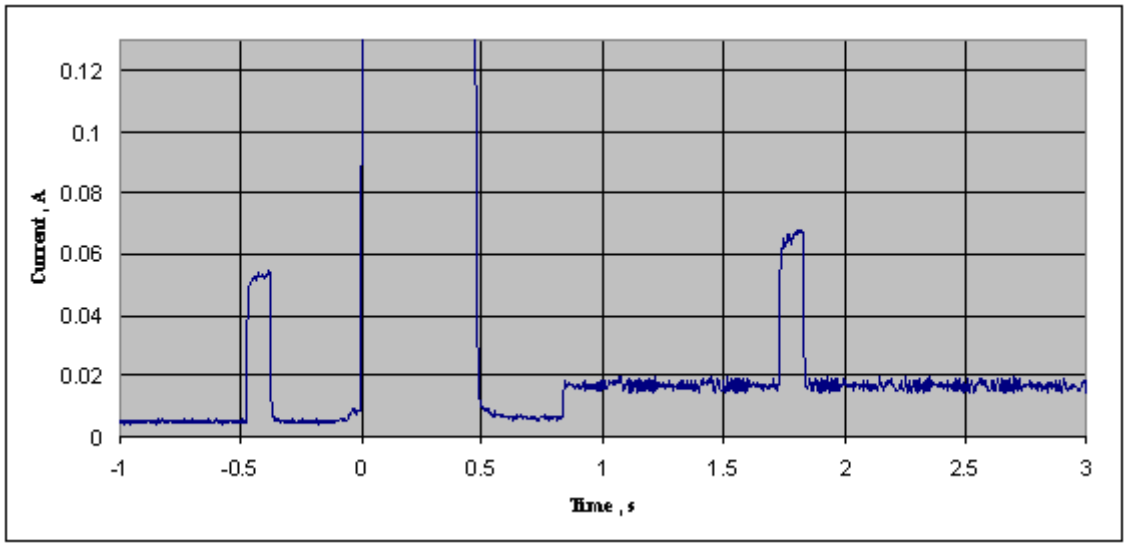


Fig. 2. 3 Switched 121 channel from off to on position. Strobe light flashes

Pretest battery discharge was calculated considering that values of current measured in test laboratory are not more than ones provided by beacon manufacturer. Accounting that calculated pre-discharge 0.385 A·h is less than pre-discharge for beacon model Tron60GPS it was assumed to expand result of life-time test of model Tron60GPS to model Tron60S.
Result of pre-discharge calculation is presented in Table F-E.1 below.

Table F-E.2: Pre-test Battery Discharge Calculations

Characteristic	Designation	Units	Value	Comments
Beacon battery replacement period (from date of cell manufacture)	T_{BR} or TBR	Number of years	10	Note 1
Battery pack electrical configuration	8 cells in serial			
Cell model and cell chemistry	L91 Lithium / Iron Disulfide (Li / FeS_2)			
Nominal cell capacity		A-hrs	3.1	
Nominal battery pack capacity	C_{BN}	A-hrs	3.1	
Annual battery cell capacity loss (self-discharge) due to aging, as specified by cell manufacturer at ambient temperature	L_{SDC}	%	1	Note 2
Calculated battery pack capacity loss due to self-discharge: $L_{CBN} = C_{BN} - [C_{BN} *(1 - L_{SDC} /100)^{TBR}]$	**L_{CBN}**	A-hrs	0.296	
Number of self-tests per year	N_{ST}		12	
Average battery current during a self-test	I_{ST}	mA	103.78	
Maximum duration of a self-test	T_{ST}	sec	5.77	
Calculated battery pack capacity loss due to self-tests during battery replacement period: $L_{ST} = I_{ST}*T_{ST}*T_{BR}*N_{ST} / 3600$	**L_{ST}**	mA-hrs	9.98	
Maximum Number of GNSS self-tests between battery replacements	N_{GST}		0	
Average battery current during a GNSS self-test of maximum duration	I_{GST}	mA	0	
Maximum duration of a GNSS self-test	T_{GST}	sec	0	
Calculated battery pack capacity loss due to GNSS self-tests during battery replacement period: $L_{GST} = I_{GST}*T_{GST}*N_{GST} / 3600$	**L_{GST}**	mA-hrs	0	
Average stand-by battery pack current	I_{SB}	mA	0.0005	
Battery pack capacity loss due to constant operation of circuitry prior to beacon activation: $L_{ISB} = I_{SB}*T_{BR}*8760$	**L_{ISB}**	mA-hrs	43.8	
Calculated value of the battery pack pre-test discharge $L_{CDC} = L_{CBN} + 1.65*(L_{ST} + L_{GST} + L_{ISB})/1000$	**L_{CDC}**	A-hrs	0.385	

Note 1. Beacon manufacturer declared 5 years of battery replacement period in Application. 10 years was assigned for pre-discharge calculation to make conditions harder in agree with beacon manufacturer.

