PUBLIC ENTERPRISE TESTING CENTER «OMEGA»

Approved by
Director
PE TC "OMEGA"
_____ Belikov N.I.
January 29, 2013

TEST REPORT No. 12/1410
Issue 2
on type approval of COSPAS-SARSAT
Personal Locator Beacon (PLB)

Model **rescueME PLB1**

Manufacturer **Ocean Signal Ltd., Great Britain**

Volume 1

Sevastopol
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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. AKP.0510-14 PTH valid until 19.05.2015

Russia Maritime Register of Shipping. Certificate of Recognition testing laboratory No. 12.61074.184 valid until 21.08.2017

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

Letter of FCC acceptance #181479 dated August 19, 2008

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

IC registration of 3m alternative test site #8780A-2 dated January 18, 2010

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

Letter of USCG Acceptance for testing EPIRBs #16714/161.011/OMEGA dated February 7, 2008

Accreditation certificate No. AAC.T.00130 dated 28.10.2011 valid until 28.10.2014 issued by AAC "Analitica", Full Member and Signatory to ILAC and APLAC Mutual Recognitions Arrangements (www.aac-analitica.ru)

Equipment under test	Personal Locator Beacon (PLB) 406 MHz COSPAS–SARSAT model: rescueME PLB1
Manufacturer	Ocean Signal Limited, Unit 4, Ocivan Way, Margate, Kent, CT9 4NN, United Kingdom
Applicant	Ocean Signal Limited, Unit 4, Ocivan Way, Margate, Kent, CT9 4NN, United Kingdom
Technical officer **Name** **Title** **Phone** **E-mail**	 Simon Nolan Technical Director +44 (0)1843 282931 simon.nolan@OceanSignal.com
Test commencement date	19.12.2012
Test completion date	28.12.2012

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Introduction	
Present Test Report consists of:	
1. Test Report No.12/1410 Volume 1, Issue 2	<OSL_PLB1_Vol1_Iss2.pdf>
2. Test Report No.12/1410 Volume 2, Issue 2	<OSL_PLB1_Vol2_Iss2.pdf>
3. Spreadsheet of frequency stability tests	<OSL_PLB1_TCXO v1.xls>

Report Issue History

No.	Data of issue	Report reissue reason
1	28.12.2012	The initial issue.
2	29.12.2013	Amended: Application form (Annex G). Tables F-E.1 and F-E.2. Calculations of extending of operational lifetime. Added: Description of deviation from standard test procedures (Section 10.Conclusion and Summary table, test parameter 10).

1. EQUIPMENT UNDER TEST

Equipment category	Personal Locator Beacon (PLB) 406 MHz COSPAS–SARSAT
Equipment type	PLB
Equipment model	rescueME PLB1
Cospas-Sarsat equipment class	Class 2 (operating temperature range - 20 ºC to +55 ºC)
Equipment serial numbers	TA1, (conducted unit configured so that antenna ports were connected to the 50 Ohms test system using coaxial cable) TA5 (radiated unit which are similar to the proposed production beacons equipped with its proper antenna)
Equipment destination	Alarm message transmission of distress incident via the COSPAS-SARSAT satellite system
Software	00.06

2. MODIFICATIONS OF THE TEST SAMPLES DURING TYPE APPROVAL TESTING

No modification were made to the samples during testing

3. SUBMITTED DOCUMENTATION

No.	Documentation	References to T.007	Pages[1]
1.	Application form (Annex G)	5.a	5
2.	Photographs of the beacon, with its antenna deployed whilst in all manufacturer declared configurations	5.b	12
3.	Analysis and calculations that support the pre-test battery discharge figures required for the operating lifetime at minimum temperature test	5.c.	14
4.	For beacons with multiple operator selectable and/or automatic modes of operation (e.g. voice transceivers, internal GNSS receivers, homers, etc.), analysis supported by test results that identifies:	5.d.	
4.1	the operating mode that draws the maximum battery energy,	5.d.i	16
4.2	the operating mode that have pulls loads greater than in i above	5.d.ii	16
5.	Beacon operating instructions and a technical data sheet	5.e	19
6.	Beacon marketing brochure	5.f	36
7.	The technical data sheet for the battery cells used in the beacon and the electric diagram of the beacon's battery pack	5.g.	40
8.	A copy of the beacon label	5.h.	46
9.	Technical data sheet of the reference oscillator, including oscillator type and specifications	5.i.	49
10.	Descriptions, complete with diagrams as necessary, to demonstrate that the design:	5.j.	
10.1	provides protection against continuous transmission (A.3.4 T.007);	5.j.i	55
10.2	meets the frequency stability requirements over 5 years (A.3.5 T.007, 2.3.1 T.001);	5.j.ii	55
10.3	provides protection from repetitive self-test mode transmissions (A.3.6 T.007);	5.j.iii	56
10.4	ensures that the self-test messages (except for GNSS self-test) have default values encoded in position fields, at all times and irrespectively of the navigation data input	5.j.iv	57
10.5	provides protection against erroneous position encoding into the beacon message (4.5.5 T.001)	5.j.v	57
11.	Information that confirms that the nominal output impedance of the beacon power amplifier is 50 Ohms and the beacon antenna VSWR measured relative to 50 Ohms is within a ratio of 1.5:1	5.k	72
12.	Beacon quality assurance plan (Annex L)	5.m	74
13.	Description of the GPS receiver operation cycle and its phases, including duration and average battery current measured for each phase	5.n	77
14.	List and description of all automatic and manually selectable operation modes	5.o	80
15.	For beacon models with several variants, a comprehensive description of differences between these variants	5.q	83
16.	Results of test which conducted by the manufacturer:		
16.1	Beacon Coding Software Test	A.2.8	89
16.2	Position Data Encoding Test	A.3.8.7	107

[1] referring to Test Report 12/1410 Volume 2 Issue 2

4. TEST PURPOSE

Test purpose is to confirm compliance of PLB model rescueME PLB1 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) and Interim procedure for the determination of compliance of 406 MHz beacons equipped with a TCXO with COSPAS-SARSAT Type Approval requirements C/S IP TCXO.

5. TEST CONDITIONS AND METHODS

Procedure, conditions and methods of testing correspond to requirements and methods of C/S T.001 (Issue 3 – Revision 13 October 2012) and C/S T.007 (Issue 4 – Revision 7 October 2012) standards and Interim procedure for the determination of compliance of 406 MHz beacons equipped with a TCXO with requirements C/S IP TCXO Rev.4 October 2012.

6. TEST PROGRAM

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.	GNSS self-test mode	4.5.4	Annex A section A.3.6
6.	Thermal shock test	4.2.3	Annex A section A.2.2, A.3.1.4, A.3.2.1, A.3.2.2.1
7.	Temperature gradient	4.2.2	Annex A section A.2.4, A.3.1.4, A.3.2.1, A.3.2.2.1
8.	Operating lifetime at minimum temperature	4.5.1	Annex A section A.2.3
9.	Beacon antenna test	2.3.3	Annex A section A.2.6
10.	Navigation system test	3.2, 4.5.5.3, (Annex A section A.3.3)	Annex A section, A.2.7, A.3.8 (excluding A.3.8.7 test which conducted manufacturer) , A.3.1.4
11.	Satellite qualitative test	2.1.3, Annex A section A.2.5	Annex A section A.2.5
12.	Frequency stability test (interim procedure for the determination of compliance of 406 MHz beacons equipped with a TCXO)	C/S IP (TCXO) sections 1, 3	C/S IP (TCXO) sections 1, 3
13.	Test for position field in self-test message	C/S Secretariat special request	C/S Secretariat special request

7. TEST SCHEDULE

No.	Test name	Serial Number	SW version	Date
1.	Performance measurements at normal temperature	TA1	00.06	19.12.2012
2.	Performance measurements at maximum declared temperature	TA1	00.06	20.12.2012
3.	Performance measurements at minimum declared temperature	TA1	00.06	19.12.2012
4.	Self-test mode	TA1	00.06	19.12.2012 - 20.12.2012
5.	GNSS self-test mode	TA1	00.06	19.12.2012
6.	Thermal shock test	TA1	00.06	20.12.2012
7.	Temperature gradient	TA1	00.06	20.12.2012 - 22.12.2012
8.	Operating lifetime at minimum temperature	TA1	00.06	24.12.2012 - 25.12.2012
9.	Beacon antenna test	TA5	00.06	20.12.2012
10.	Navigation system test	TA1	00.06	25.12.2012- 28.12.2012
11.	Satellite qualitative test	TA5	00.06	25.12.2012 - 26.12.2012
12.	Frequency stability test IP (TCXO)	TA1	00.06	24.12.2012
13.	Test for position field in self-test message	TA1	00.06	27.12.2012

8. 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.	GNSS self-test mode	Pass
6.	Thermal shock test	Pass
7.	Temperature gradient	Pass
8.	Operating lifetime at minimum temperature	Pass
9.	Beacon antenna test	Pass
10.	Beacon coding software	Pass
11.	Navigation system test	Pass
12.	Satellite qualitative test	Pass
13.	Frequency stability test IP (TCXO)	Pass
14.	Test for position field in self-test message	Pass

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

APPLICATION FOR A COSPAS-SARSAT 406 MHz BEACON TYPE APPROVAL CERTIFICATE[1]

G.1 INFORMATION PROVIDED BY THE BEACON MANUFACTURER

Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Ocean Signal Limited
Beacon Model	rescueME PLB1
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	☐
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	406.040 MHz
Operating temperature range	Tmin = -20 °C Tmax= 55 °C
Operating lifetime	24 hours min
Beacon power supply type (internal, external, combined, other)	Internal

[1] - according to C/S T.007 Iss.4 Rev.7 Oct 2012

Characteristic	Specification
External power supply parameters (AC/DC and nominal voltage)	N/A
Is external power supply needed to energise the beacon or its ancillary devices in any of operational modes (N/A or Yes or No)	N/A
Battery chemistry	Lithium Manganese Dioxide
Battery cell model name, size and number of cells in battery pack, and details of battery pack electrical configuration	Photo 123, CR123, 3, 3 cells in series
Battery cell manufacturer	Energizer
Battery pack manufacturer and part number	Ocean Signal Ltd, Part No - 901S-01227 Iss 01.00
Battery manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	2 years
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	8 years
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	Rakon UK Limited
Oscillator part name and number	E5344LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes
Antenna type: Integral or Other (e.g. External, Detachable – specify type)	Integral
Antenna manufacturer	Ocean Signal Limited
Antenna part name and number	130S-01180 Issue 01.00
Navigation device type (Internal, External or None)	Internal
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)	Yes
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes

Characteristic	**Specification**	
For Internal Navigation Devices		
- Geodetic reference system (WGS 84 or GTRF)	WGS84	
- GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes	
- Navigation device manufacturer	Quectel	
- Navigation device model name and part Number	L70	
- Internal navigation device antenna type(integrated, internal, external, passive/active) , manufacturer and model	Internal, AEL Crystals Ltd, Part No DAE1575R1820A	
- GNSS system supported (e.g. GPS, GLONASS, Galileo)	GPS	
For External Navigation Devices		
- Data protocol for GNSS receiver to beacon interface	N/A	
- Physical interface for beacon to navigation device	N/A	
- Electrical interface for beacon to navigation device	N/A	
- Part number of the external navigation interface device (if applicable)	N/A	
- Navigation device model and manufacturer (if beacon designed to use specific devices)	N/A	
Self-Test Mode Characteristics:	Self-Test Mode	Optional GNSS Self-Test Mode
- Self-test has separate switch position (Yes or No)	Yes	Yes
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes	Yes
- Self-test activation can cause an operational mode transmission (Yes or No)	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	No
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	Indicator LED/Strobe	Indicator LED/Strobe
- The content of the encoded position data fields of the self-test message has default values	Yes	N/A

Characteristic	Specification	
- Self-test can be activated from beacon remote activation points (Yes or No)	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	N/A
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	Yes, 121.5MHz for 1 second	N/A
- Self-test can be activated directly at beacon (Yes or No)	Yes	Yes
- List of Items checked by self-test	406 Power, Synthesiser, 121.5 power, Battery status	GPS
- Self-test transmission burst duration (440 or 520 ms)	520 ms	N/A
- Self-test format bit ("0" or "1")	1	N/A
- Maximum duration of self-test	9.35 second	315.3 second
- Maximum number of GNSS Self Tests (beacons with internal navigation devices only)	N/A	10
- Self-test results in transmission of a single burst, irrespectively of the test result (Yes or No)	N/A	No
- Maximum number of self-tests during battery pack replacement period	96 recommended	N/A
- List all methods of Self-test mode and GNSS Self-test mode activation. Provide details on a separate sheet, if insufficient space to describe	Key Press Activation	Key Press Activation

Message Coding Protocols:	(x)	Tick the boxes below against the intended protocol options
User 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
	☐	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
RLS Location Protocol (tick where appropriate) [2]	☐	EPIRB
	☐	ELT
	☐	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

[2] RLS protocols will be effective as of 1 November 2014. The use of RLS-enabled beacons will be regulated by national administrations. Since the RLS functionality might affect the 406 MHz beacon performance, amendments to the type approval procedure for these beacons could be required. Beacon manufacturers should consult the Cospas-Sarsat Secretariat before undertaking the type approval of RLS-enabled beacon models.

Beacon includes a homer transmitter(s) (Yes or No) - homer transmitter(s) frequency - homer transmitter(s) power	Yes 121.5 MHz 17 dBm ±3dBm
- homer transmitter(s) duty cycle - duty cycle of homer swept tone	97 % 34 %
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.	Strobe Light, 1 cd at 24 flashes per minute
Beacon includes automatic activation mechanism (Yes or No) Specify type of automatic beacon activation mechanism	No
Beacon includes features and functions not listed above, related or non-related to 406 MHz (Yes or No) List features and use a separate sheet if insufficient space	No
Beacon model hardware part number (P/N) and version	900S-01240 Issue 01.00
Beacon model software/firmware P/N, version, date of issue/releases	500S-01239 Issue 00.06, 18/12/2012
Beacon model printed circuit board P/N and version	101S-01162 Issue 01.00

Dated 28/01/2013. Signed:.....Simon Nolan, Technical Director, Ocean Signal Limited
(Name, Position and Signature of Beacon Manufacturer Representative)

10. CONCLUSION

G.2 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: **18 December 2012**

Applicable C/S Standards:

Document	Issue	Revision
C/S T.001	3	13
C/S T.007	4	7
C/S IP TCXO	-	4

I hereby confirm that the 406 MHz beacon described above has been successfully tested in accordance with the Cospas-Sarsat 406 MHz Beacon Type Approval Standard (C/S T.007).
Deviation[1] from the standard test procedure during Operational Lifetime test (A.2.3) was observed[2]. We took into account influence of the deviation and performed the additional calculations of extened operational lifetime that confirmed compliance tested beacon with the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001).
I hereby confirm that the 406 MHz beacon described above complies with the Specification for Cospas-Sarsat 406 MHz Distress Beacons (C/S T.001) and complies with Interim procedure for the determination of compliance of 406 MHz beacons equipped with a TCXO with Cospas-Sarsat Type Approval requirements C/S IP (TCXO) as demonstrated in the attached report.

Dated January 29, 2013 Signed

V. Kovalenko
Department manager

[1] The deviation was reflected in accordance with Footnote 1 on page G-7 of C/S T.007 Issue 4 – Rev.7
[2] GNSS signal was available throughout the test that did not ensure that the internal GNSS receiver drew the maximum energy from the battery as per the C/S T.007, A.2.3.

TABLE F.1: OVERALL SUMMARY OF 406 MHZ RESCUEME PLB1 Class 2 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
– transmitter power output (min and max)	35-39	dBm	36.00 to 36.13	35.91 to 36.10	35.84 to 35.86	
– power output rise time	<5	ms	0.30 to 0.35	0.40 to 0.45	0.40 to 0.45	
– power output 1 ms before burst	<-10 dBm	√[1]	√	√	√	
2. Digital Message Bits number						Annex 1
– bit sync 1-15	15 bits "1"	√	√	√	√	
– frame sync 16-24	"000101111"	√	√	√	√	
– format flag 25	1 bit	bit value	1	1	1	
– protocol flag 26	1 bit	bit value	0	0	0	
– 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	110111	110111	110111	
– additional data / BCH (if applicable) 113-144	32 bits	√	√	√	√	
– position error (if applicable)	<5	km	—	—	—	
3. Digital Message Generator						Annex 1
– repetition rate T_R:						
• average T_R	48.5-51.5	sec	49.61	49.61	49.61	
• min T_R	$47.5 \le T_R \le 48.0$	sec	47.51	47.51	47.51	
• max T_R	$52.0 \le T_R \le 52.5$	sec	52.21	52.21	52.21	
• standard deviation	0.5-2.0	sec	1.48	1.48	1.48	
– bit rate:						
• min f_b	≥396	bit/sec	400.07	400.09	400.10	
• max f_b	≤404	bit/sec	400.20	400.23	400.23	
– total transmission time:						
• short message	435.6-444.4	ms	—	—	—	
• long message	514.8-525.2	ms	518.20 to 518.25	518.10 to 518.15	518.15 to 518.20	
– unmodulated carrier:						
• min T_1	≥158.4	ms	159.90	159.90	159.91	
• max T_1	≤161.6	ms	159.91	159.91	159.92	
– first burst delay	≥47.5	sec	50.03 to 50.19	50.09 to 50.21	50.15 to 50.27	

[1] Indicate that testing demonstrated conformance to requirements by placing the √ symbol in Table F.1.

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
– biphase-L		√	√	√	√	
– rise time (min and max)	50-250	μsec	141.66 to 145.75	143.48 to 145.73	143.43 to 145.66	
– fall time (min and max)	50-250	μsec	157.97 to 160.40	154.34 to 157.21	152.67 to 154.55	
– phase deviation: positive (min and max)	+(1.0 to 1.2)	radians	1.10 to 1.12	1.08 to 1.09	1.07 to 1.09	
– phase deviation: negative (min and max)	-(1.0 to 1.2)	radians	-1.02 to -1.05	-1.10 to -1.12	-1.13 to -1.14	
– symmetry measurement	≤0.05	√	√	√	√	
5. 406 MHz Transmitted Frequency						Annex 1
– nominal value	406.039 - 406.041	MHz	406.039957	406.039952	406.039951	
– short-term stability	$\leq 2\times10^{-9}$	/100 ms	1.62E-10	1.18E-10	7.41E-11	
– medium-term stability slope	(-1 to +1) $\times10^{-9}$	/min	-4.91E-11	-9.34E-11	-7.61E-11	
– medium-term stability residual frequency variation	$\leq 3\times10^{-9}$		5.63E-10	8.42E-11	8.71E-11	
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
– nominal transmitted frequency	406.039 - 406.041	MHz	406.039957	406.039950	406.039951	
– modulation rise time (min and max)	50-250	μsec	141.89 to 145.78	143.85 to 145.93	143.24 to 146.24	
– modulation fall time (min and max)	50-250	μsec	157.07 to 160.37	154.95 to 157.03	152.39 to 155.15	
– phase deviation: positive (min and max)	+(1.0 to 1.2)	radians	1.10 to 1.12	1.06 to 1.10	1.07 to 1.10	
– phase deviation: negative (min and max)	-(1.0 to 1.2)	radians	-1.02 to -1.04	-1.10 to -1.13	-1.12 to -1.14	
– 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
– frame sync	"011010000"	√	√	√	√	
– format flag	1/0	bit value	1	1	1	
– single radiated burst	≤440/520 (±1%)	ms	518.25	518.20	518.20	
– default position data (if applicable)	must be correct	√	√	√	√	Annex 9 Volume 2 page 59
– description provided		√	√	√	√	Volume 2 page 29
– design data provided on protection against repetitive self-test mode transmissions		√	√	√	√	Volume 2 page 58
– 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
			T_{min} (-20 °C)	T_{amb} (20 °C)	T_{max} (55 °C)	
8 (b). GNSS Self-Test Mode (if applicable)						Annex 1
– frame sync	"011010000"	√	N/A	N/A	N/A	
– format flag	1	bit value	N/A	N/A	N/A	
– radiated burst duration	≤ 520 (+1%)	ms	N/A	N/A	N/A	
– position data (if applicable)	must be within 500m (or 5.25km for User Location Protocol) of the actual position	√	N/A	N/A	N/A	
– design data showing how GNSS Self-Test is limited in number of transmissions and duration	must be provided	√	√	√	√	
– single burst verification (if applicable)	must be one burst	√	N/A	N/A	N/A	
– 121.5 MHz RF power (if applicable)	verify that RF power is emitted	√	N/A	N/A	N/A	
– 406 MHz RF power (if applicable)	verify that RF power is emitted	√	N/A	N/A	N/A	
– Maximum duration of GNSS Self-Test	Manufacturer to specify value	sec	315	315	315	
– Actual duration of Self-Test with encoded location	Less than maximum duration	sec	N/A	26.54-28.43	N/A	With GPS signal
– Maximum number of GNSS Self-Tests (only beacons with internal navigation devices)	Manufacturer to specify number	number	10	10	10	
– Distinct indication to register successful completion or failure of the GNSS selftest	must be provided	√	√	√	√	Volume 2 pages 30, 83
– Distinct indication that a maximum number of GNSS self-tests has been attained after GNSS self-test mode activation and without transmission of a test message or further GNSS receiver current drain	must be provided	√	√	√	√	Volume 2 pages 30, 83

Parameters to be Measured	Range of Specification	Units	Test Results	Comments
9. Thermal Shock [1]				Annex 2
– soak temperature		°C	T_{soak}= 55 °C	
– measurement temperature		°C	T_{meas}= 25 °C	
– the following parameters are to be met within 15 minutes of beacon turn on and maintained for 2 hours:				
– transmit frequency nominal value	406.039 - 406.041	MHz	406.039948	
– transmit frequency short-term stability	$\leq 2\times10^{-9}$	/100 ms	4.41E-11 to 1.25E-10	
– transmit frequency medium-term stability slope	(-2 to +2) $\times10^{-9}$	/min	-1.31E-10 to 1.11E-10	
– transmit frequency medium-term stability residual frequency variation	$\leq 3\times10^{-9}$		6.30E-11 to 3.26E-10	
– transmitter power output (min and max)	35-39	dBm	35.87 to 36.19	
– digital message	correct	√	√	
10. Operating Lifetime at Minimum Temperature[2]				Annex 4
– duration	>24	hrs	33:00:22 hours at Tmin=-20°C	Deviation from the standard test procedure during Operational Lifetime test was observed: GNSS signal was available throughout the test that did not ensure that the internal GNSS receiver drew the maximum energy from the battery as per the C/S T.007, A.2.3. The extened operational lifetime confirmed compliance with C/S T.001
– transmit frequency nominal value	406.039 - 406.041	MHz	406.039960 - 406.039978	
– transmit frequency short-term stability	$\leq 2\times10^{-9}$	/100ms	5.87E-11 to 4.66E-10	
– transmit frequency medium-term stability slope	(-1 to +1) $\times10^{-9}$	/min	-2.07E-10 to 9.84E-11	
– transmit frequency medium-term stability residual frequency variation	$\leq 3\times10^{-9}$		4.97E-11 to 8.53E-10	
– transmit power output (min and max)	35-39	dBm	35.07 to 36.72	
– Pt_{EOL} = minimum transmitter power output observed during lifetime at minimum temperature	35-39	dBm	36.06 minimum observed during first 25 hours 58 minutes of test 35.07 minimum observed after 25 hours 58 minutes of test	
– Digital message	correct	√	√	
– homer transmitter continuous operation during the lifetime test	>24	Hours	33:00:22 hours at Tmin=-20°C	
– homer frequency				
– at the beginning of the test		MHz	121.503175	
– at the end of the test		MHz	121.501587	
– homer peak power level				
– at the beginning of the test		dBm	15.90	
– at the end of the test		dBm	16.80	
– homer transmitter duty cycle				
– at the beginning of the test		%	97.20	
– at the end of the test		%	97.20	

[1] Attach graphs depicting the test results.
[2] Attach graphs depicting the test results.

Parameters to be Measured	Range of Specification	Units	Test Results	Comments
11. Temperature Gradient (5 °C/hr)[1] Up Ramp				Annex 3
– transmit frequency nominal value	406.039 - 406.041	MHz	406.039942 to 406.039959	
– transmit frequency short-term stability	$\leq 2\times10^{-9}$	/100ms	3.75E-11 to 2.60E-10	
– transmit frequency medium-term stability:				
• slope (A to B, C+15 to D)	(-1 to +1) $\times10^{-9}$	/min	-1.17E-10 to 1.14E-10	
• slope (B to C+15)	(-2 to +2) $\times10^{-9}$	/min	-3.77E-10 to 2.05E-10	
– residual frequency variation	$\leq 3\times10^{-9}$		4.39E-11 to 6.11E-10	
– transmitter power output (min and max)	35-39	dBm	35.59 to 36.38	
– digital message	correct	√	√	
Down ramp				
– transmit frequency nominal value	406.039 - 406.041	MHz	406.039947 to 406.039963	
– transmit frequency short-term stability	$\leq 2\times10^{-9}$	/100ms	3.19E-11 to 2.25E-10	
– transmit frequency medium-term stability:				
• slope (C to D and E+15 to F)	(-1 to +1) $\times10^{-9}$	/min	-6.34E-11 to 1.06E-10	
• slope (D to E+15)	(-2 to +2) $\times10^{-9}$	/min	-2.15E-10 to 3.01E-10	
– residual frequency variation	$\leq 3\times10^{-9}$		4.72E-11 to 6.08E-10	
– transmitter power output (min and max)	35-39	dBm	35.72 to 36.62	
– digital message	correct	√	√	
12. Oscillator Aging (data provided)				
– 5-year carrier nominal frequency variation	C/S T.001	Hz	from -121 Hz to 24 Hz by 5 years (-0.298 ppm to 0.059 ppm by 5 years)	Volume 2 Page 66
– MTS analysis (if applicable)	Must demonstrate compliance	√		Annex 10
13. Protection Against Continuous Transmission description provided	<45	sec	√	Volume 2 Page 57

[1]Attach graphs depicting the test results.

Parameters to be Measured	Range of Specification	Units	Test Results	Comments
14. Satellite Qualitative Test (results provided)[1]	15 Hex ID provided by LUT and position within 5 km 80% of time	√	√ The received digital message corresponds to the encoded radio beacon ID. Received messages with coordinates are determined (successfully located by satellites).	
Integral antenna Configuration 7	- // -	√	26.12.12 - 14 satellite passes with ratio of successful solutions – 100 % and location error 0.132 .. 3.519 km	Annex 8.1 Test configuration 7. Beacon on ground plane.
Integral antenna Configuration 8	- // -	√	25.12.12 - 11 satellite passes with ratio of successful solutions – 100 % and location error 0.132 .. 0.840 km	Annex 8.3 Test configuration 8. Beacon above ground plane.
15.1 Antenna Characteristics **Integral antenna** – polarization – VSWR – $EIRP_{LOSS}$ – $EIRP_{maxEOL}$ – $EIRP_{minEOL}$	 linear or RHCP ≤1.5 ≤43 ≥32	 dB dBm dBm	 linear n/a 0.04 42.20 32.83	Annex 5.1 Test configuration 3. (Fig: B.2) Beacon sitting on ground plane.
15.2 Antenna Characteristics **Integral antenna** – polarization – VSWR – $EIRP_{LOSS}$ – $EIRP_{maxEOL}$ – $EIRP_{minEOL}$	 linear or RHCP ≤1.5 ≤43 ≥30	 dB dBm dBm	 linear n/a 0.04 42.52 36.67	Annex 5.2 Test configuration 4. (Fig: B.5) Beacon above ground plane.

[1] Attach a satellite qualitative test summary report as per Appendix A to Annex F of T.007 standard for each test configuration.

Parameters to be Measured	Range of Specification	Units	Test Results	Comments
16. Beacon Coding Software[1]				Annex 6
– sample message provided for each coding option of the applicable coding types	correct	√		Per Table F-D.2 (Data provided by manufacturer) Per Table F-D.3 (Data provided by manufacturer)
– sample self-test message provided for each coding option of the applicable coding types	correct	√		Per Table F-D.2 (Data provided by manufacturer) Per Table F-D.3 (Data provided by manufacturer)
17. Navigation System[2]				
– position data default values	correct	√	√	Annex 7 Test per A.3.8.1
– position acquisition time[3]	<10 (int.nav) < 1 (ext.nav)	min	From 0.83 to 0.85	Annex 7 Test per A.3.8.2 Results per Tables F-C.4
– position accuracy[3]	C/S T.001	m	√	Test per A.3.8.2 Results per Tables F-C.4
– encoded position data update interval	>5	min	29.46 - SLP 29.46 - NLP 29.46 - ULP	Test per A.3.8.3
– position clearance after deactivation	correct	√	√	Annex 7 Test per A.3.8.4
– position data input update interval	<1.0 min (ELT) <20 min (EPIRB/PLB)	√	n/a	
– stored position cleared within interval	1.0-1.5 min (ELT) 20-30 min (EPIRB/PLB)		n/a	
– position data encoding	correct	√	√	Test per A.3.8.7 (Data provided by manufacturer)
– retained last valid position after navigation input lost	240(±5)	min	239.49 - SLP 239.48 - NLP 240.22 - ULP	Annex 7 Test per A.3.8.6
– default position data transmitted after 240(±5) minutes without valid position data	correct	√	√	
– information provided on protection against erroneous position encoding into the beacon message		√	√	Volume 2 page 57

[1] Attach examples of each requested coding option as per Appendix D to Annex F.
[2] Attach navigation system test results as per Appendix C to Annex F.
[3] Report the results of this test for all the declared beacon configurations

TEST RESULTS OF INTERIM PROCEDURE FOR THE DETERMINATION OF COMPLIANCE OF 406 MHZ BEACONS EQUIPPED WITH A TCXO WITH COSPAS-SARSAT TYPE APPROVAL REQUIREMENTS

Table A-1: Fast Track Analysis

MTS Characteristic	**TOT**	**OSC**	**beacon_wc**	**osc_max**	**beacon_ max/min**	**ageing**	**bcn_5 year_max**	**C/S spec**	**Pass /Fail**
Residual, ppb	0.61	0	0.61	2.00	2.09	**0.2**	2.29	**3.0**	Pass
Static Positive Mean Slope, ppb/min	0.11	-0.08	0.14	0.7	0.71	**0**	-	**1.0**	Pass
Static Negative Mean Slope, ppb/min	-0.12	0.11	-0.16	-0.7	-0.72	**0**	-	**-1.0**	Pass
Gradient Positive Mean Slope, ppb/min	0.30	-0.27	0.41	1.70	1.75	**0**	-	**2.0**	Pass
Gradient Negative Mean Slope, ppb/min	-0.38	0.28	-0.47	-1.7	-1.76	**0**	-	**-2.0**	Pass

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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 conditions:

- normal testing temperature 20 °C;
- maximum testing temperature 55 °C;
- minimum testing temperature -20 °C;
- active load value for VSWR test is 17 Ohm;
- matching network was not used;
- mode of beacon operating: 406 and 121.5 MHz
- GNSS signal not available during test.

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.

The list of parameters

Parameter tested	Operating temperature		
	20 °C	55 °C	-20 °C
	page No		
Transmitter power output			
Transmitter power output	31	43	54
Maximum and minimum value of output power during operating	30	42	53
Output power rise time	31	43	54
Power output 1 ms before burst	30	42	53
Messages			
Message contents	32	44	55
Digital message generator			
First burst delay	33	45	56
Average repetition rate and standard deviation	33	45	56
Minimal and maximal value of digital message generator parameters	30	42	53
Modulation			
Modulation index	33	46	56
Modulation rise and fall times	33	46	56
View of modulation 3 first bit message	33	46	56
Maximum and minimum value during operating	30	42	53
Transmitted frequency			
Nominal value	31	43	54
Medium /short term frequency stability	31	43	54
Maximum and minimum value during operating	30	42	53
Spurious emissions			
Spurious emissions	35	47	58
VSWR test			
Transmitter nominal frequency	36	48	59
Digital message content	37	49	60
The modulation parameters	36	48	59
Self-test mode			
Duration of the burst	38	50	61
Digital message content (frame synchronization, format flag)	39	51	62
The Output power, frequency of the self- test burst	38	50	61

ANNEX 1.1.

PERFORMANCE MEASUREMENTS AT NORMAL TEMPERATURE

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

Model: rescueME PLB1
Serial number: TA1
Beacon SW: 00.06
Test Date: 19.12.2012

Test conditions:

- Ambient laboratory temperature: 18 °C;
- Relative air humidity: 45 %.
- Atmospheric pressure: 753 mm/Hg;
- Beacon environment temperature during test: 20°C.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 0:14:53	Bursts received 19	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039952	406.039952	406.039952
+Phase deviation, rad	1.00	1.20	1.08	1.08	1.09
-Phase deviation, rad	-1.00	-1.20	-1.12	-1.12	-1.10
Phase time rise, us	50.00	250.00	143.48	145.30	145.73
Phase time fall, us	50.00	250.00	154.34	157.21	157.21
Power, dBm	35	39	35.91	36.10	36.10
Power rise, ms	0.00	5.00	0.40	0.40	0.45
Power output 1 ms before burst, dBm		-10		-23.08	
Bit Rate, bps	396.00	404.00	400.09	400.09	400.23
Asymmetry, %	0.00	5.00	0.35	0.35	0.44
CW Preamble, ms	158.40	161.60	159.90	159.90	159.91
Total burst duration, ms	514.80	525.20	518.10	518.15	518.15
Slope	-1.00E-09	1.00E-09	-9.34E-11	-9.34E-11	-9.34E-11
Residual variations	0.00E-09	3.00E-09	8.42E-11	8.42E-11	8.42E-11
Short term variations	0.00E-09	2.00E-09	1.18E-10	1.18E-10	1.18E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499180	**Low Sweep Frequency, Hz**	351
Power, mW	54.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	825
Modulation Index, %	100		

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

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

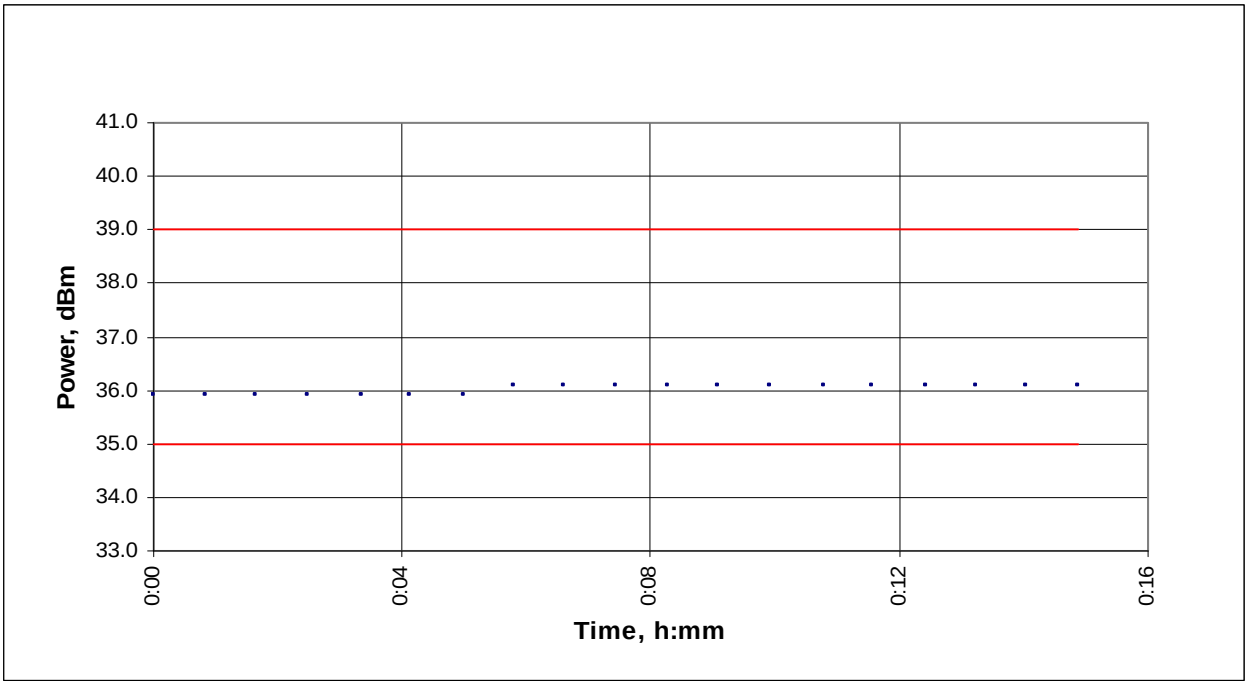
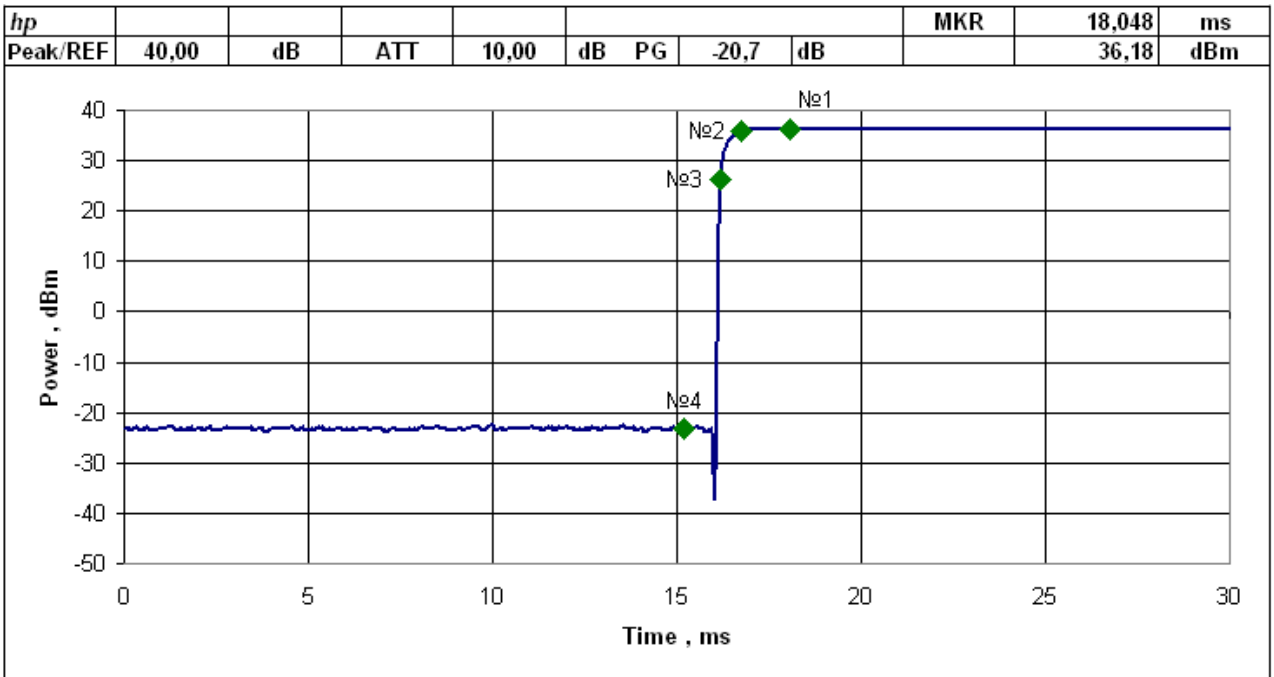


Figure 1.1. 1 – Transmitter power during test

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



RES BW	10000	Hz	VBV	30000	Hz	SWP	30	ms
Marker	Trace	Type	Freq/Time			Amplitude		
№1	<A>	Type	18,048		ms	36,18		dBm
№2	<A>	Type	16,762		ms	35,72		dBm
№3	<A>	Type	16,190		ms	26,18		dBm
№4	<A>	Type	15,190		ms	-23,08		dBm

Figure 1.1. 2 – Transmitter power output rise

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

Bursts received	19
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	100000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

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	49.61
Minimum repetition period ,s	47.5	48.0	47.51
Maximum repetition period ,s	52.0	52.5	52.21
Standard deviation	0.5	2.0	1.48
Differences of Rep. period, s	4		4.70

- **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 operation burst
1st measurement	50.09
2d measurement	50.21
3d measurement	50.13
Minimum value	**50.09**
Maximum value	**50.21**