Note 2. Battery manufacturer declared 0.6% annual battery cell capacity loss due to aging (see Vol.2 Iss.4 p.55). 1% was assigned for pre-discharge calculation to make conditions harder in agree with beacon manufacturer.

ANNEX 3

BEACON CODING SOFTWARE

(According to C/S T.007 – section A.2.8)

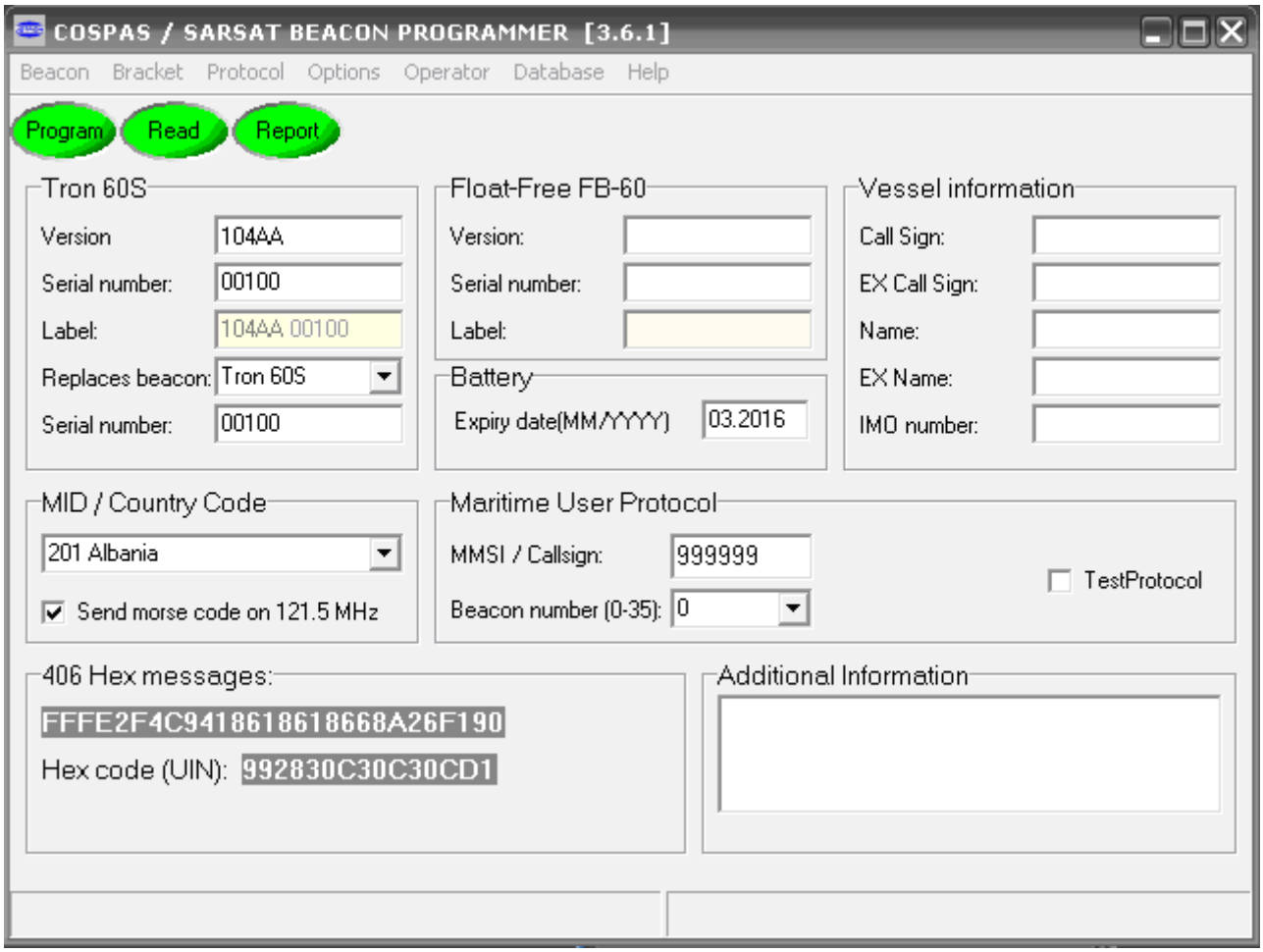
Model: Tron 60S
Serial number: 00100
Beacon SW: v1.04
Test Date: 12.07.2011

The procedure for checking of possibility beacon coding with a protocol is as follows:
1. Operator inputs the protocol data to program.
2. Program rewrites the data to beacon long-term power independent memory via a data comport.
3. Beacon switched on and the message checked.
4. The self-test and operating message is verified.

BEACON CODING SOFTWARE RESULTS
Table F-D.1: Examples of User Protocol Beacon Messages
(Examples required for each protocol requested for inclusion on the type approval certificate)

Protocol	Operational Message (in hexadecimal including bit and frame synchronization bits)	Self-Test Message (in hexadecimal including bit and frame synchronization bits)
Maritime User Protocol with MMSI	FFFE2F4C9418618618668A26F190	FFFED04C9418618618668A26F190
Maritime User Protocol with Radio Call Sign	FFFE2F4C9526F6F06B268C679110	FFFED04C9526F6F06B268C679110
Serial User: Float-Free EPIRB with Serial Number	FFFE2F4C96A000C6007CED45E1D0	FFFED04C96A000C6007CED45E1D0
Radio Call Sign User Protocol	FFFE2F4C9DBDBC1A55468D215510	FFFED04C9DBDBC1A55468D215510

Registration and identification card of Maritime User Protocol with MMSI



Decoding Operational Message

Protocol: Maritime User Protocol with MMSI

Full message: FFFE2F4C9418618618668A26F190

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Maritime User	37-39	010
Maritime MMSI (6 digits): 999999	40-75	000011000011000011000011000011000011
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

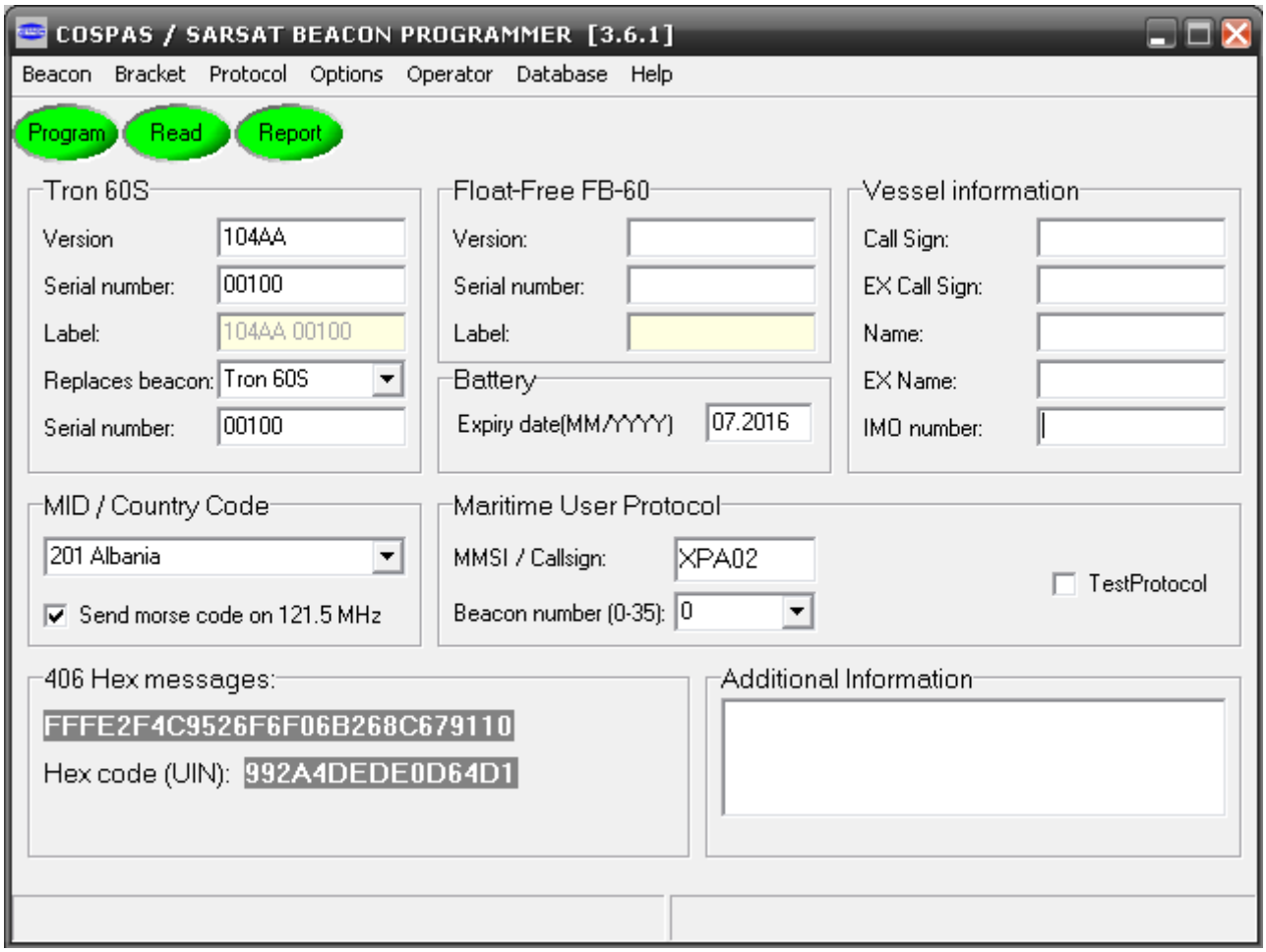
Decoding Self-Test Message

Protocol: Maritime User Protocol with MMSI

Full message: FFFED04C9418618618668A26F190

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Maritime User	37-39	010
Maritime MMSI (6 digits): 999999	40-75	000011000011000011000011000011000011
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