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

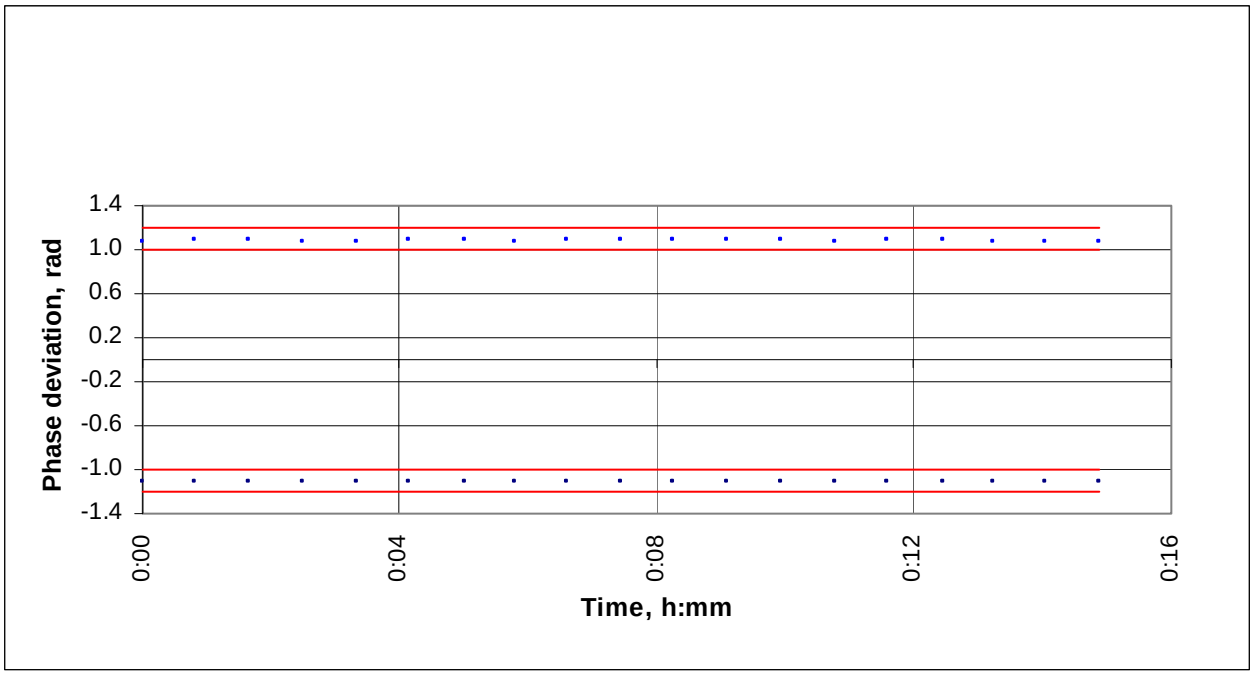


Figure 1.1. 3 – Modulation index

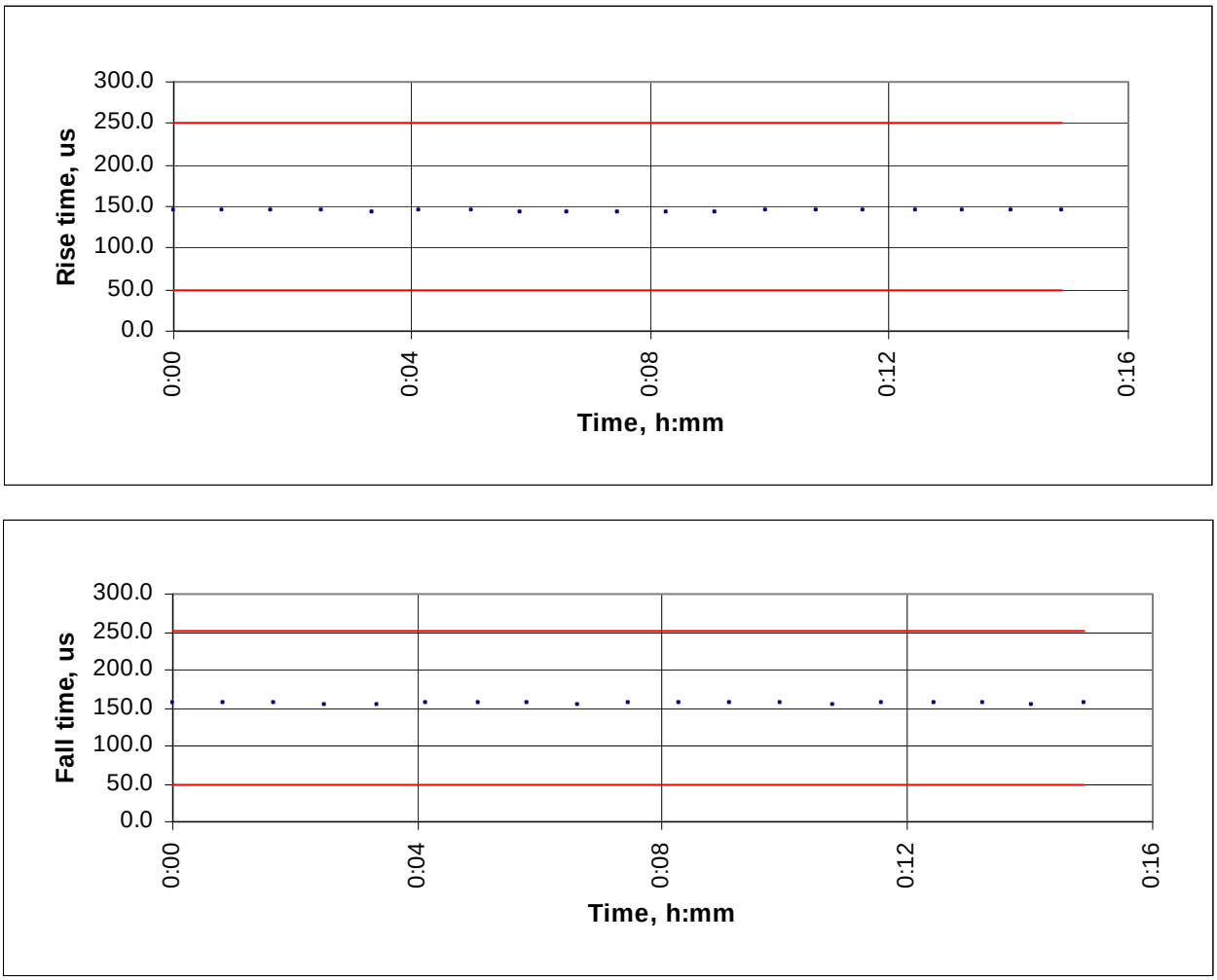


Figure 1.1. 4 – Modulation rise and fall times

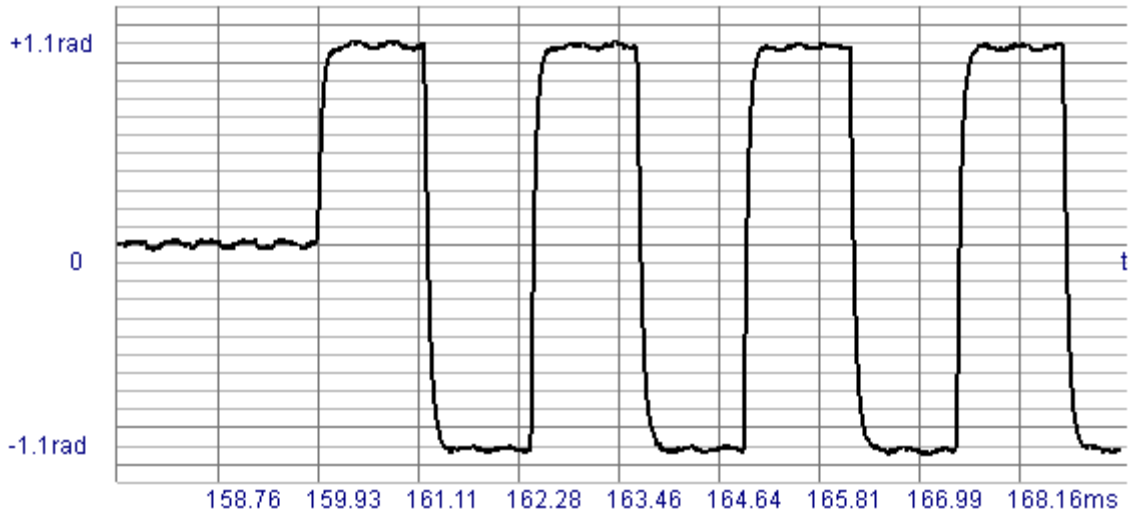


Figure 1.1. 5 – Modulation symmetry of the bi-phase demodulated signal

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

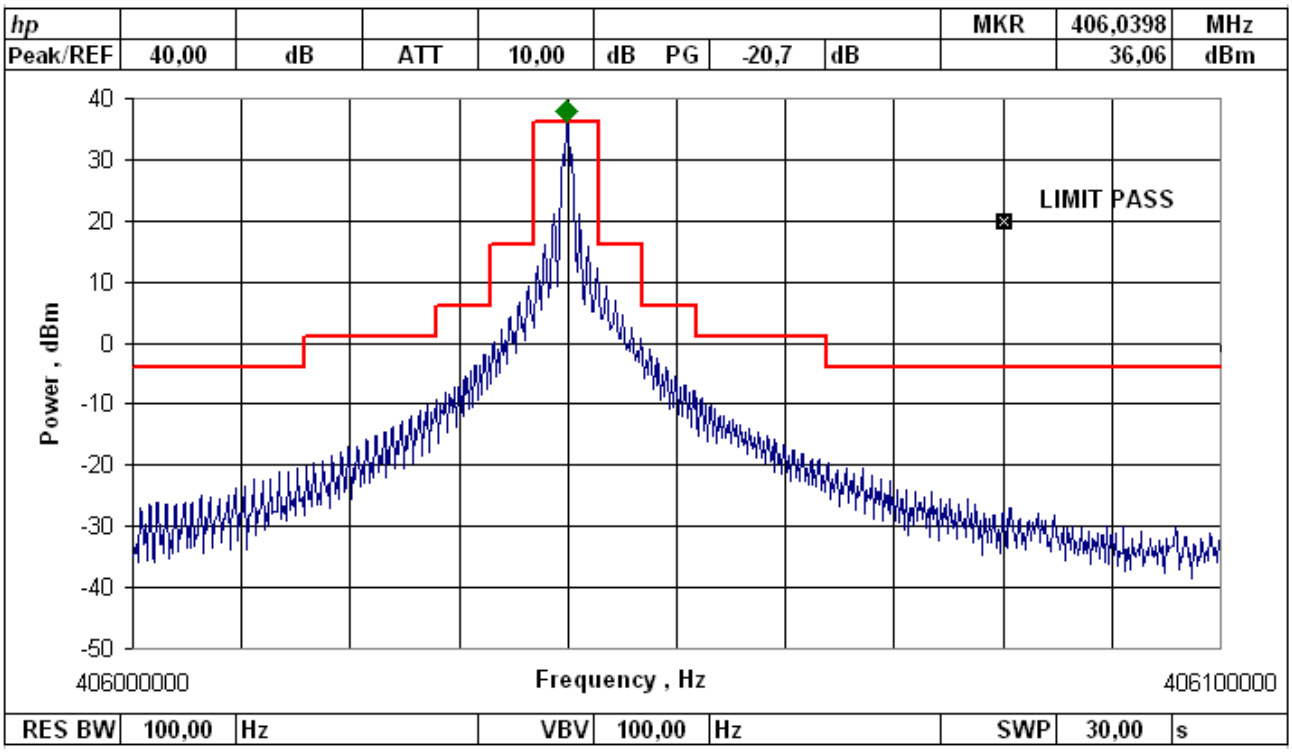


Figure 1.1. 6 – Spurious output.

f) 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 17 Ohm), during which time parameters were measured.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 0:14:53	Bursts received 19		BCH error 0	Self-Test 0	
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039950	406.039950	406.039950
+Phase deviation, rad	1.00	1.20	1.06	1.08	1.10
-Phase deviation, rad	-1.00	-1.20	-1.13	-1.11	-1.10
Phase time rise, us	50.00	250.00	143.85	143.97	145.93
Phase time fall, us	50.00	250.00	154.95	156.03	157.03
Asymmetry, %	0.00	5.00	0.31	0.44	0.53

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499169	**Low Sweep Frequency, Hz**	645
Power, mW	8.5	**High Sweep Frequency, Hz**	1429
Sweep Period, sec	0.5	**Sweep Range, Hz**	784
Modulation Index, %	100		

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

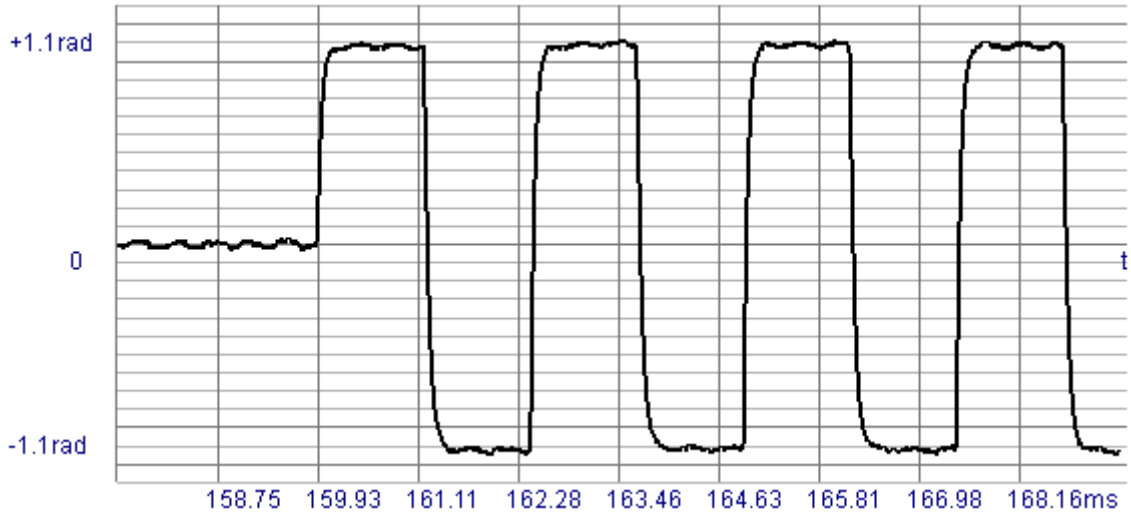


Figure 1.1. 7 – Modulation symmetry of the bi-phase demodulated signal

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

Bursts received	19
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

g) 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)	:FFFED08C9E0000037FDFFC13353783E0F66C

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1
406 MHz Transmitter Parameters	**Limits**		**Measured**
	min	**max**	**current**
Frequency, MHz	406.039	406.041	406.039965
Power, dBm	35	39	36.30
Total burst duration, ms	514.80	525.20	518.20
121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz		121499187	
Power, mW		51.9	

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

Bursts received	1
BCH error	0
Self test message	1
Full HEX message	FFFED08C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

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

GNSS Self-test was performed in two conditions: with GNSS signal and without GNSS signal. During GNSS Self-test beacon didn't transmit any burst at 406 MHz and 121.5 MHz.

With GPS signal	
Duration of the self test	29 sec
Test Result	successful test: the strobe flashing and the green LED flashing

Without GPS signal	
Duration of the self test	315 sec
Test Result	failure test: indicated by the red LED flashing

GNSS self test counter was checked. GNSS signal was available during the test. See results below.

With GPS signals	
Start test time	Duration, sec
19.12.12 14:00	26.54
19.12.12 14:01	27.36
19.12.12 14:02	28.15
19.12.12 14:03	27.49
19.12.12 14:04	26.81
19.12.12 14:05	27.32
19.12.12 14:06	28.07
19.12.12 14:07	28.43
19.12.12 14:08	26.92
19.12.12 14:09	27.08
19.12.12 14:10	GNSS Self-test was not performed

ANNEX 1.2.

PERFORMANCE MEASUREMENTS AT MAXIMUM DECLARED TEMPERATURE

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

Model: rescueME PLB1
Serial number: TA1
Beacon SW: 00.06
Test Date: 20.12.2012

Test conditions:

- Ambient laboratory temperature: 17 °C;
- Relative air humidity: 46 %.
- Atmospheric pressure: 750 mm/Hg.
- Beacon environment temperature during test:55 °C;

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 0:14:53	Bursts received 19	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039951	406.039951	406.039951
+Phase deviation, rad	1.00	1.20	1.07	1.08	1.09
-Phase deviation, rad	-1.00	-1.20	-1.14	-1.14	-1.13
Phase time rise, us	50.00	250.00	143.43	143.90	145.66
Phase time fall, us	50.00	250.00	152.67	153.31	154.55
Power, dBm	35	39	35.84	35.84	35.86
Power rise, ms	0.00	5.00	0.40	0.45	0.45
Power output 1 ms before burst, dBm		-10		-23.60	
Bit Rate, bps	396.00	404.00	400.10	400.10	400.23
Asymmetry, %	0.00	5.00	0.21	0.24	0.32
CW Preamble, ms	158.40	161.60	159.91	159.92	159.92
Total burst duration, ms	514.80	525.20	518.15	518.15	518.20
Slope	-1.00E-09	1.00E-09	-7.61E-11	-7.61E-11	-7.61E-11
Residual variations	0.00	3.00E-09	8.71E-11	8.71E-11	8.71E-11
Short term variations	0.00	2.00E-09	7.41E-11	7.41E-11	7.41E-11

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121498710	**Low Sweep Frequency, Hz**	345
Power, mW	70.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100		

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

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

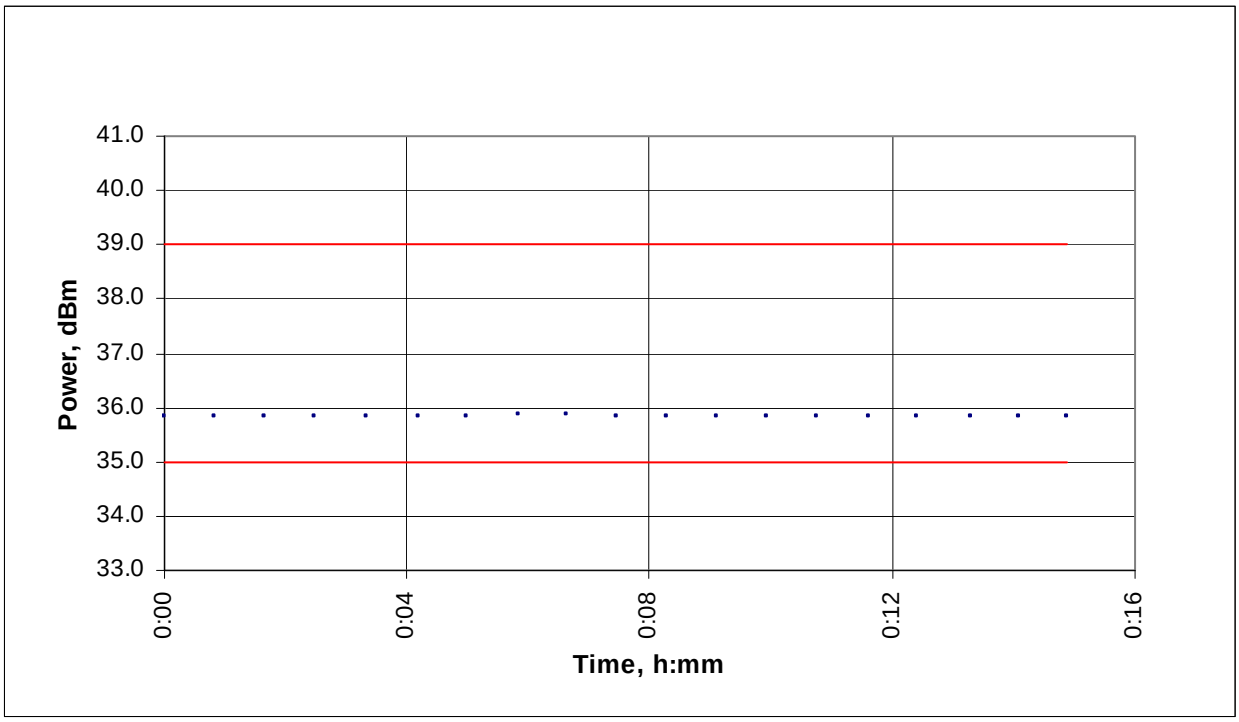
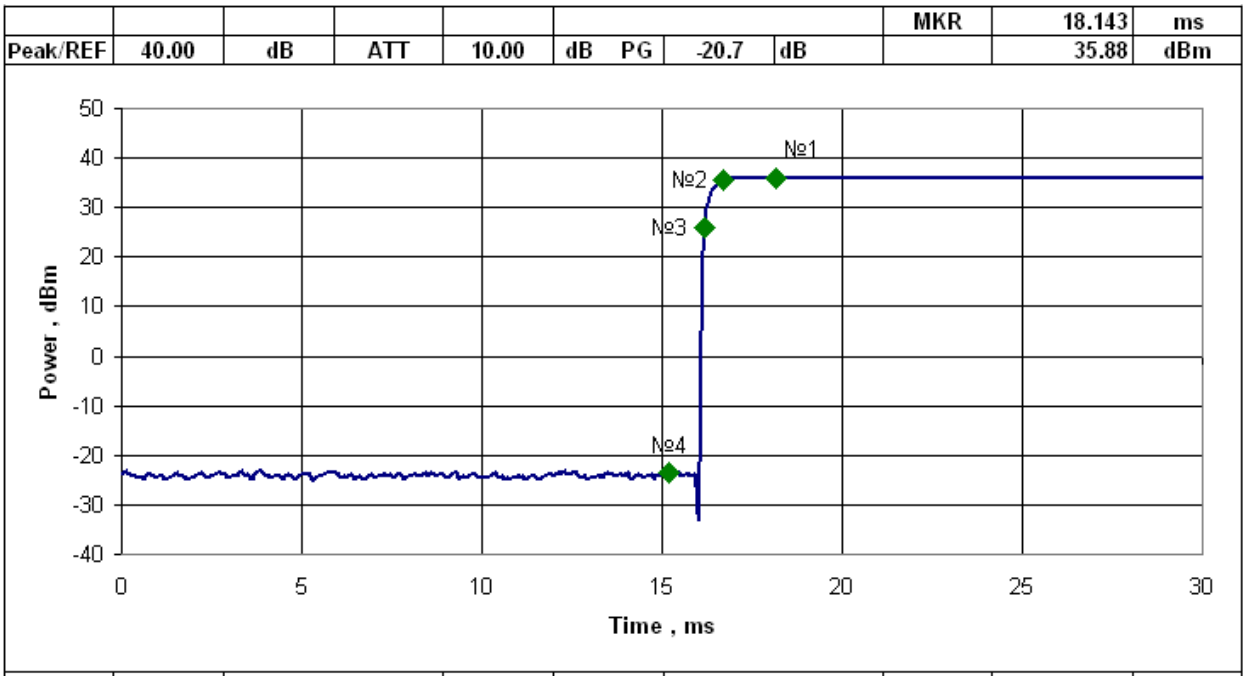


Figure 1.2. 1 – Transmitter power during test

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



RES BW	10000	Hz	VBV	30000	Hz	SWP	35	ms
Marker	Trace	Type	Freq/Time			Amplitude		
№1	<A>	Type	18.143		ms	35.88		dBm
№2	<A>	Type	16.714		ms	35.42		dBm
№3	<A>	Type	16.190		ms	25.88		dBm
№4	<A>	Type	15.190		ms	-23.51		dBm

Figure 1.2. 2 – Transmitter power output rise

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

Bursts received	19
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

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	49.61
Minimum repetition period ,s	47.5	48.0	47.51
Maximum repetition period ,s	52.0	52.5	52.21
Standard deviation	0.5	2.0	1.48
Differences of Rep. period, s	4		4.70

- **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 (operating) burst
1st measurement	50.27
2d measurement	50.15
3d measurement	50.21
Minimum value	**50.15**
Maximum value	**50.27**

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

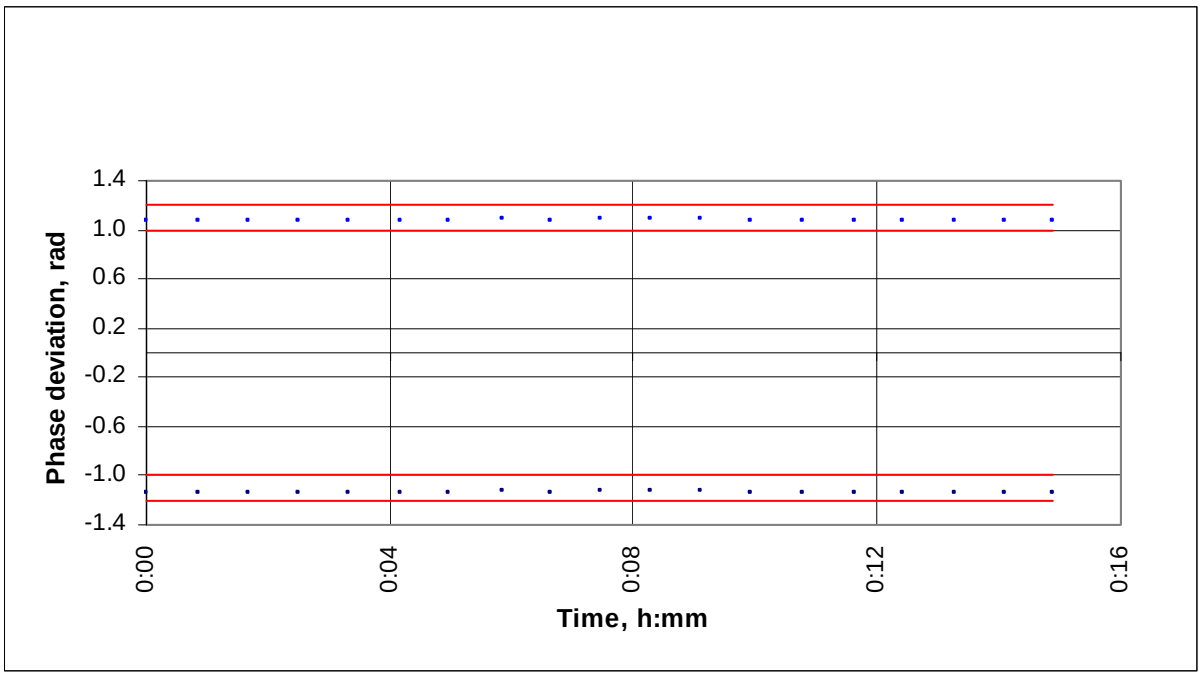
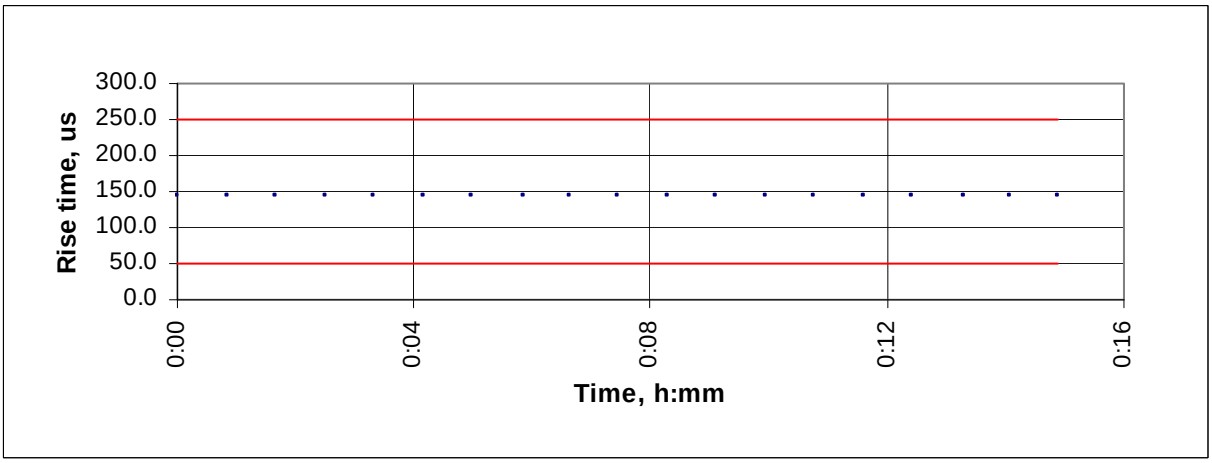


Figure 1.2. 3 – Modulation index



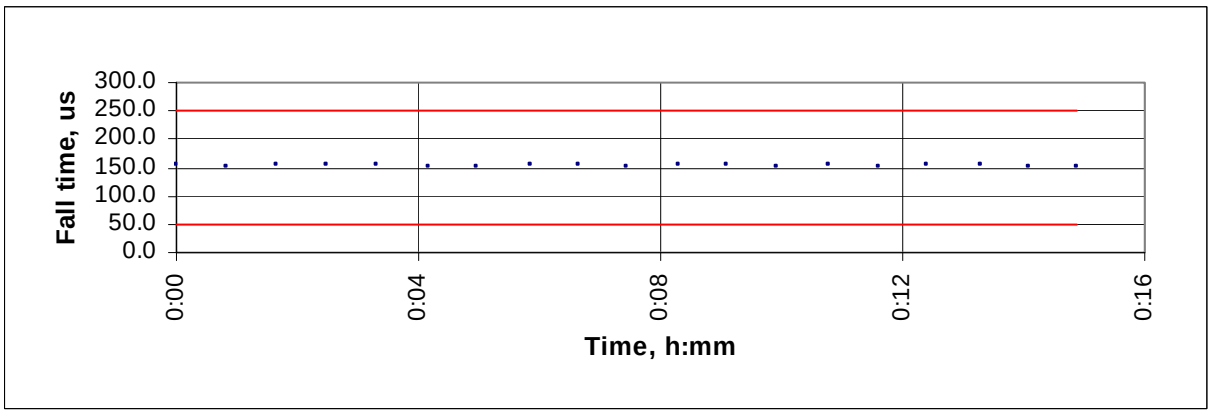


Figure 1.2. 4 – Modulation rise and fall times

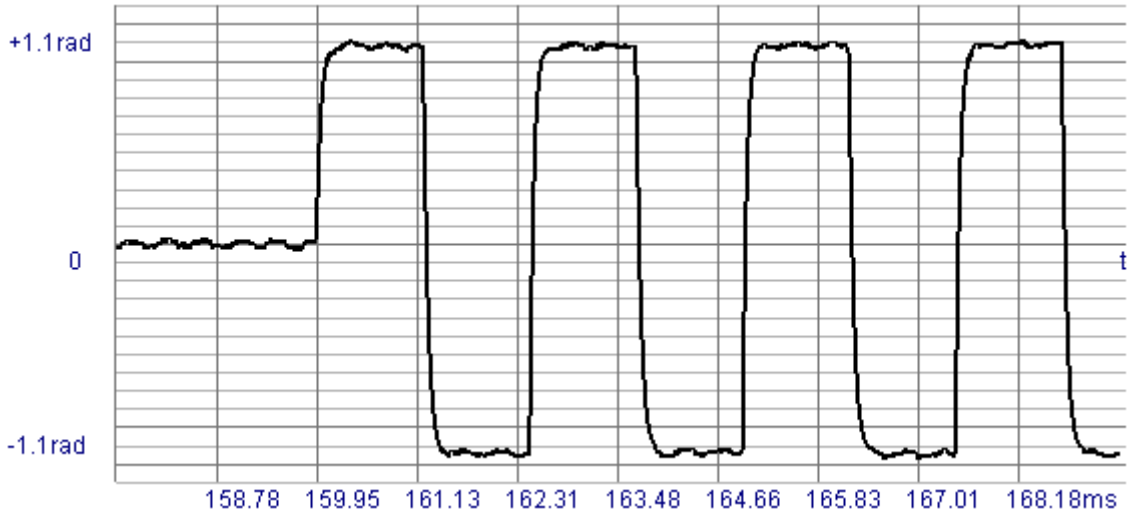


Figure 1.2. 5 – Modulation symmetry of the bi-phase demodulated signal

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

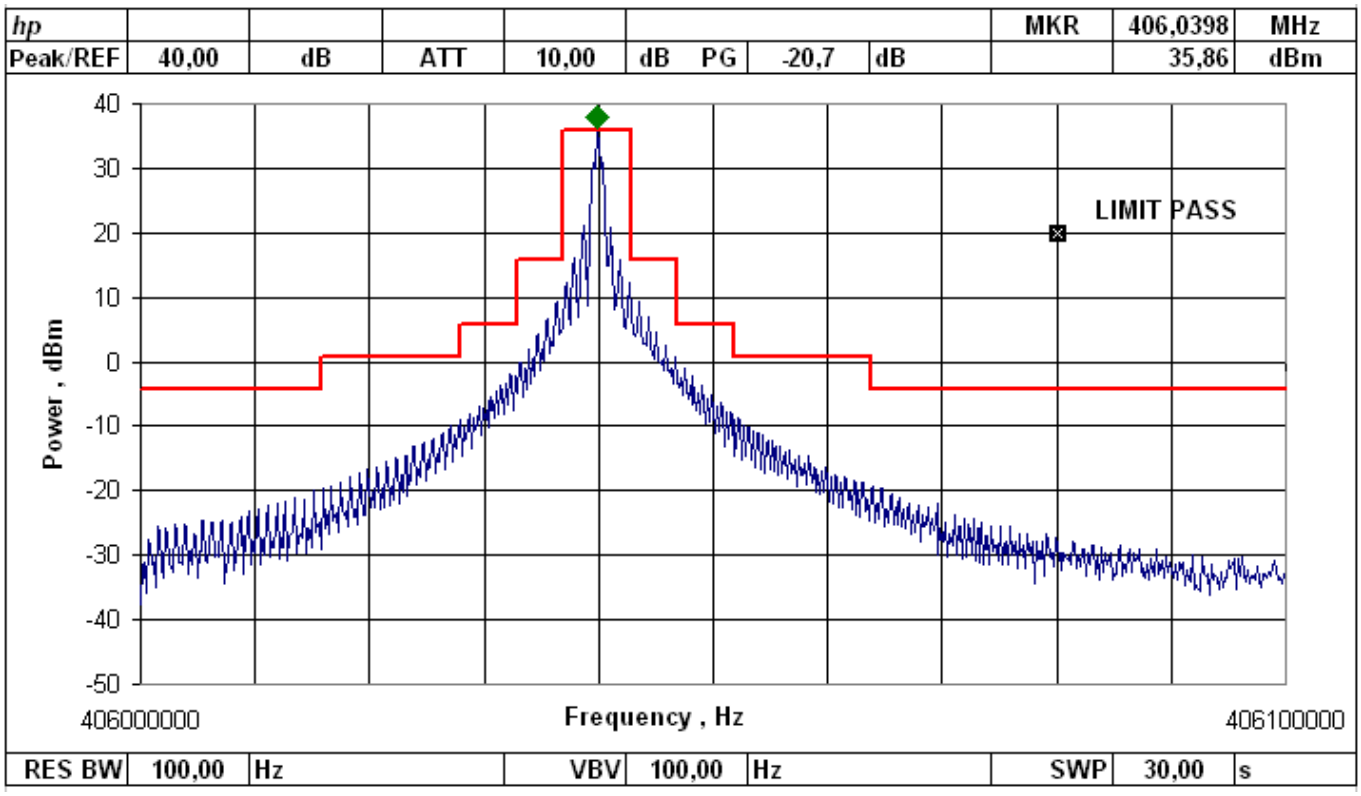


Figure 1.2. 6 – Spurious output.

f) 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 17 Ohm), during which time parameters were measured.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 0:14:53	Bursts received 19		BCH error 0	Self-Test 0	
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039951	406.039951	406.039951
+Phase deviation, rad	1.00	1.20	1.07	1.08	1.10
-Phase deviation, rad	-1.00	-1.20	-1.14	-1.14	-1.12
Phase time rise, us	50.00	250.00	143.24	144.08	146.24
Phase time fall, us	50.00	250.00	152.39	153.15	155.15
Asymmetry, %	0.00	5.00	0.17	0.22	0.35

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121498750	**Low Sweep Frequency, Hz**	351
Power, mW	11.0	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	825
Modulation Index, %	100		

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

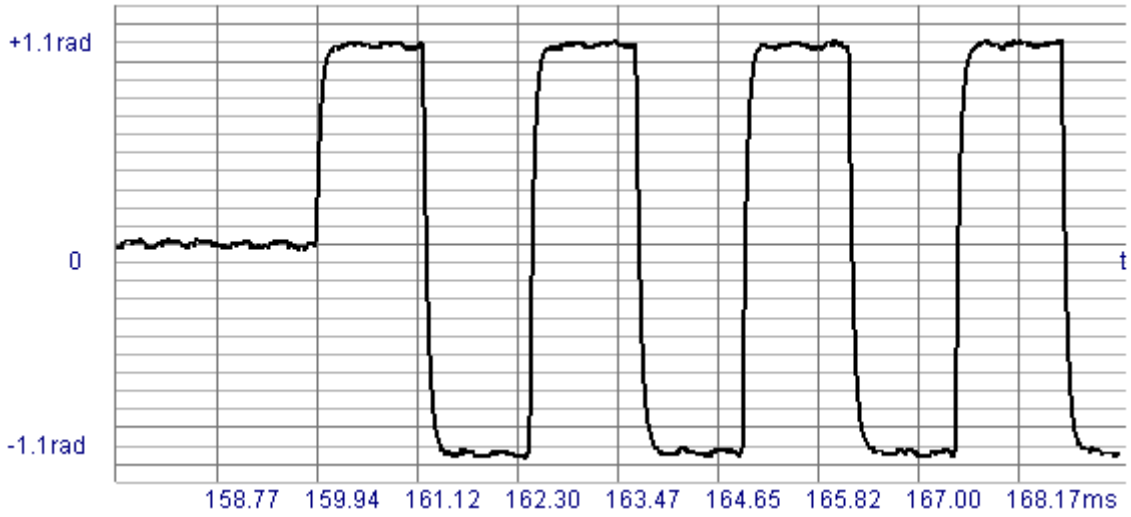


Figure 1.2. 7 – Modulation symmetry of the bi-phase demodulated signal

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

Bursts received	19
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

g) 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)	:FFFED08C9E0000037FDFFC13353783E0F66C

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1
406 MHz Transmitter Parameters	**Limits**		**Measured**
	min	**max**	**current**
Frequency, MHz	406.039	406.041	406.039951
Power, dBm	35	39	35.91
Total burst duration, ms	514.80	525.20	518.20
121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121498713		
Power, mW	68.4		

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

Bursts received	1
BCH error	0
Self test message	1
Full HEX message	FFFED08C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

ANNEX 1.3.

PERFORMANCE MEASUREMENTS AT MINIMUM DECLARED TEMPERATURE

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

Model: rescueME PLB1
Serial number: TA1
Beacon SW: 00.06
Test Date: 19.12.2012

Test conditions:

- Ambient laboratory temperature: 18°C;
- Relative air humidity: 45 %.
- Atmospheric pressure: 751 mm/Hg.
- Beacon environment temperature during test: -20°C

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 0:14:53	Bursts received 19	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039957	406.039957	406.039957
+Phase deviation, rad	1.00	1.20	1.10	1.12	1.12
-Phase deviation, rad	-1.00	-1.20	-1.05	-1.03	-1.02
Phase time rise, us	50.00	250.00	141.66	143.99	145.75
Phase time fall, us	50.00	250.00	157.97	159.78	160.40
Power, dBm	35	39	36.00	36.00	36.13
Power rise, ms	0.00	5.00	0.30	0.35	0.35
Power output 1 ms before burst, dBm		-10		-21.49	
Bit Rate, bps	396.00	404.00	400.07	400.07	400.20
Asymmetry, %	0.00	5.00	0.58	0.74	0.78
CW Preamble, ms	158.40	161.60	159.90	159.91	159.91
Total burst duration, ms	514.80	525.20	518.20	518.20	518.25
Slope	-1.00E-09	1.00E-09	-4.91E-11	-4.91E-11	-4.91E-11
Residual variations	0.00E-09	3.00E-09	5.63E-10	5.63E-10	5.63E-10
Short term variations	0.00E-09	2.00E-09	1.62E-10	1.62E-10	1.62E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499241	**Low Sweep Frequency, Hz**	351
Power, mW	29.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	825
Modulation Index, %	100		

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

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

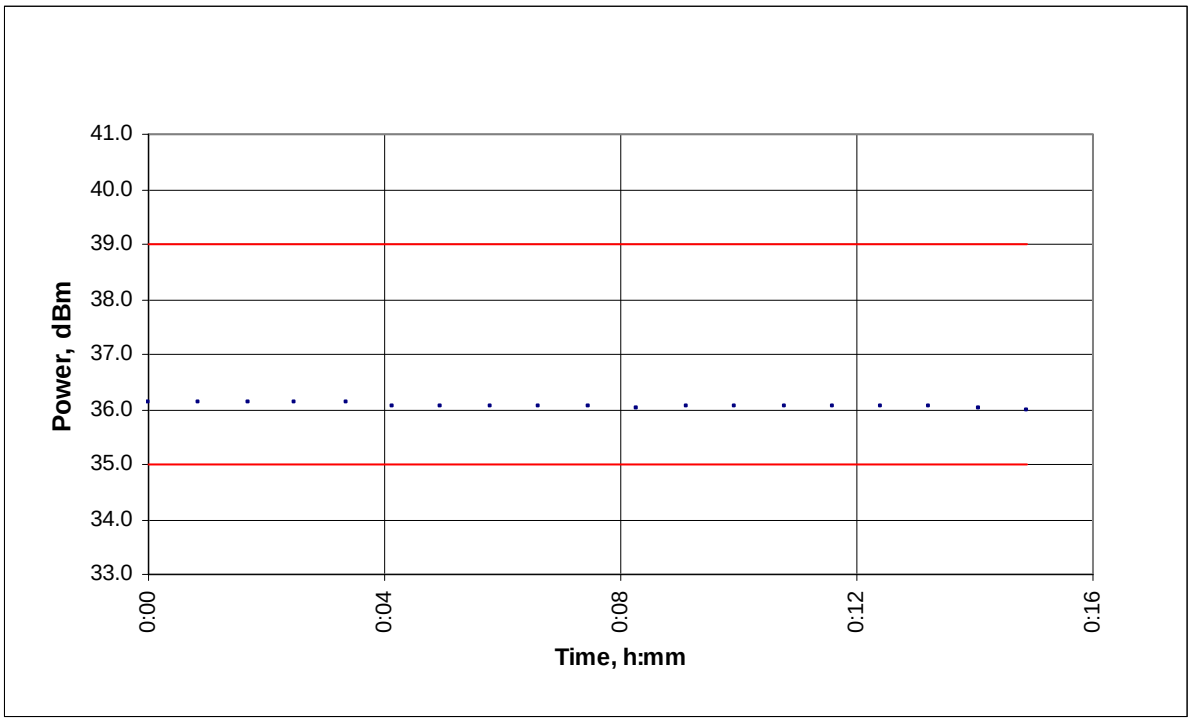
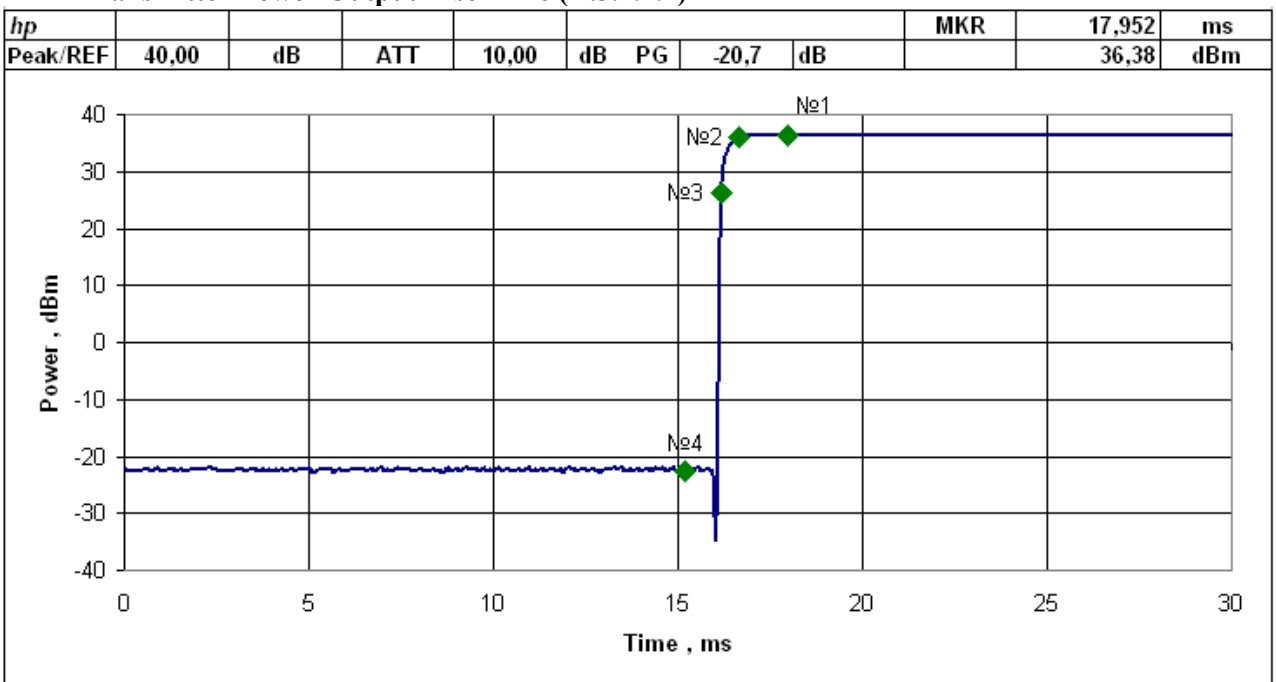


Figure 1.3. 1– Transmitter power during test

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



RES BW	10000	Hz	VBV	30000	Hz	SWP	30	ms
Marker	Trace	Type	Freq/Time			Amplitude		
№1	<A>	Type	17,952		ms	36,38		dBm
№2	<A>	Type	16,667		ms	35,93		dBm
№3	<A>	Type	16,190		ms	26,38		dBm
№4	<A>	Type	15,190		ms	-22,57		dBm

Figure 1.3. 2 – Transmitter power output rise

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

Bursts received	19
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

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	49.61
Minimum repetition period ,s	47.5	48.0	47.51
Maximum repetition period ,s	52.0	52.5	52.21
Standard deviation	0.5	2.0	1.48
Differences of Rep. period, s	4		4.70

- **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 (operating) burst
1st measurement	50.03
2d measurement	50.19
3d measurement	50.08
Minimum value	**50.03**
Maximum value	**50.19**

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

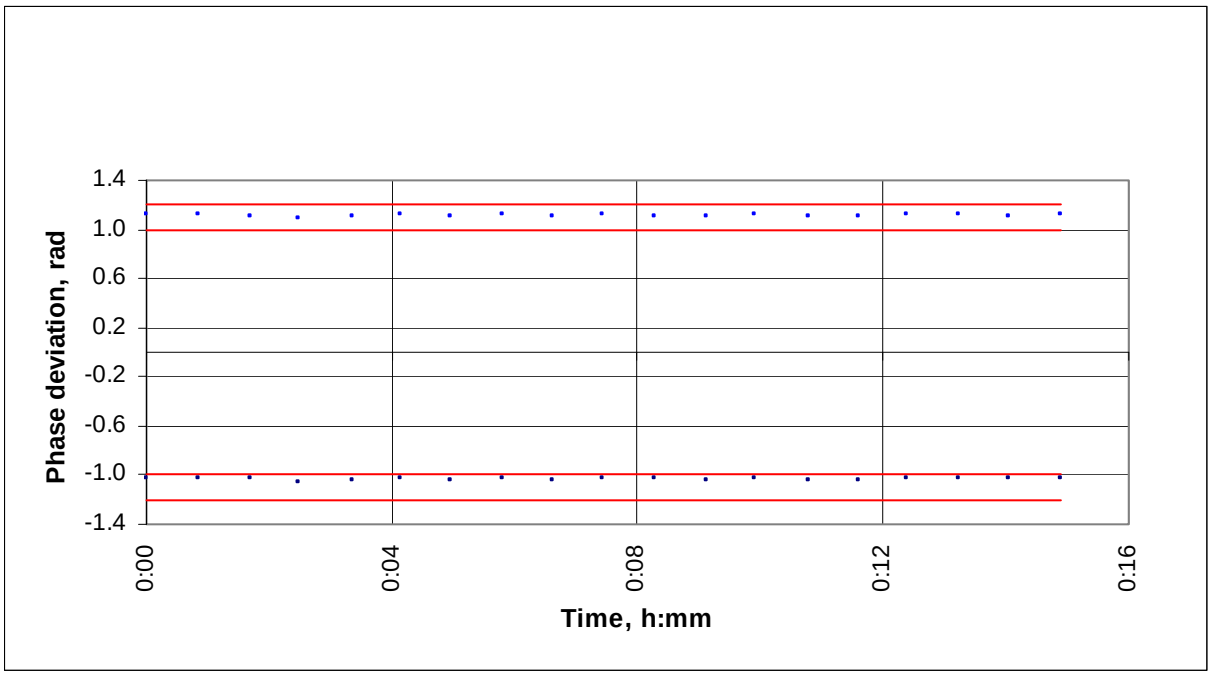
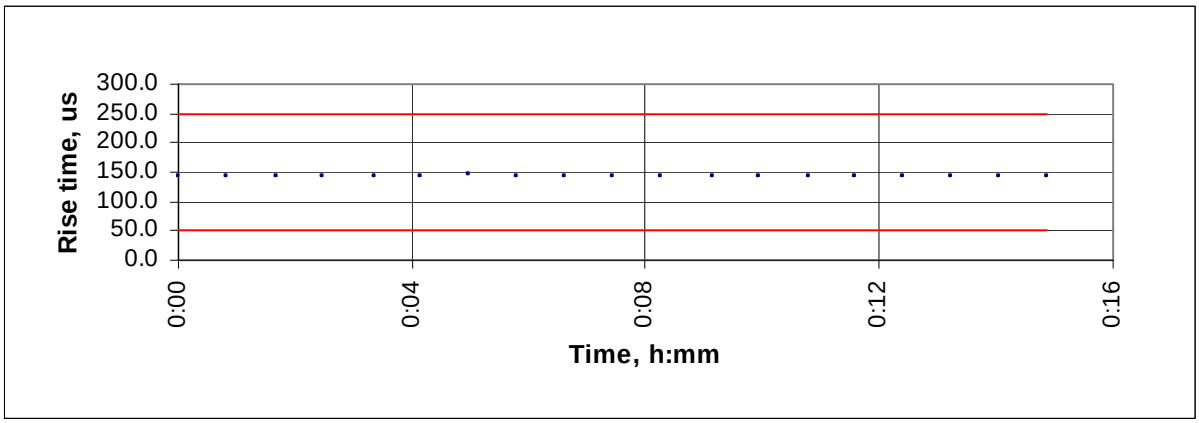