Registration and identification card of Maritime User Protocol with Radio Call Sign



Decoding Operational Message

Protocol: Maritime User Protocol with Radio Call Sign

Full message: FFFE2F4C9526F6F06B268C679110

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Maritime User	37-39	010
Radio Call Sign (6 digits): XPA02	40-75	100100110111101101111000001101011001
Specific bcn: 0	76-81	001101
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	10001100111001000100
Calculated BCH 1:	N/A	10001100111001000100
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	992A4DEDE0D64D1

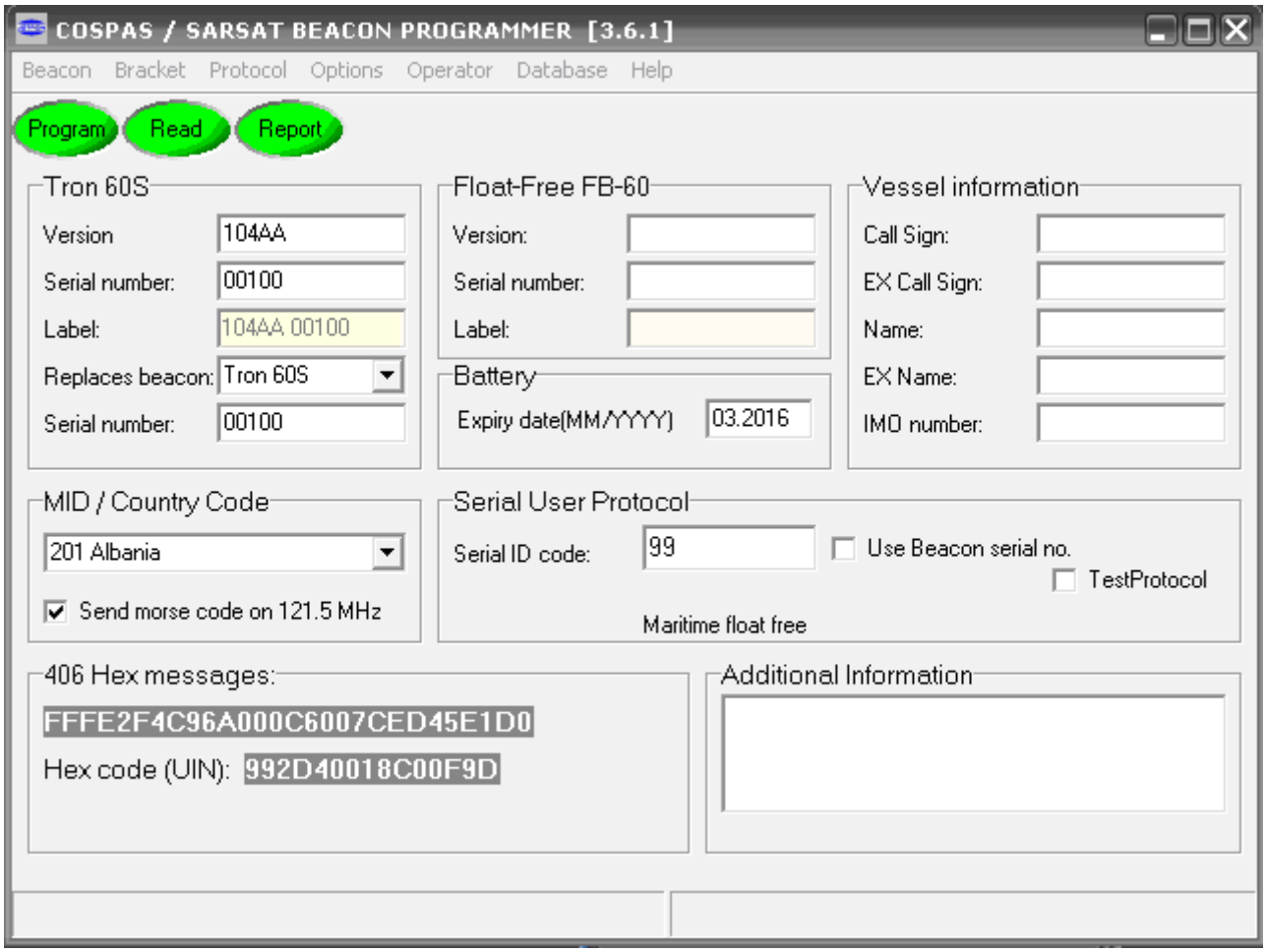
Decoding Self-Test Message

Protocol: Maritime User Protocol with Radio Call Sign

Full message: FFFED04C9526F6F06B268C679110

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Maritime User	37-39	010
Radio Call Sign (6 digits): XPA02	40-75	100100110111101101111000001101011001
Specific bcn: 0	76-81	001101
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	10001100111001000100
Calculated BCH 1:	N/A	10001100111001000100
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	992A4DEDE0D64D1

Registration and identification card of Serial User: Float-Free EPIRB with Serial Number



Decoding Operational Message

Protocol: Serial User: Float-Free EPIRB with serial Number

Full message: FFFE2F4C96A000C6007CED45E1D0

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201 - **Albania**	27-36	0011001001
User type: Serial User	37-39	011
Serial Type: Float Free EPIRB with Serial Identification Number	40-42	010
Cospas-Sarsat Certificate Number in bits 74-83: Yes	43	1
Serial Number: 99	44-63	00000000000001100011
All 0s or National Use	64-73	0000000000
C/S Number or National Use (bit 43 refers): 999	74-83	1111100111
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	10101000101111000111
Calculated BCH 1:	N/A	10101000101111000111
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered if all 0s, otherwise Nationally assigned	109-112	0000
15 Hex ID:	N/A	992D40018C00F9D