Figure 1.3. 3 – Modulation index



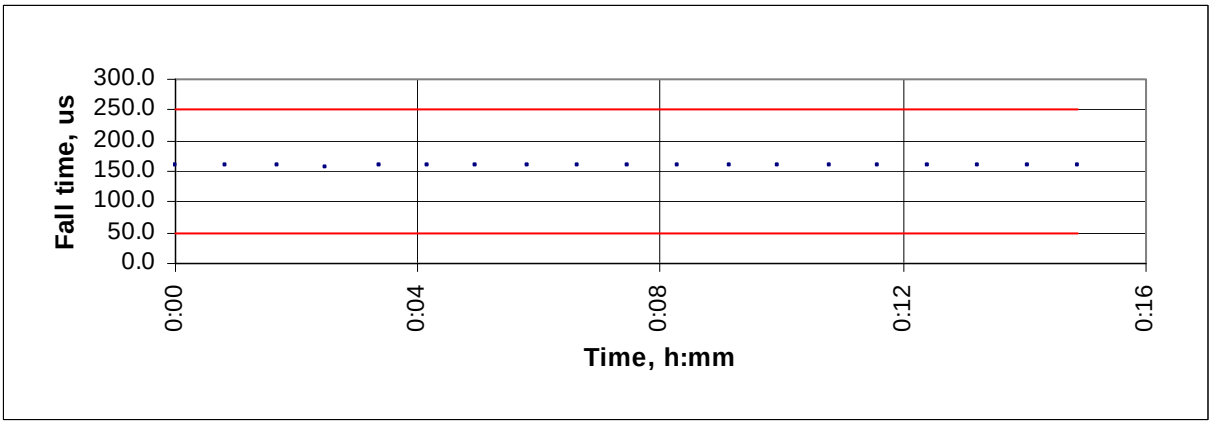


Figure 1.3. 4– Modulation rise and fall times

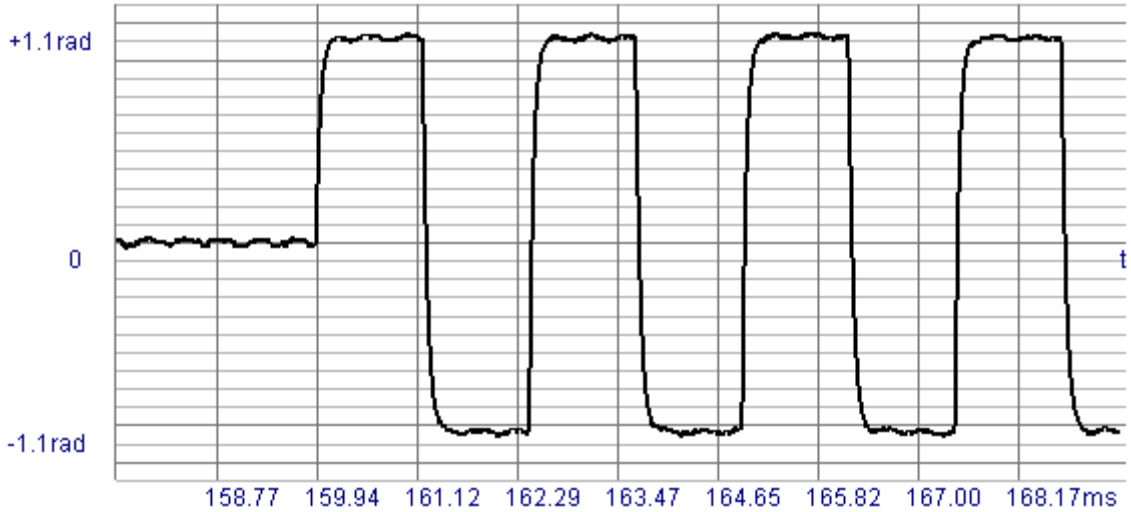


Figure 1.3. 5– Modulation symmetry of the bi-phase demodulated signal

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

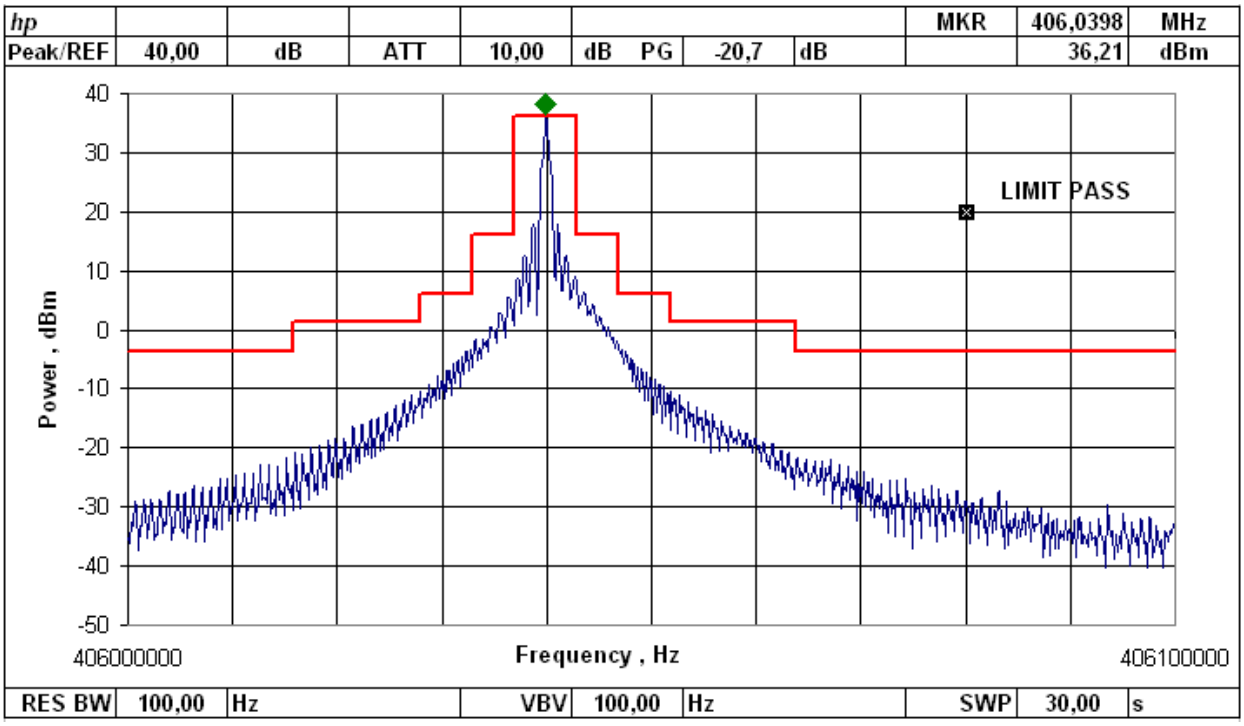


Figure 1.3. 6 – Spurious output.

f) 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 17 Ohm), during which time parameters were measured.

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 0:14:53	Bursts received 19	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039957	406.039957	406.039957
+Phase deviation, rad	1.00	1.20	1.10	1.12	1.12
-Phase deviation, rad	-1.00	-1.20	-1.04	-1.03	-1.02
Phase time rise, us	50.00	250.00	141.89	141.89	145.78
Phase time fall, us	50.00	250.00	157.07	158.66	160.37
Asymmetry, %	0.00	5.00	0.65	0.74	0.78

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499239	**Low Sweep Frequency, Hz**	345
Power, mW	5.4	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100		

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

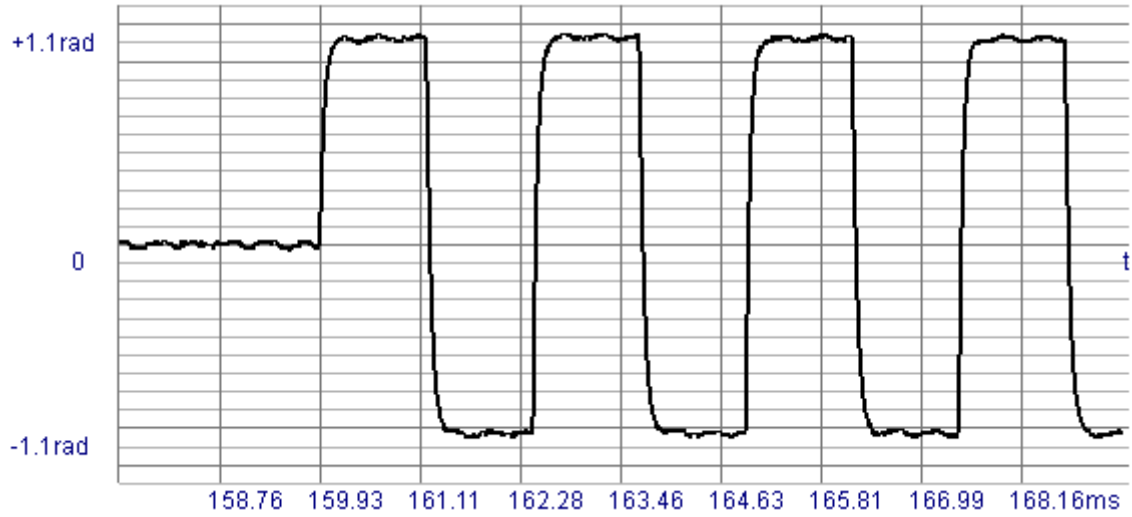


Figure 1.3. 7– Modulation symmetry of the bi-phase demodulated signal

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

Bursts received	19
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

g) 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)	:FFFED08C9E0000037FDFFC13353783E0F66C

Test duration 0 h 0 m	Bursts received 1	BCH error 0	Self-Test 1
406 MHz Transmitter Parameters	**Limits**		**Measured**
	min	**max**	**current**
Frequency, MHz	406.039	406.041	406.039973
Power, dBm	35	39	36.53
Total burst duration, ms	514.80	525.20	518.25
121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499219		
Power, mW	28.7		

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

Bursts received	1
BCH error	0
Self test message	1
Full HEX message	FFFED08C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	**BITS**	**VALUE**
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

ANNEX 2.

THERMAL SHOCK TEST

(Accordance to C/S T.007 – section A.2.2)

Model: rescueME PLB1
Serial number: TA1
Beacon SW: 00.06
Test Date: 20.12.2012

Test conditions:

- Ambient laboratory temperature: 21 °C;
- Relative air humidity: 75 %.
- Atmospheric pressure: 753 mm/Hg.
- Beacon environment temperature before thermal shock: 55 °C;
- Time of beacon exposure at environment temperature before thermal shock: 2 hours;
- Beacon mode during exposure before thermal shock: turned off;
- Beacon environment temperature during thermal shock test: 25 °C;
- Difference in environment temperatures before and during thermal shock: 30 °C;
- Beacon mode when it was exposed to thermal shock 25 °C: turned on at once after the beacon environment changed;
- Time interval after beacon was turned on till the start time of measurement: 15 minutes;
- Duration of beacon test after beginning of parameter measuring: 2 hours;
- matching network was not used.
- mode of beacon operating: 406 and 121.5 MHz
- GNSS signal not available during test;

Test procedure:

The beacon under test, while turned off, is to stabilize at a selected temperature in its operating range. The beacon is then simultaneously placed into an environment held at 30 degrees C offset from the initial temperature and turned on. The beacon is then allowed to operate for 15 minutes before measurements are started

List of test parameters

Measured parameters	page No.
Transmission frequency 406 MHz	
Nominal frequency value	66
Short and average frequency stability	66
Maximum and minimum frequency stability values during test	65
Transmitter power output	
Diagram of power output values during test	67
Maximum and minimum power output values during test	65
Message	
Message contents	68

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 1:59:54	Bursts received 147		BCH error 0	Self-Test 0	
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039948	406.039948	406.039948
Power, dBm	35	39	35.87	36.17	36.19
Slope	-2.00E-09	2.00E-09	-1.31E-10	-1.27E-10	1.11E-10
Residual variations	0.00E-09	3.00E-09	6.30E-11	3.16E-10	3.26E-10
Short term variations	0.00E-09	2.00E-09	4.41E-11	7.01E-11	1.25E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499179	**Low Sweep Frequency, Hz**	345
Power, mW	54.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100		

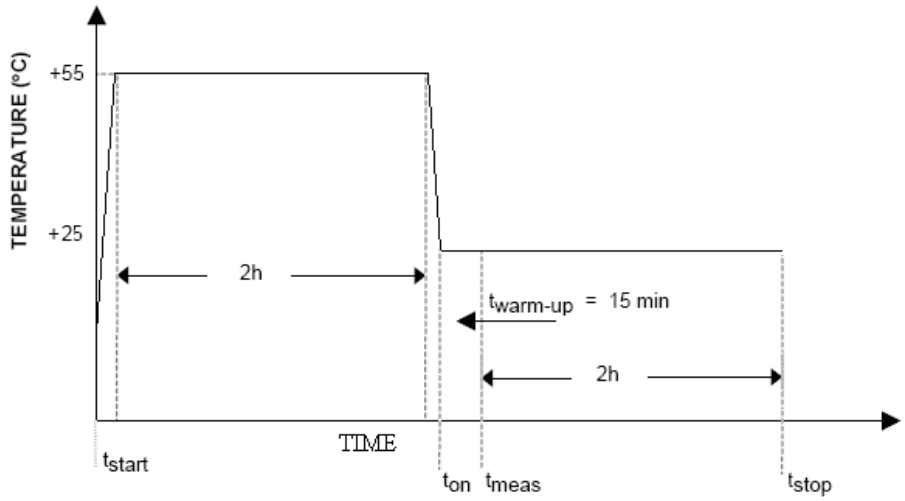


Figure 2. 1 - Temperature Test Profile

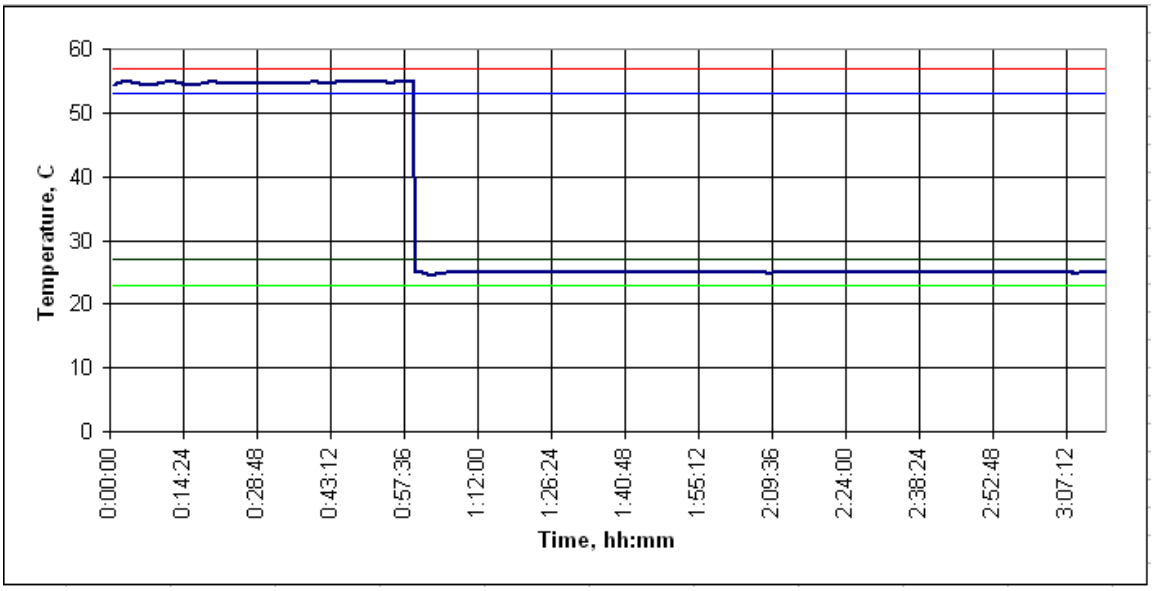


Figure 2. 2 - Temperature During The Test

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

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

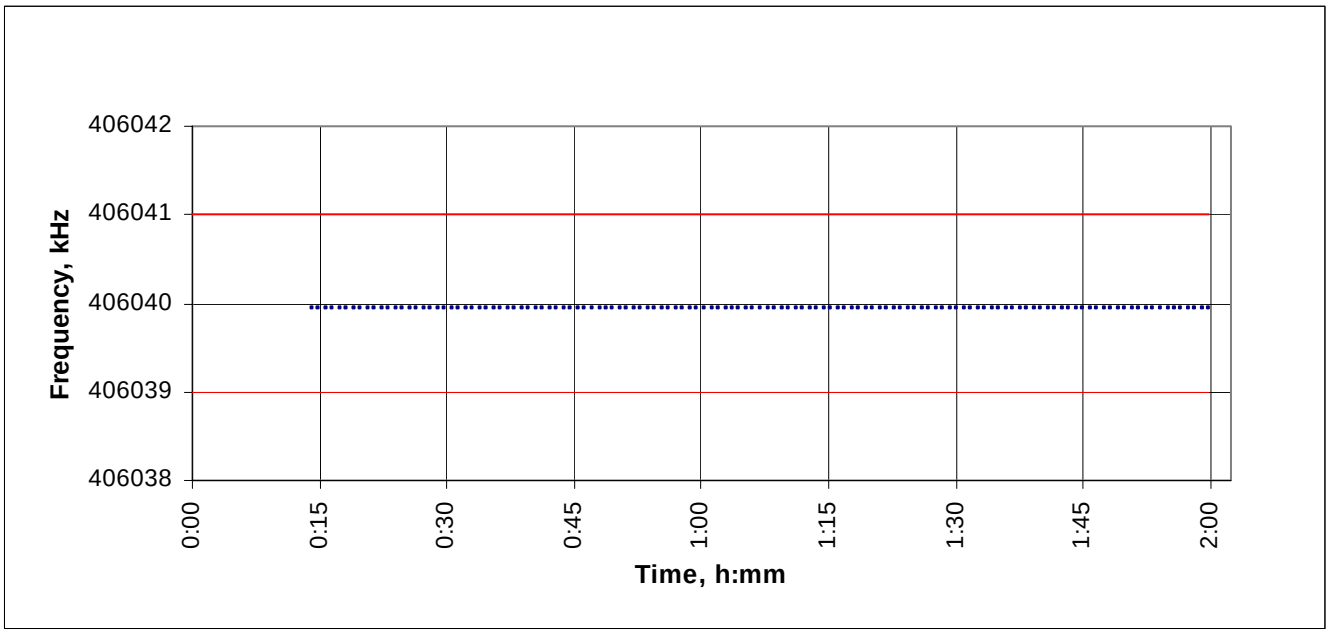


Figure 2. 3 – Nominal Value of frequency

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

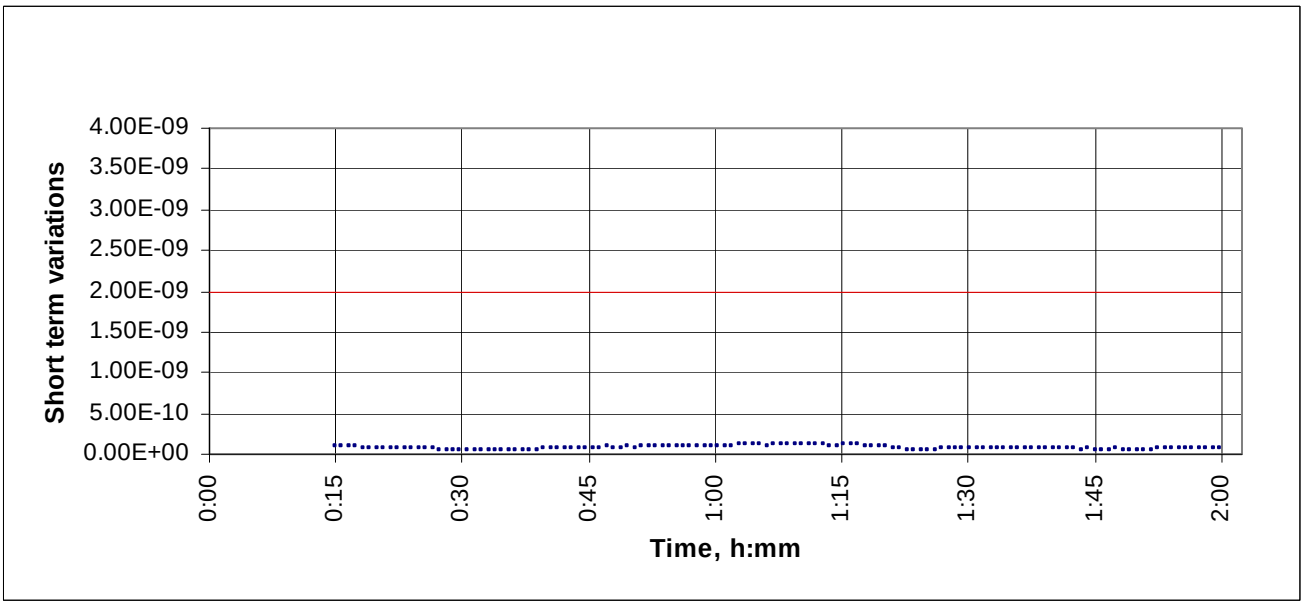


Figure 2. 4 – Short-Term Stability

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

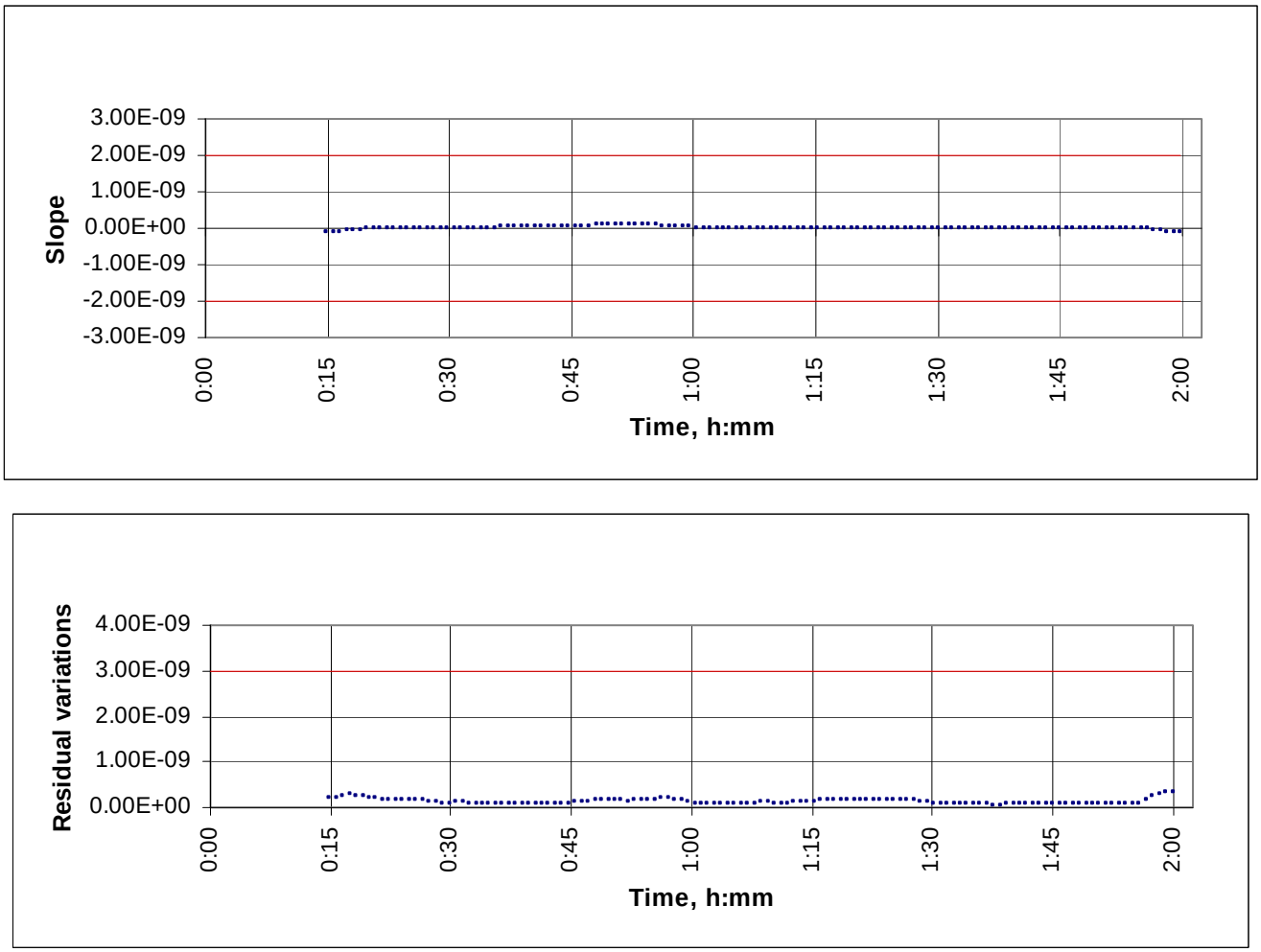


Figure 2. 5 – Medium-Term Stability

b) Transmitter Power Output (according to C/S T.007 – section A.3.2.2.1).