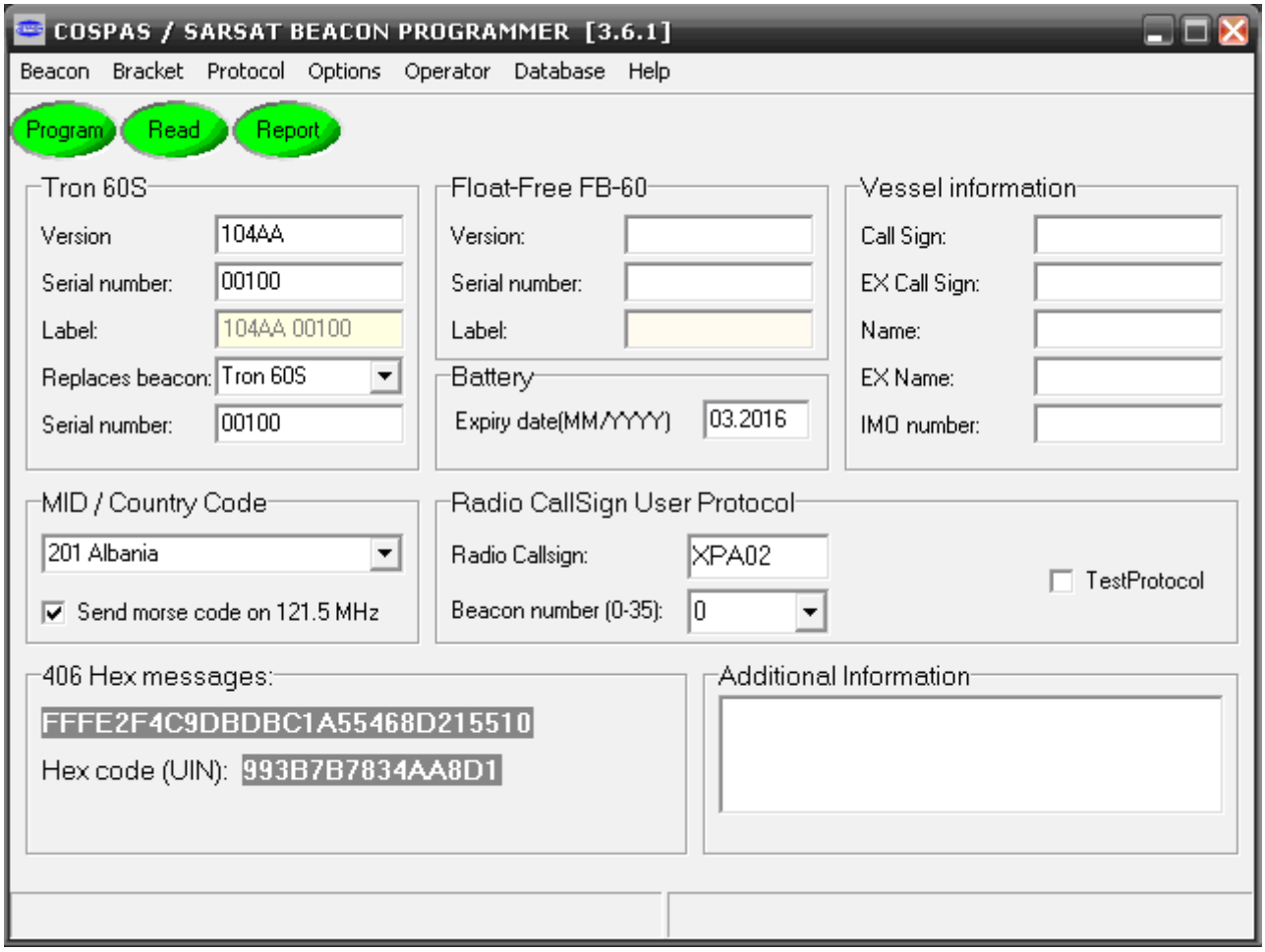
Decoding Self-Test Message

Protocol: Serial User: Float-Free EPIRB with Serial Number

Full message: FFFED04C96A000C6007CED45E1D0

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Serial User	37-39	011
Serial Type: Float Free EPIRB with Serial Identification Number	40-42	010
Cospas-Sarsat Certificate Number in bits 74-83: Yes	43	1
Serial Number: 99	44-63	00000000000001100011
All 0s or National Use	64-73	0000000000
C/S Number or National Use (bit 43 refers): 999	74-83	1111100111
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	10101000101111000111
Calculated BCH 1:	N/A	10101000101111000111
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered if all 0s, otherwise Nationally assigned	109-112	0000
15 Hex ID:	N/A	992D40018C00F9D

Registration and identification card of Radio Call Sign User Protocol



Decoding Operational Message

Protocol: Radio Call Sign User Protocol

Full message: FFFE2F4C9DBDBC1A55468D215510

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Radio Call Sign	37-39	110
Radio Call Sign Identification: XPA02	40-75	1101111011011110000011010010101010
Specific bcn: 0	76-81	001101
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	10100100001010101010 0
Calculated BCH 1:	N/A	10100100001010101010 0
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered if all 0s, otherwise Nationally assigned	109-112	0000
15 Hex ID:	N/A	993B7B7834AA8D1

Decoding Self-Test Message

Protocol: Radio Call Sign User Protocol

Full message: FFFED04C9DBDBC1A55468D215510

ITEM	BITS	VALUE
Message format: short format	25	0
Protocol: User	26	1
Country code: 201	27-36	0011001001
User type: Radio Call Sign	37-39	110
Radio Call Sign Identification: XPA02	40-75	110111101101111000001101001010101010
Specific bcn: 0	76-81	001101
Spare	82-83	00
Aux radio device: 121.5 MHz	84-85	01
Encoded BCH 1:	86-106	10100100000101010100
Calculated BCH 1:	N/A	10100100000101010100
Emerg Code: Emergency Code Data Not Entered	107	0
Activation Type: Automatic and Manual Activation	108	1
Emergency Code: No information entered if all 0s, otherwise Nationally assigned	109-112	0000
15 Hex ID:	N/A	993B7B7834AA8D1

ANNEX 4

SATELLITE QUALITATIVE TEST

(According to C/S T.007 – section A.2.5)

ANNEX 4.1

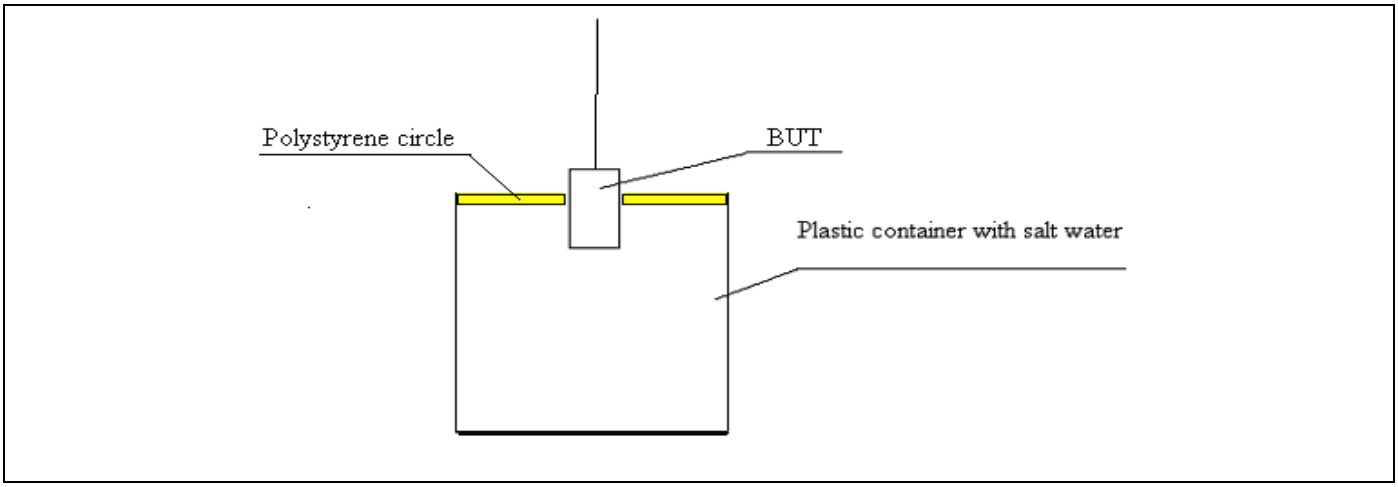
TEST CONFIGURATION 5
WATER GROUND PLANE

Satellite qualitative test
(According to C/S T.007 – section 4.5)

Model: Tron 60S
Serial number: 00102
Beacon SW: v1.04
Date of the Test: July 18, 2011

Test conditions:

- Ambient temperature at open testing area: 29..32 ^{O}C
- Relative air humidity: 62..66 %
- Atmosphere pressure: 748..750 mm/Hg
- The duration of the satellite test: 3.5 hours.
- The homing transmitter not operated.
- Actual Location: N 44° 32.17'; E 33° 26.70'.
- Data provided by RUSSIA MCC.
- Beacon was completely submerged in salt water (composition 5% NaCl solution by weight), activated while submerged, and floating to the surface under its own buoyancy.
- Beacon was maintained at the centre of the container for the duration of the test that was provided by a polystyrene radio transparent circle, floating on the surface of water, the free swimming of beacon in water was provided by the central opening.
- Container holding the salt water was placed in an area with a good all round view of the sky.
- Container by a diameter 34 cm and depth by a 60 cm is made from a non-conductive material (PVC plastic) and there is 36 cm of salt water under the base of the beacon when it is floating in the container and 11 cm of salt water between the beacon and the sides of the container.
- Beacon is submerged in a container with water at floating-line.



Beacon coding

- Beacon is coded with Test User Protocol