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

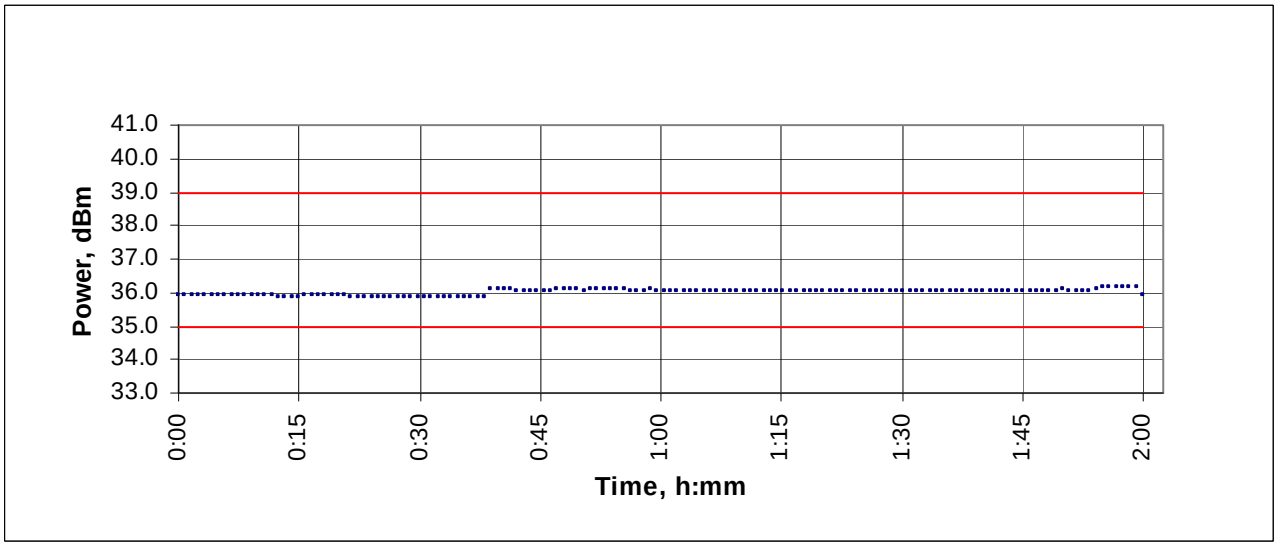


Figure 2. 6 – Transmitter power during test

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

Bursts received	147
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

ANNEX 3.

FREQUENCY STABILITY TEST WITH TEMPERATURE GRADIENT

(According to C/S T.007 – section A.2.4)

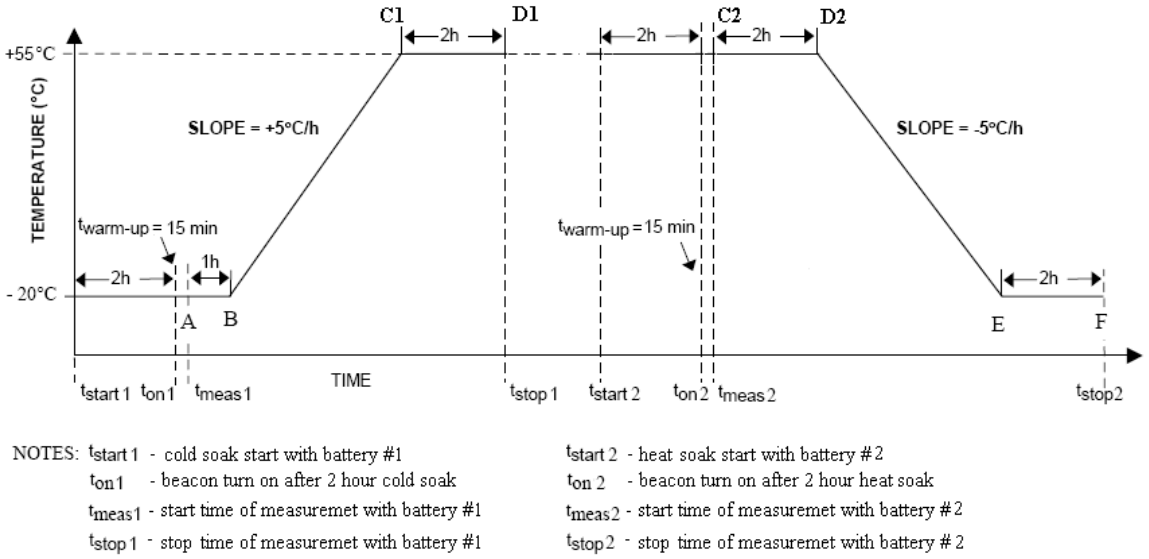
Model: rescueME PLB1
Serial number: TA1
Beacon SW: 00.06
Test Date: 20.12.2012 - 22.12.2012

Testing conditions:

- Ambient laboratory temperature: 21..23 °C;
- Relative air humidity: 72..74 %.
- Atmospheric pressure: 752..755 mm/Hg.
- Minimum declared operating temperature of the beacon (Tmin): -20 °C;
- Exposure time of the turned-off beacon at the temperature (Tmin): 2 hours;
- Exposure time of the turned-on beacon at the temperature (Tmin) prior to measurements: 15 minutes;
- Parameters measurement duration of turned-on beacon at the temperature (Tmin) : 1 hour;
- Temperature gradient from -20ºC to 55 ºC: 5 °C/hour;
- Duration of temperature gradient from -20 ºC to 55 ºC: 15 hours;
- Maximum declared operating temperature of the beacon (Tmax): 55 °C;
- Exposure time of the turned-on beacon at the temperature (Tmax=55 °C): 2 hours;
- Temperature gradient from 55 ºC to -20ºC: - 5 °C/hour;
- The battery was replaced during temperature gradient test and the whole test cycle was divided for the up-ramp and down-ramp parts as it is allowed in A.2.4 of C/S T.007.
- Exposure time of the turned-off beacon at the temperature (Tmax): 2 hours;
- Exposure time of the turned-on beacon at the temperature (Tmax) prior to measurements: 15 minutes;
- Parameters measurement duration of turned-on beacon at the temperature (Tmax): 2 hour;
- Duration of temperature gradient from 55 ºC to -20ºC: 15 hours;
- Exposure time of the turned-on beacon at the temperature (Tmin= -20ºC): 2 hours.
- matching network was not used.
- mode of beacon operating: 406 and 121.5 MHz
- GNSS signal not available during test;

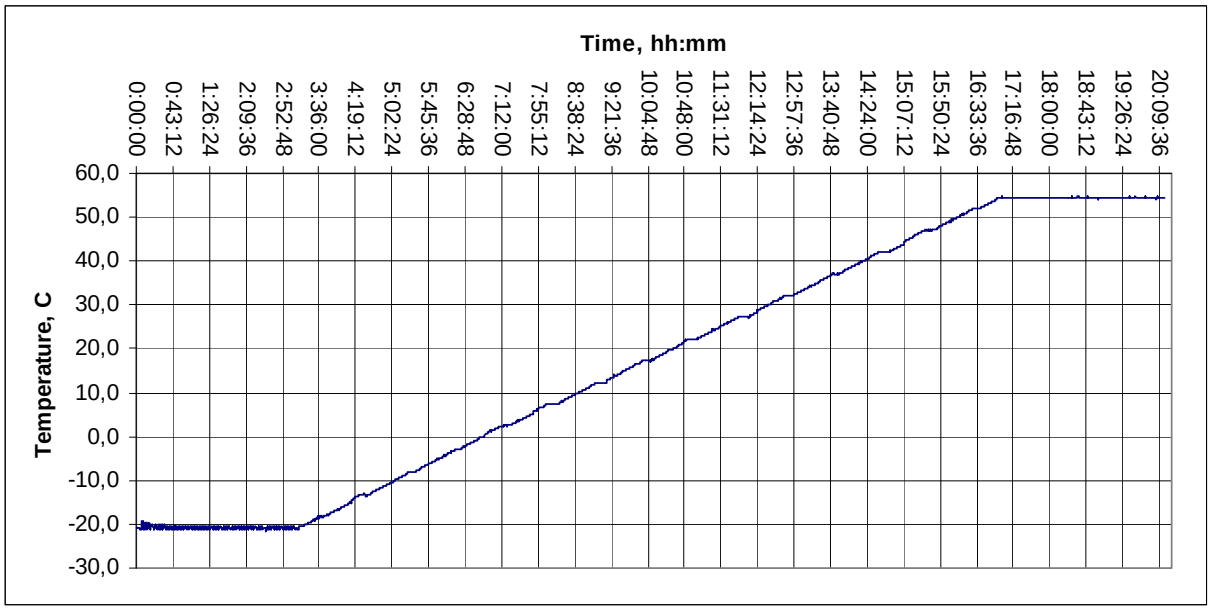
List of test parameters

Measured parameters	page No.	page No.
	Up ramp	Down ramp
Transmission frequency 406 MHz		
Nominal frequency value	72	76
Short and average frequency stability	73	77
Maximum and minimum frequency stability values during test	72	76
Transmitter power output		
Diagram of power output values during test	74	77
Maximum and minimum power output values during test	72	76
Message		
Message contents	75	79



NOTES: $t_{start\,1}$ - cold soak start with battery #1
$t_{on\,1}$ - beacon turn on after 2 hour cold soak
t_{meas1} - start time of measuremet with battery #1
$t_{stop\,1}$ - stop time of measuremet with battery #1
$t_{start\,2}$ - heat soak start with battery # 2
$t_{on\,2}$ - beacon turn on after 2 hour heat soak
t_{meas2} - start time of measuremet with battery # 2
$t_{stop\,2}$ - stop time of measuremet with battery # 2

Figure 3. 1 – Temperature Gradient Test Profile



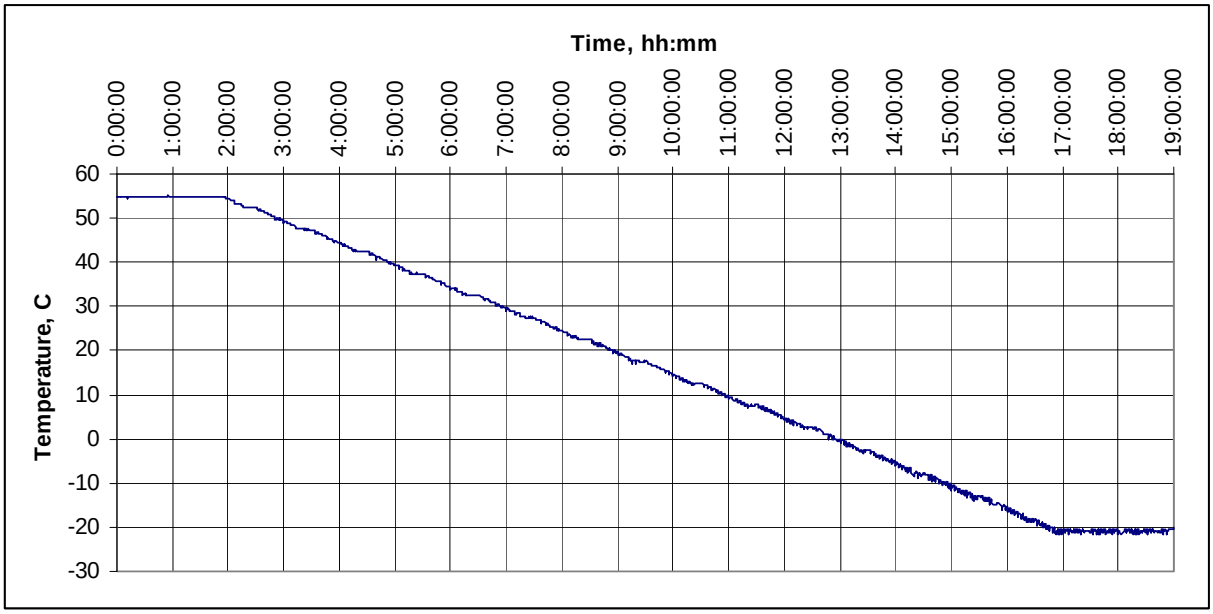


Figure 3. 2 – Temperature During The Test

Gradient up ramp

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 18:00:44	Bursts received 1308	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039942	406.039957	406.039959
Power, dBm	35	39	35.59	35.60	36.38
slope (A to B and C+15 to D)	-1.00E-09	1.00E-09	-1.17E-10	6.57E-11	1.14E-10
slope (B to C+15 and D to E+15)	-2.00E-09	2.00E-09	-3.77E-10		2.05E-10
Residual variations	0.00E+00	3.00E-09	4.39E-11	1.14E-10	6.11E-10
Short term variations	0.00E+00	2.00E-09	3.75E-11	9.91E-11	2.60E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121498713	**Low Sweep Frequency, Hz**	345
Power, mW	70.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100		

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

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

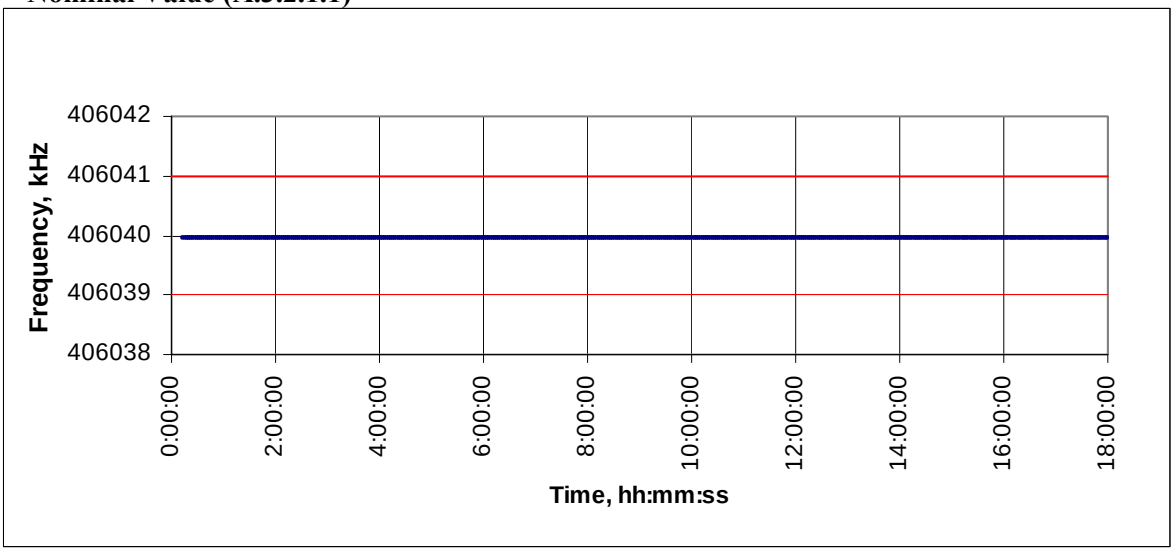


Figure 3. 3 – Nominal Value of frequency

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

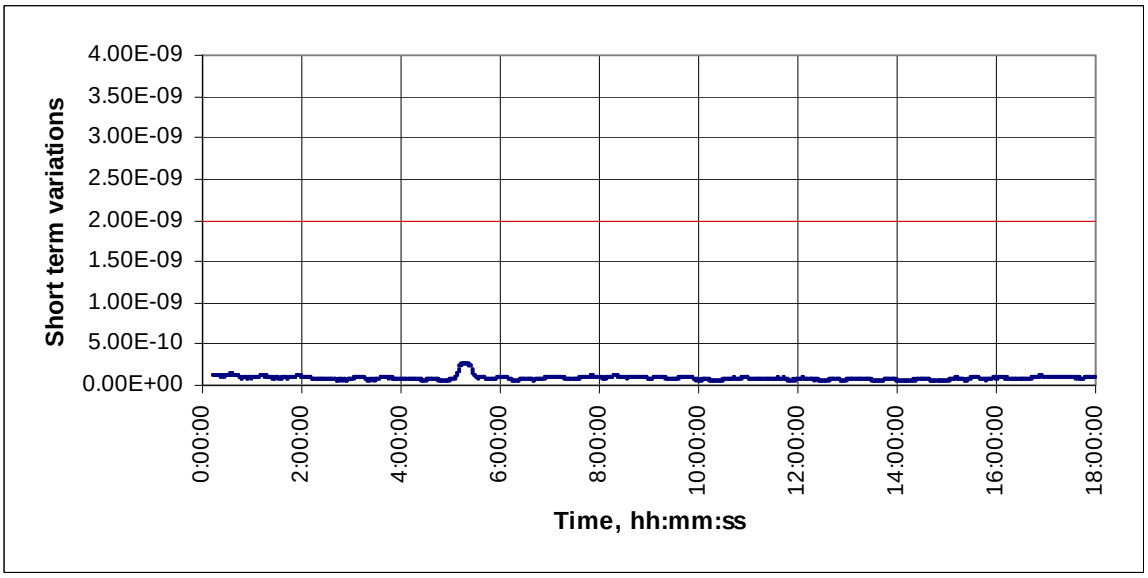
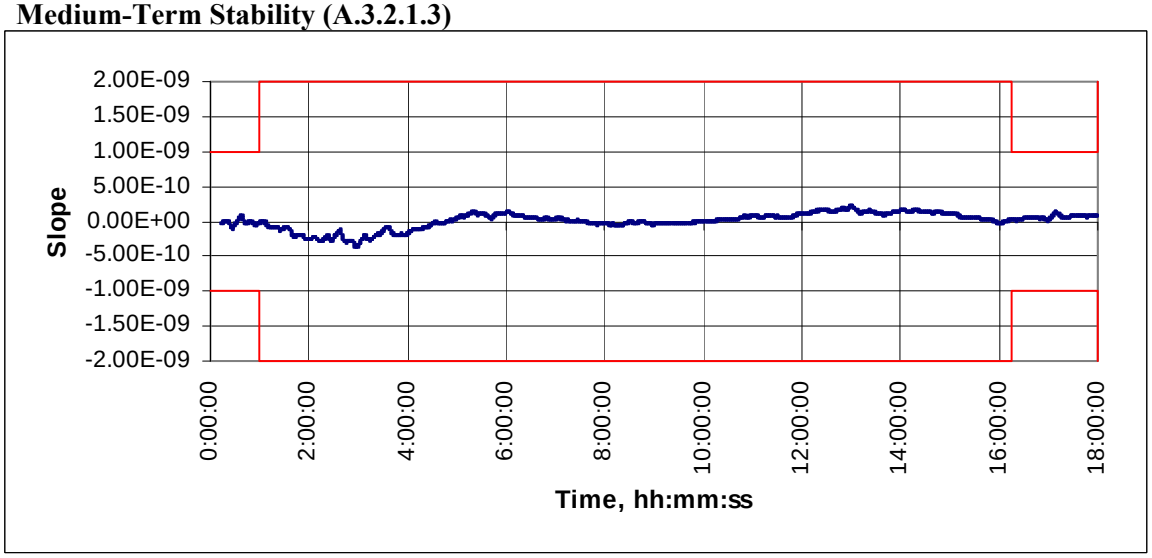


Figure 3. 4 – Short-Term Stability

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



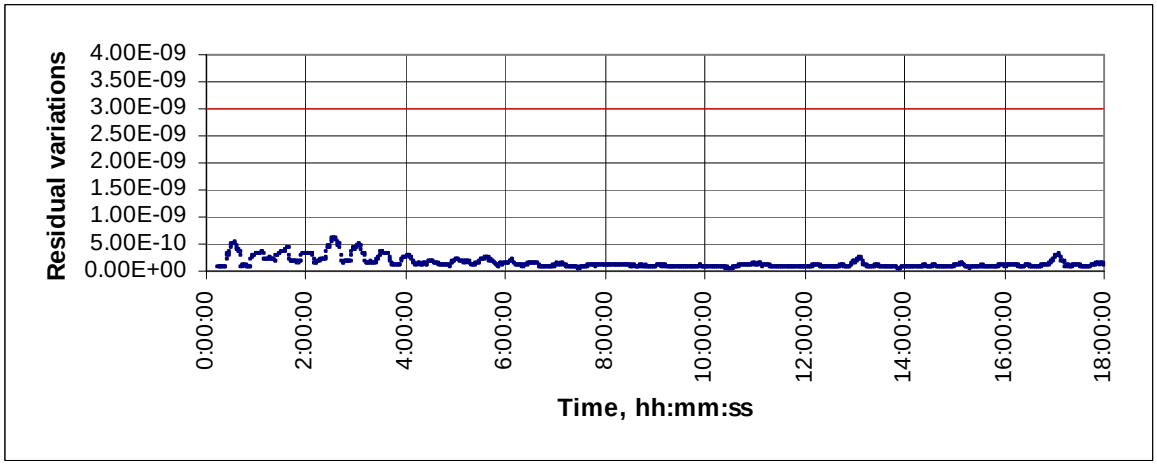


Figure 3. 5 – Medium-Term Stability

b) Transmitter Power Output (according to C/S T.007 – section A.3.2.2.1).