- Country code is 273 (RUSSIA),
- Message content 1 – 112 bits: FFFE2F511EA000CC007CED486F10.
- Beacon identification number (15-digit ID): A23D40019800F9D.

APPENDIX A TO ANNEX F

SATELLITE QUALITATIVE TEST SUMMARY REPORT

Date of the Test: July 18, 2011

Beacon Model: Tron 60S

Beacon 15 Hex ID: A23D40019800F9D

Actual location of the test beacon: Latitude: N 44° 32.17'; Longitude: E 33° 26.70'.

Beacon test configuration: floating in water (configuration 5 section 4.5 C/S T.007)

Sat ID	Satellite Pass Number	Time of Closest Approach (UTC)	Cross Track Angle	15 Hex ID Provided by LUT	Doppler Location	Location error, km
S8	55774	06:25	4.2	A23D40019800F9D	N 44° 31.9', E 33° 27.1'	0.77
S11	24614	07:33	2.8	A23D40019800F9D	N 44° 32.3', E 33° 26.4'	0.44
S9	47108	07:44	13.1	A23D40019800F9D	N 44° 32.1', E 33° 26.9'	0.32
S8	55775	08:05	20.1	A23D40019800F9D	N 44° 32.1', E 33° 26.9'	0.32
S7	68520	13:29	3.5	A23D40019800F9D	N 44° 32.3', E 33° 26.2'	0.69
S7	68521	15:09	14.3	A23D40019800F9D	N 44° 32.4', E 33° 27.2'	0.76

$$\text{Ratio of successful solutions} = \frac{\text{number of Doppler solutions within 5 km with } 1^{o} < \text{CTA} < 21^{o}}{\text{number of satellite passes over test duration with } 1^{o} < \text{CTA} < 21^{o}} \times 100\ \%$$

$$\text{Ratio of successful solutions} = \frac{6}{6} \times 100\% = 100\ \%$$

ANNEX 4.2

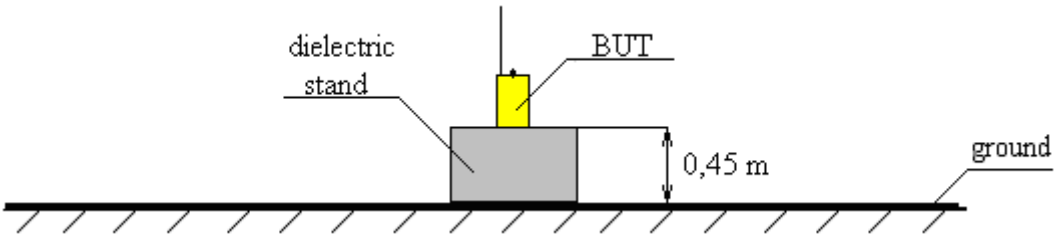
TEST CONFIGURATION 8
ABOVE GROUND PLANE

Satellite qualitative test
(According to C/S T.007 – section 4.5)

Model: Tron60S
Serial number: 00102
Beacon SW: 1.04
Mode: 406 MHz
Date of the Test: October 05, 2011
Time of the Test: 11:00 GMT – 15:15 GMT

Test conditions:

- Ambient temperature at open testing area: 21..24 ^{O}C
- Relative air humidity: 51..55 %
- Atmosphere pressure: 758 mm/Hg
- The duration of the satellite test: 8 hours 15 minutes.
- The homing transmitter not operated.
- Actual Location: 44° 31' 44.454" N, 33° 28' 23.046" E.
- Data provided by ITMCC
- Beacon was placed in the vertical orientation described in the manufacturer's instructions.
- Beacon was placed in an area with a good all round view of the sky.
- Beacon was placed on a electrically insulating support so that its base is 0.45m above level dry ground. Configuration 8 Section 4.5 C/S T.007



Beacon coding

- Beacon is coded with Test User Protocol.
- Country code is 201 (ALBANIA)
- Message content 1 – 112 bits: FFFE2F 4C9EA000CC007CEAF83AD0.
- Beacon identification number (15-digit ID): 993D40019800F9D.

APPENDIX A TO ANNEX F

SATELLITE QUALITATIVE TEST SUMMARY REPORT

Date of the Test: October 05, 2011

Time of the Test: 11:00 GMT – 15:15 GMT

Beacon Model: Tron60S

Beacon 15 Hex ID: 993D40019800F9D

Actual location of the test beacon: Latitude: 44° 31' 44.454" N; Longitude: 33° 28' 23.046" E.

Beacon test configuration: beacon operated above ground plane (configuration 8 section 4.5 C/S T.007)

Sat ID	Satellite Pass Number	Time of Closest Approach (UTC)	Cross Track Angle	15 Hex ID Provided by LUT	Doppler Location	Location Error, km
S10	32848	11:28:35	1.1	993D40019800F9D	44 31.7N 033 28.2E	0.26
S7	69643	11:43:38	20.4	993D40019800F9D	44 31.7N 033 28.2E	0.26
S12	13694	11:59:25	13.5	993D40019800F9D	44 31.7N 033 28.1E	0.38
S10	32849	13:09:57	16.9	993D40019800F9D	44 31.7N 033 28.1E	0.38
S7	69644	13:22:19	4.7	993D40019800F9D	44 31.7N 033 28.2E	0.26
S7	69645	15:02:28	13.0	993D40019800F9D	44 31.7N 033 28.2E	0.26

$$\text{Ratio of successful solutions} = \frac{\text{number of Doppler solutions within 5 km with } 1^{o} < \text{CTA} < 21^{o}}{\text{number of satellite passes over test duration with } 1^{o} < \text{CTA} < 21^{o}} \times 100\ \%$$

$$\text{Ratio of successful solutions} = \frac{6}{6} \times 100\% = 100\ \%$$

ANNEX 5

PHOTOS OF BEACON

Fig. 5. 1 General view of beacon Tron 60S serial No. 00102

Fig. 5. 2 General view of beacon Tron 60S serial No. 00100

Fig. 5. 3 General view of test site during satellite qualitative test. Conf. 5 - Beacon on water gound plane**.**

Fig. 5. 4 General view of test site during satellite qualitative test. Conf. 8 – Beacon above ground plane.

ANNEX 6

TEST EQUIPMENT USED AND TEST FACILITY ACCURACY

TEST EQUIPMENT

No.	Name of test equipment	Type, model	ser. No	Calibration due
1.	Beacon tester	BT-611	1005	06.2012
2.	Spectrum analyzer	HP8593E	3831U02306	07.2012
3.	Climatic chamber	KPK 400V	15	08.2012
4.	Stop-watch	SOSpr	2388	10.2011

TEST FACILITY ACCURACY

No.	Parameter	Test facility accuracy
1.	Repetition Time	± 0,01 sec
2.	Total (Transmission Time)	± 1,0 ms
3.	CW Preamble	± 1,0 ms
4.	Bit Rate	± 0,6 bit/sec
5.	Nominal Frequency	± 100 Hz
6.	Frequency Stability	$< 1 \times 10^{-10}$
7.	Transmitted Power	± 0,5 dB
8.	Spurious Power Level	± 2 dB
9.	Carrier Rise Time	± 0,5 ms
10.	Modulation Rise	± 25 μs
11.	Modulation Symmetry	< 0,01
12.	Phase Modulation	± 0,04 rad
13.	Voltage	0.1%
14.	Current value	2%
15.	Ambient temperature (near beacon) various	± 2°C