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

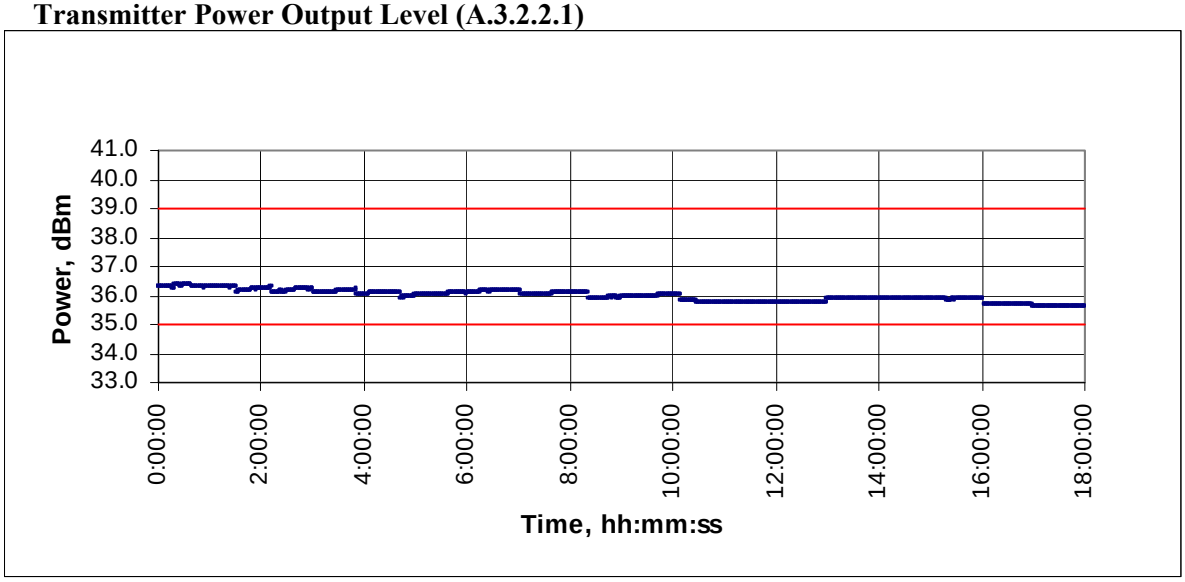


Figure 3. 6 – Transmitter power during test

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

Bursts received	1308
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	100000100110011010100
BCH 1 Calculated:	N/A	100000100110011010100
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	193C000006FFBFF

Gradient down ramp

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 19:03:35	Bursts received 1384	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039947	406.039962	406.039963
Power, dBm	35	39	35.72	36.62	36.62
slope (C+15 to D and E+15 to F)	-1.00E-09	1.00E-09	-6.34E-11	-1.03E-11	1.06E-10
slope (D to E+15)	-2.00E-09	2.00E-09	-2.15E-10		3.01E-10
Residual variations	0.00E+00	3.00E-09	4.72E-11	2.09E-10	6.08E-10
Short term variations	0.00E+00	2.00E-09	3.19E-11	1.07E-10	2.25E-10

121.5 MHz Transmitter Parameters			
Carrier Frequency, Hz	121499240	**Low Sweep Frequency, Hz**	345
Power, mW	29.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100		

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

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

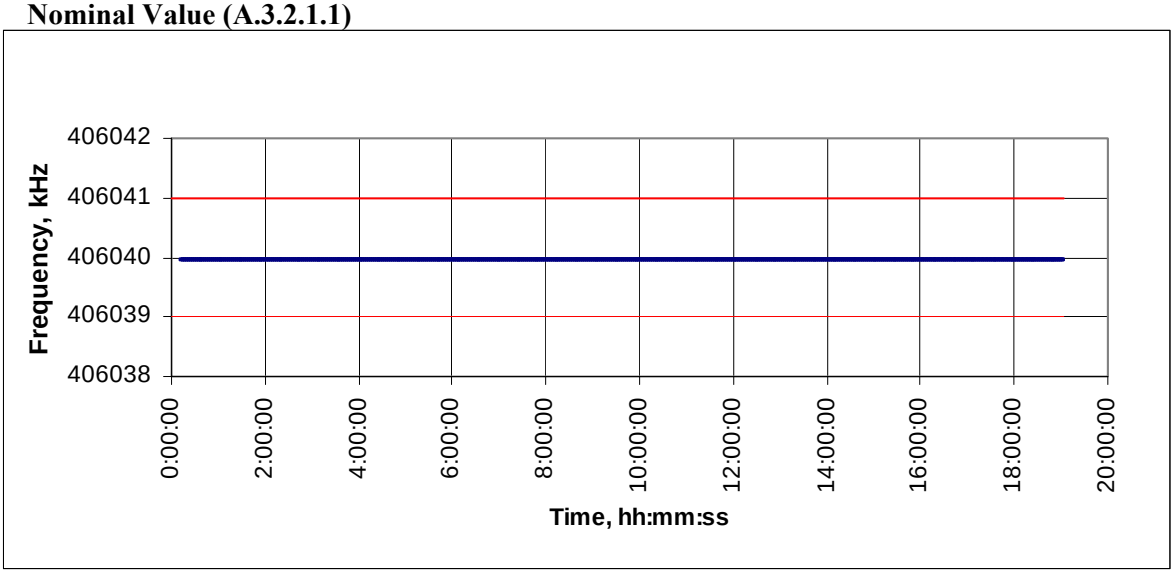


Figure 3. 7 – Nominal Value of frequency

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

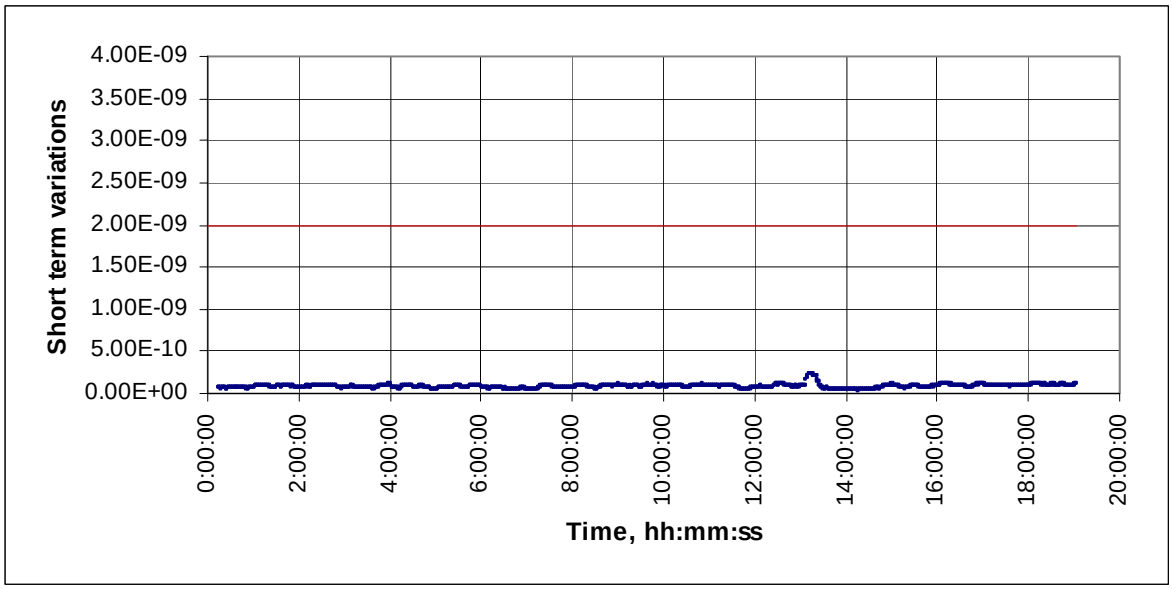
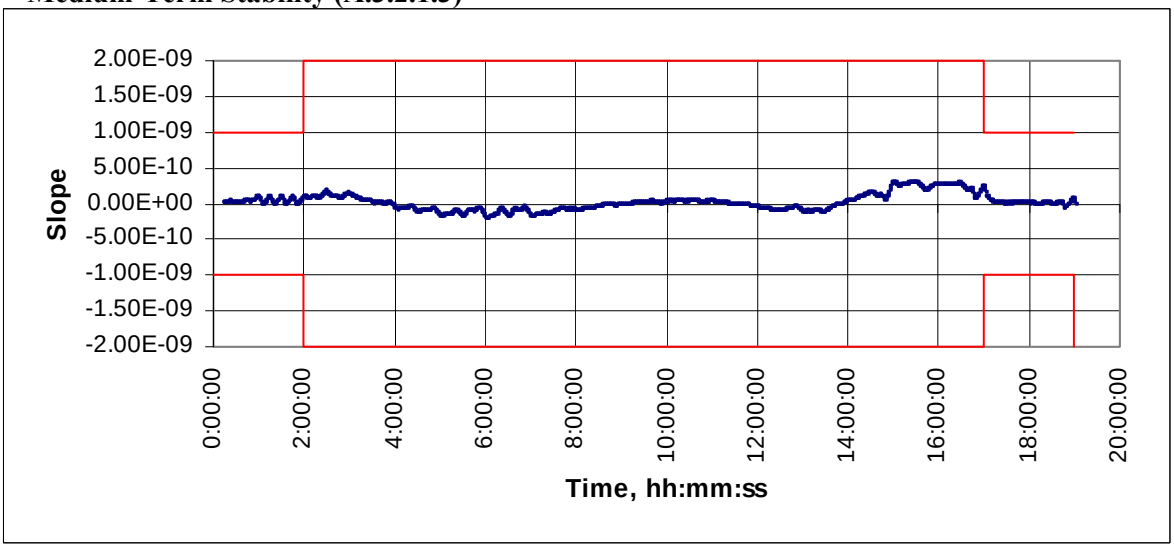


Figure 3. 8 – Short-Term Stability

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



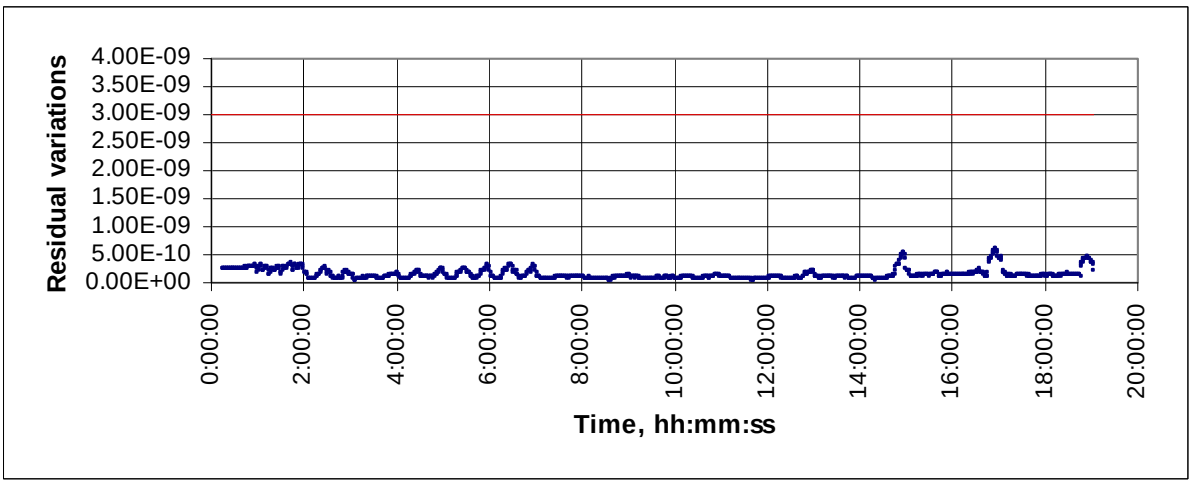


Figure 3. 9 – Medium-Term Stability

e) Transmitter Power Output (according to C/S T.007 – section A.3.2.2.1).

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

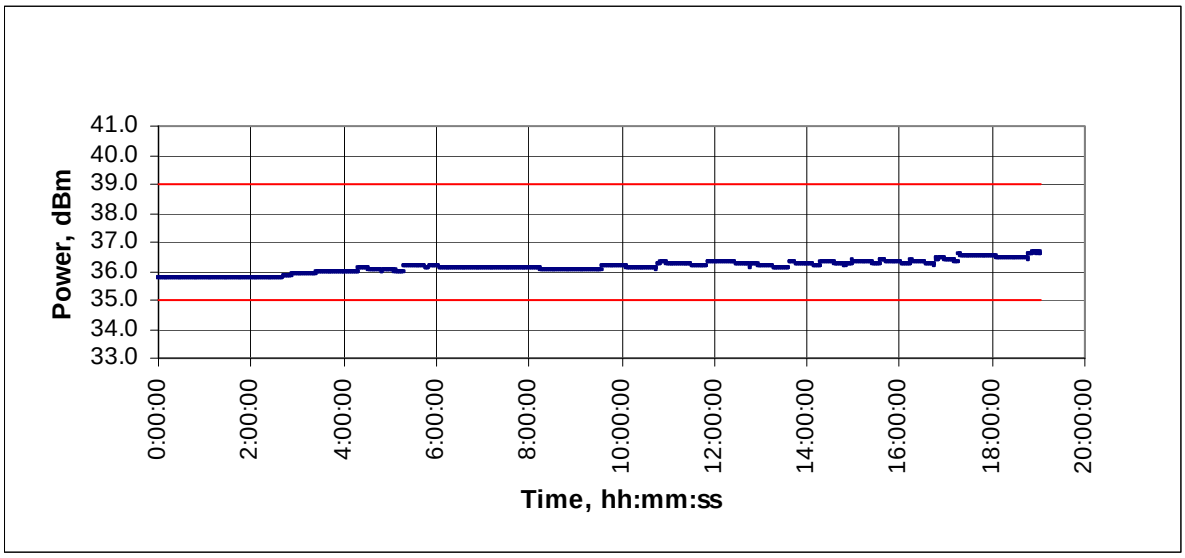


Figure 3. 10 – Transmitter power during test

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

Bursts received	1384
BCH error	0
Self test message	0
Full HEX message	FFFE2F8C9E0000037FDFFC13353783E0F66C

Decoding Beacon Message

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

ANNEX 4.

OPERATING LIFETIME AT MINIMUM TEMPERATURE

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

Model: rescueME PLB1
Serial number: TA1
Beacon SW: 00.06
Test Date: 24.12.2012 - 25.12.2012

Test Conditions:

- Beacon was placed in climatic chamber in turn off mode;
- Exposure time of the turned-off beacon at the minimal temperature: 2 hours;
- Beacon manually turned on;
- Parameters defined immediately after activation of beacon except for Medium Term Frequency Stability (mean slope of the frequency and by the residual frequency variation about the mean slope), which computed after warm up time (15 minutes) according to T.001 section 2.3.1;
- The total duration of lifetime test was 33 hours 00 minutes then beacon was switched OFF;

Current measurement

Beacon manufacturer provided operating currents and pre-test battery discharge calculations (see p.12 vol.2).

Operational currents were verified by the testing laboratory with measurement results reported in Table F-E.1 below.

During operating current measurement in modes No. 1, 2, 4, 5 GNSS signal was not available
During operating current measurement in modes No. 3 GNSS signal was available

Measured values do not exceed values provided by manufacturer.

Table F-E.1: Beacon Operating Current

No.	Beacon Operating Modes	Mode: Manually selectable or Automatic	Measurement interval, sec	Average Current, mA	Peak Current, mA
1	Self test mode	Manually to selftest on, auto off	9.35	68.27	1135.29
2	**Operating mode with GPS receiver in search mode (406 MHz+Homer+GPS on+Strobe light)**	**Automatic**	**50**	**38.72**	**1194.12**
3	Operating mode with GPS fix obtained (406 MHz+Homer+GPS off+Strobe light)	Automatic	50	28.94	1170.59
4	GNSS selftest mode	Manually to GNSS selftest on	315.3	16.36	85.29
5	Standby mode	Automatic	600	0.00001	

Conclusions: The beacon mode: **406 MHz+Homer+GPS on+Strobe light** is mode at which beacon has the highest current consumption.

Table F-E.2: Pre-test Battery Discharge Calculations as provided by manufacturer and verified by Omega

Characteristic	Designation	Units	Value	Comments
Declared beacon battery replacement period (from date of installation in the beacon to expiry date marked on the beacon)	T_{BR} or TBR	Years	**8**	
Beacon manufacturers declared maximum allowed cell shelf-life (from date of cell manufacture to date of battery pack installation in the beacon)	T_{CS} or TCS	Years	**2**	
Battery pack electrical configuration	3 123 cells in series			
Cell model and cell chemistry	Energizer 123 Photo MNO2			
Nominal cell capacity		A-hrs	1.5	
Nominal battery pack capacity	C_{BN}	A-hrs	1.5	
Annual battery cell capacity loss (self-discharge) due to aging, as specified by cell manufacturer at ambient temperature	L_{SDC}	%	1.0	
Calculated battery pack capacity loss due to self-discharge: $L_{CBN} = C_{BN} - [C_{BN} * (1 - L_{SDC}/100)^{TBR+TCS}]$	L_{CBN}	A-hrs	**0.143**	
Number of self-tests per year	N_{ST}		12	
Average battery current during a self-test	I_{ST}	mA	68.27*	
Maximum duration of a self-test	T_{ST}	sec	9.35	
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	**17.458**	
Maximum Number of GNSS self-tests between battery replacements	N_{GST}		10	
Average battery current during a GNSS self-test of maximum duration	I_{GST}	mA	16.36*	
Maximum duration of a GNSS self-test	T_{GST}	sec	315.30	
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	**14.76**	
Average stand-by battery pack current	I_{SB}	mA	1.00E-05	
Other Capacity Losses	L_{OTH}	mA-hrs	**5.0**	To simulate worst case of GPS receiver consumption when GNSS signal is available after 12 hrs of Operation lifetime test
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	0.70	
Calculated value of the battery pack pre-test discharge $L_{CDC} = L_{CBN} + 1.65*(L_{ST} + L_{GST} + L_{ISB})/1000 + L_{OTH}/1000$	**L_{CDC}**	A-hrs	0.201	

* The current values for self-test and GNSS self-test used in Table F-E.2 were measured by Omega and presented in Table F-E.1. Calculated value of the battery pack pre-test discharge doesn't exceed the value 0.203A-hrs in Table F-E.2 submitted by manufacturer (see p.12 vol.2).

According to manufacturer's description (see Volume 2, page 18) of the operating mode that draws the maximum battery energy other capacity losses equal 5.0 mA-hrs were added in Table F.E-2 since the internal GPS receiver timings are different between GPS signal present and absent.

The additional current could be drawn if the GPS signal were made available after 12 hours. During operational life testing in this instance however the PLB1 would likely gain a fix within a time less than 40 seconds and switch off the GNSS receiver. For this reason it is not possible to accurately test this mode during the operational life test for PLB1. Under these conditions additional current which should be taken into account for the potential worst case was calculated as shown below.

With the operational life test carried out without GPS signal the additional worst case GPS on time for 24 hours would be increased over the no GPS time by an additional 20 minutes. The additional current drawn with GPS on against no GPS is given as 38.8mA – 29mA = 9.8mA. This additional current at worst case equates to an extension on the operational life of 3.3 mA-hrs or 6.75 minutes operation, which is insignificant. An additional 5.0 mA-hrs were added to the Battery pre-discharge calculation to account for the additional current.

According to manufacturer's description (see Volume 2, page 18) of the operating mode that draws the maximum battery energy extending of the operational time was applied to account for the electronic witness of beacon activation.

Extending the operational time by an hour to account for the electronic witness will add an extension to the beginning of the operation so an additional first hour must be added to the operation to account for this and still meet the 24 hours minimum operation. This additional operational time would normally be with GPS on for 30 minutes in the first hour. However it would be possible for a user to only turn on the PLB1 for 5 minutes 12 times thus having the GNSS receiver on for the full additional electronic witness first hour. Again this is an extension on top of the additional hour for the electronic witness an additional 9.8mAh or 20.3 minutes operation.
In total the additional operational time required to allow for the electronic witness and the potential worst case in GPS on time is 1 hour 20.3 minutes. The PLB1 must operate for at least 25 hours 20.3 minutes after the pre discharge of the battery to meet the operational requirements.

Since 1 hour 20.3 minutes was added to the operation of the PLB if we assume worst case and have GPS on after 12 hours then we would have an additional 5 minutes of GNSS receiver on time worst case for this additional period. This would equate to an additional 0.817mAh capacity from the battery. This will require an additional 1.7 minutes extension on the operational life of the unit.

Thus to account for all worst case possibilities a 1 hour 22 minutes should be added to the 24 hours operation requirements to ensure the unit will meet the requirement.

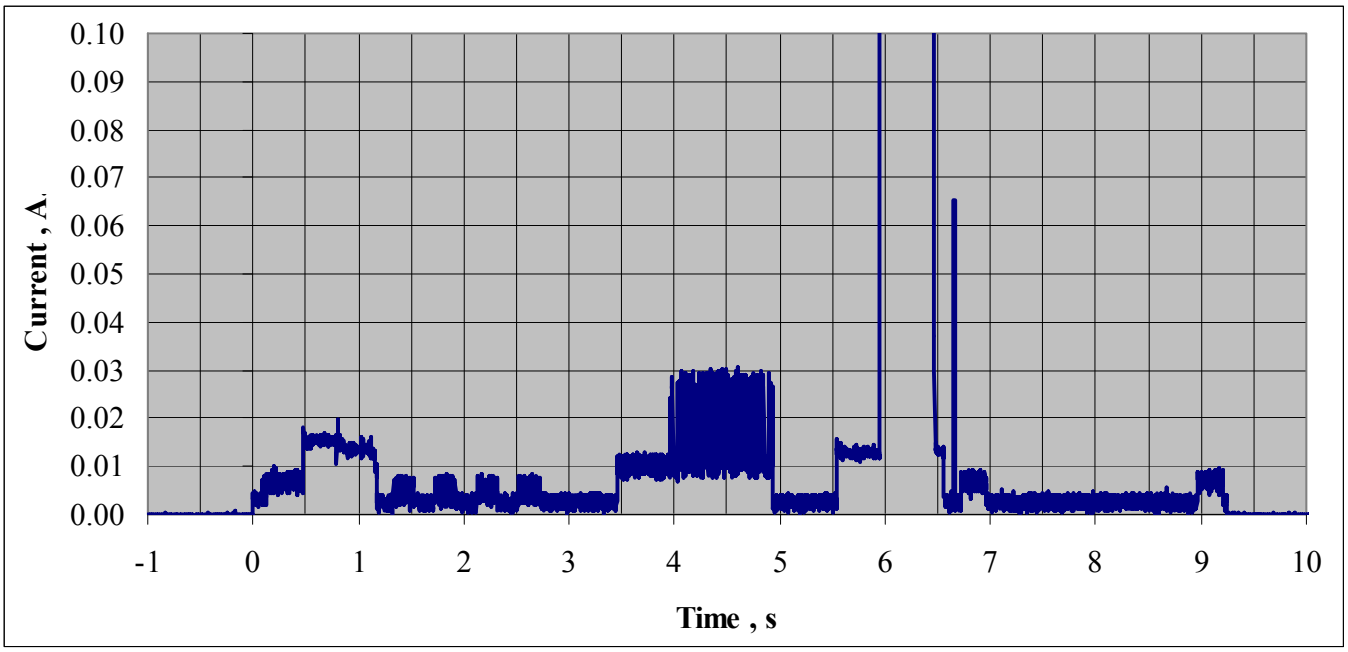


Figure 4. 1 - Current during self-test

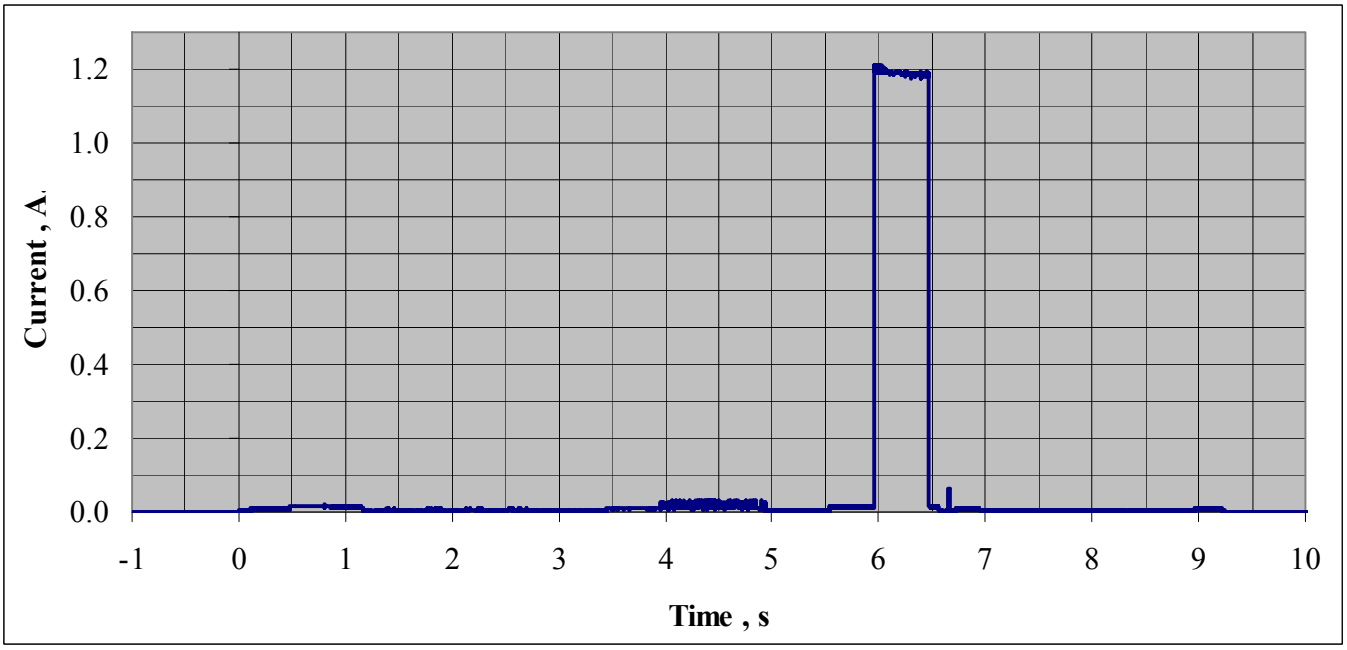


Figure 4. 2 - Demonstrate maximum current during the 406 burst

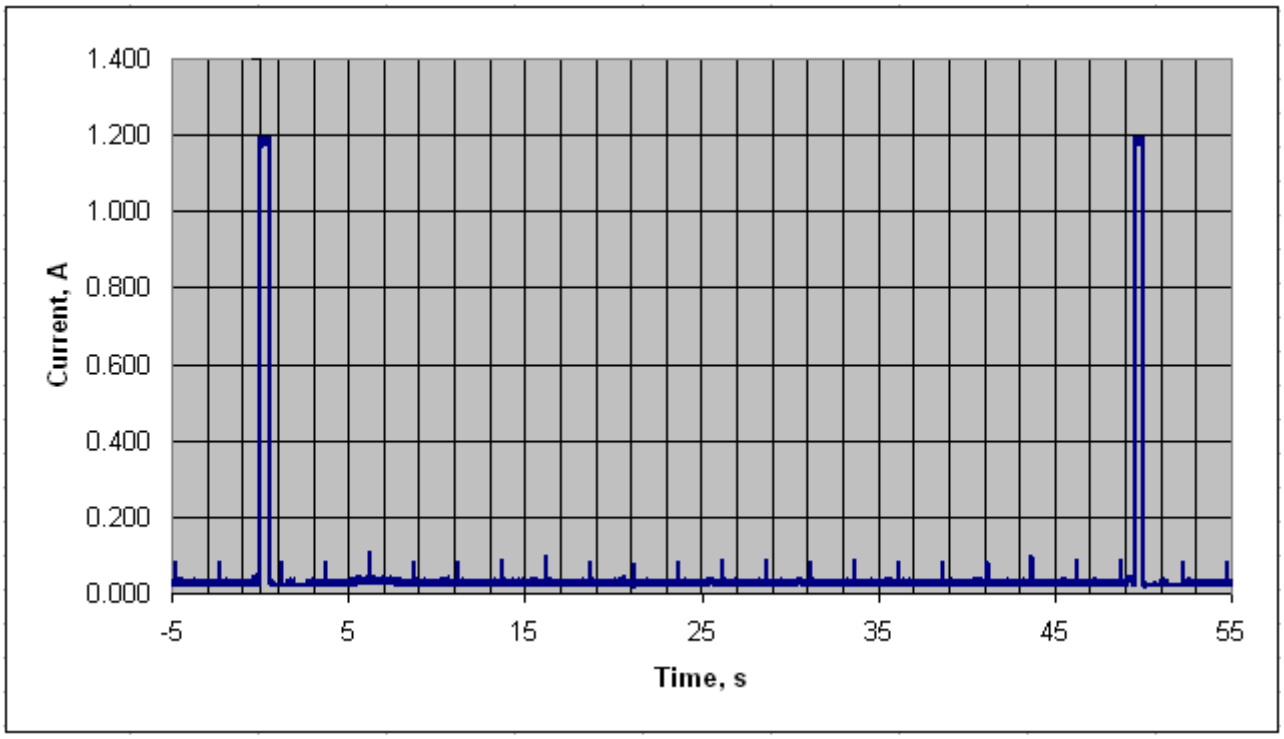


Figure 4.3 - Current during operating mode (GPS on)

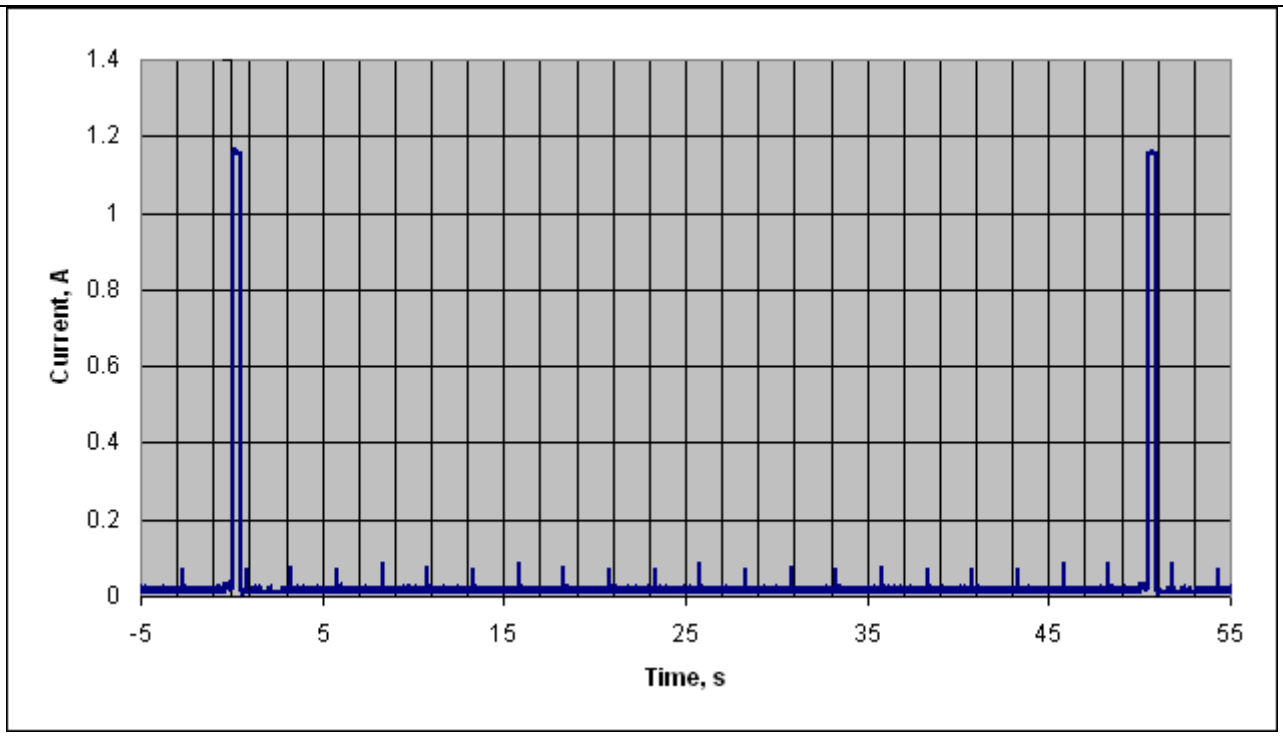


Figure 4.4 - Current during operating mode (GPS off)

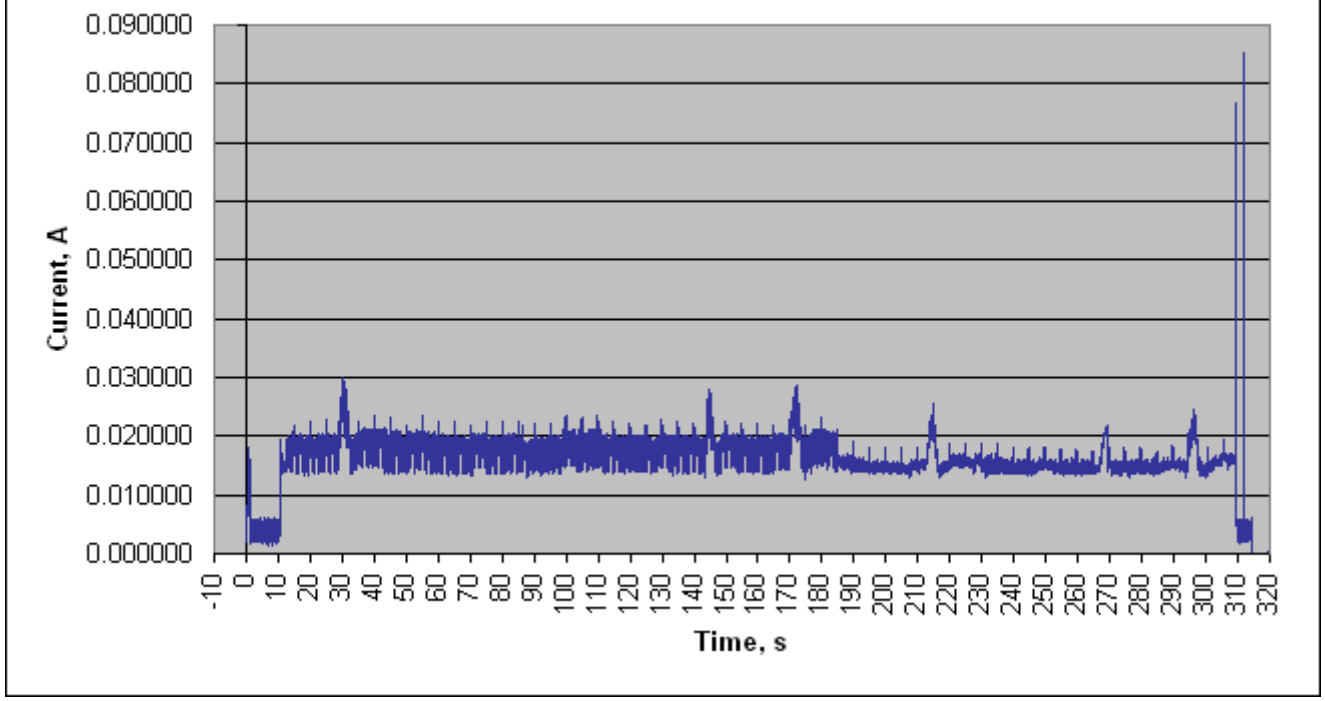


Figure 4.5 - Current during GNSS selftest

Current consumption was measured using circuit shown on Figure 4.4.

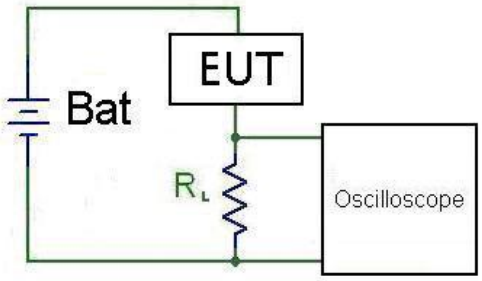


Figure 4.3 - The Circuit for Current Consumption Measurement

The value of the current calculated by equation: $I = \frac{U}{R}$, where ***I*** is a value of current (A), ***U*** is a value of voltage (V), ***R*** is a value of resistance (Ohm).
Voltage was measured by digital oscilloscope with load R=0.1.

Pre-discharge of battery

The discharge current is 50 mA.
The time of pre-discharge of the battery pack using manufacturer's pre-test discharge value is:
203.0 mAh / 50 mA = **4 hours 4 minutes**.

The battery was discharged for **4 hour 55 minutes** at the manufacturer's request.

Pre-discharge of battery was carried out before Lifetime test at room temperature on the fresh battery. Discharge was carried out on resistive load using battery analyzer UBA5 (Vencon Technologies Inc., Canada). The discharge current was 50 mA, as current similar to beacon operational current. Discharge current 50 mA was confirmed by

manufacturer. Duration of preliminary battery discharge with discharge current 50 mA was 4 hours 55 minutes.

Lifetime test at minimum temperature minus -20°C with preliminary discharged battery was carried out for 33 hours 00 minutes. During the Lifetime Test beacon have operated 406 MHz, Homer, GPS reciever with GPS timings as described in the Report Vol. 2 page 18, Strobe light.

Though during the test there was no direct visibility to GPS sattelites internal GPS receiver fixed location during the operational life test. The position obtained from GPS receiver corresponds to real position of the beacon.Thus GPS signal was available throughout the test and beacon operated in mode which did not draw the maximum energy from the battery as per the C/S T.007, A.2.3 that is deviation from the standard test procedure.

Therefore the additional current could not be drawn if the GPS signal was available since the beginning of the test.
As the worst case of internal GPS receiver current consumption is during the first 20 hours without GPS signal available the extending of the operational time was calculated to account additional current that could be drawn if the GPS signal is not available.

To account the GPS gaining a position during the operating lifetime a zero time to gain a lock during the test was assumed (worst case). With the operational life test carried out with GPS signal the additional worst case GPS on time for the first 24 hours would be increased over the no GPS time by an additional 105 minutes. This value was calculated using GPS timings provided in the table in the Report Vol. 2 page 18 and includes total GPS receiver on time without GPS signal available (worst case) during the first 20 hours: 30min + 20min + 30min + 15min + 10min.
The additional current drawn with GPS on against no GPS is given as 38.8mA – 29mA = 9.8mA. This additional current at worst case equates to an extension on the operational life of 17.15 mA-hrs or 35.5 minutes operation.

Thus to account for all worst case possibilities as described above a 1 hour 57.5 minutes (1 hour 22 minutes + 35.5 minutes) should be added to the 24 hours operation requirements to ensure the unit will meet the requirement.
The minimum operating lifetime duration shall be 25 hours 57.5 minutes.
List of parameters measured during lifetime test are shown below.

List of test parameters

Measured parameters	**page No.**
Transmission frequency 406 MHz:	
Nominal frequency value	90
Short and average frequency stability	91
Maximum and minimum frequency stability values during test	88
Transmitter power output:	
Diagram of power output values during test	94
Maximum and minimum power output values during test	88
Message:	
Message contents	95

Table of measured parameters.

Message	
Contents (full)	:FFFE2F8C9E0000037FDFFC13353783E0F66C

Test duration 33:00:22	Bursts received 2396	BCH error 0	Self-Test 0		
406 MHz Transmitter Parameters	**Limits**		**Measured**		
	min	**max**	**min**	**current**	**max**
Frequency, MHz	406.039	406.041	406.039960	406.039960	406.039978
Power, dBm	35	39	35.07	35.07	36.72
Slope	-1.00E-09	1.00E-09	-2.07E-10	-3.02E-11	9.84E-11
Residual variations	0.00E-09	3.00E-09	4.97E-11	3.02E-10	8.53E-10
Short term variations	0.00E-09	2.00E-09	5.87E-11	4.66E-10	4.66E-10

121.5 MHz Transmitter Parameters at the Beginning of the Test			
Carrier Frequency, Hz	121503175	**Low Sweep Frequency, Hz**	345
Power, dBm	15.9	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100	**Homer transmitter duty cycle**	97.2
121.5 MHz Transmitter Parameters at the End of the Test			
Carrier Frequency, Hz	121501587	**Low Sweep Frequency, Hz**	345
Power, dBm	16.8	**High Sweep Frequency, Hz**	1176
Sweep Period, sec	0.3	**Sweep Range, Hz**	831
Modulation Index, %	100	**Homer transmitter duty cycle**	97.2

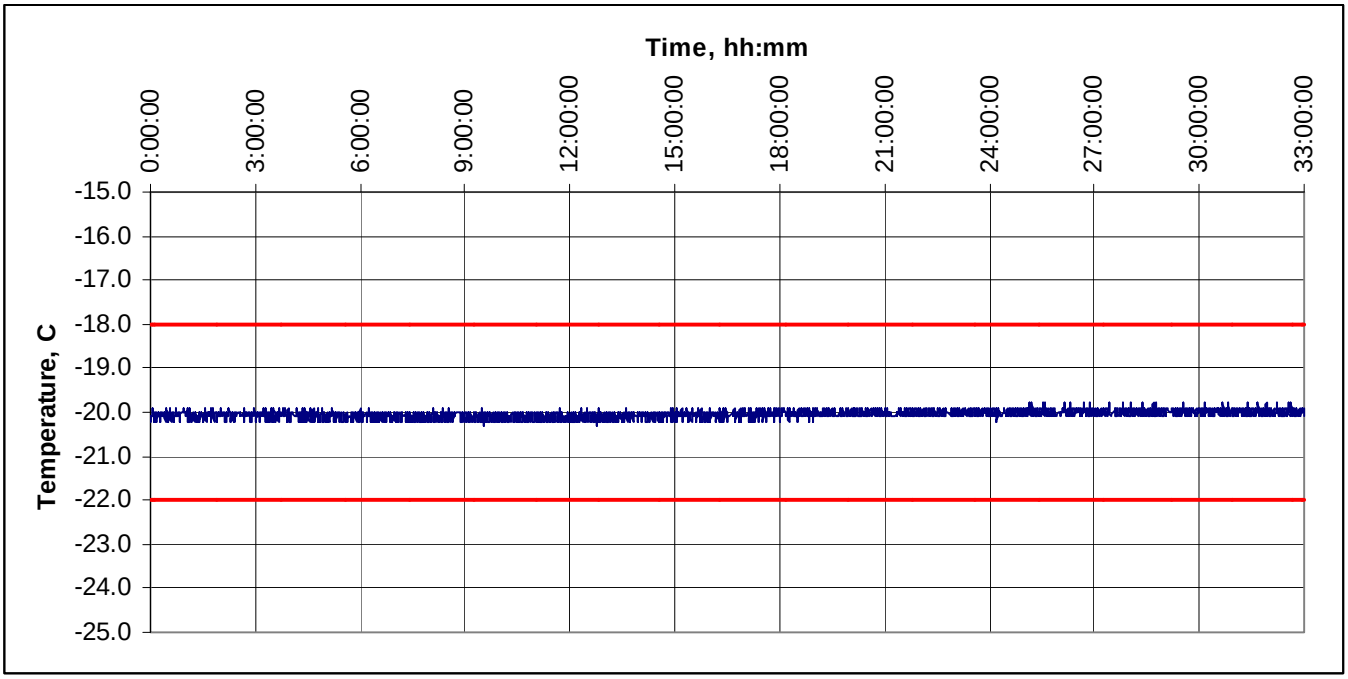


Figure 4. 3 – Temperature During The Test

Table of data measured during 30 minutes after activation of ELT.

Time (h:mm:ss)	Rep. period (s)	Power (Wt)	Frequency (MHz)	Slope	Residual variations	Short term variations	Digital message
0:00:00	0.00	4.13	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:00:50	49.51	4.11	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:01:39	49.91	4.11	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:02:31	51.41	4.10	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:03:18	47.51	4.09	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:04:11	52.21	4.16	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:04:58	47.91	4.16	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:05:47	48.31	4.16	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:06:37	50.41	4.15	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:07:27	49.31	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:08:16	49.51	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:09:06	49.91	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:09:57	51.41	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:10:45	47.51	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:11:37	52.21	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:12:25	47.91	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:13:13	48.31	4.26	-	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:14:04	50.41	4.26	406.039978	-	-	-	FFFE2F8C9E0000037FDFFC13353783
0:14:53	49.31	4.26	406.039976	-5.04E-09	1.10E-08	1.08E-10	FFFE2F8C9E0000037FDFFC13353783
0:15:43	49.51	4.26	406.039975	-4.24E-09	1.10E-08	1.12E-10	FFFE2F8C9E0000037FDFFC13353783
0:16:32	49.91	4.26	406.039973	-3.39E-09	1.04E-08	1.18E-10	FFFE2F8C9E0000037FDFFC13353783
0:17:24	51.41	4.26	406.039972	-2.57E-09	9.17E-09	1.20E-10	FFFE2F8C9E0000037FDFFC13353783
0:18:11	47.51	4.26	406.039971	-1.81E-09	7.44E-09	1.12E-10	FFFE2F8C9E0000037FDFFC13353783
0:19:04	52.21	4.25	406.039970	-1.16E-09	5.42E-09	1.14E-10	FFFE2F8C9E0000037FDFFC13353783
0:19:52	47.91	4.25	406.039969	-6.53E-10	3.22E-09	1.12E-10	FFFE2F8C9E0000037FDFFC13353783
0:20:40	48.31	4.24	406.039969	-3.42E-10	1.68E-09	1.09E-10	FFFE2F8C9E0000037FDFFC13353783
0:21:30	50.41	4.22	406.039969	-1.82E-10	9.44E-10	1.09E-10	FFFE2F8C9E0000037FDFFC13353783
0:22:20	49.31	4.22	406.039969	-9.13E-11	4.40E-10	1.05E-10	FFFE2F8C9E0000037FDFFC13353783
0:23:09	49.51	4.21	406.039969	-5.31E-11	1.78E-10	1.04E-10	FFFE2F8C9E0000037FDFFC13353783
0:23:59	49.91	4.20	406.039969	-4.33E-11	1.38E-10	1.07E-10	FFFE2F8C9E0000037FDFFC13353783
0:24:50	51.41	4.19	406.039968	-3.47E-11	1.45E-10	1.11E-10	FFFE2F8C9E0000037FDFFC13353783
0:25:38	47.51	4.18	406.039968	-3.92E-11	1.43E-10	1.14E-10	FFFE2F8C9E0000037FDFFC13353783
0:26:30	52.21	4.17	406.039968	-3.71E-11	1.43E-10	1.19E-10	FFFE2F8C9E0000037FDFFC13353783
0:27:18	47.91	4.17	406.039968	-3.56E-11	1.42E-10	1.17E-10	FFFE2F8C9E0000037FDFFC13353783
0:28:06	48.31	4.17	406.039968	-3.68E-11	1.43E-10	1.06E-10	FFFE2F8C9E0000037FDFFC13353783
0:28:57	50.41	4.17	406.039968	-4.53E-11	1.27E-10	1.06E-10	FFFE2F8C9E0000037FDFFC13353783

Note:

Column “Time”	Time from PLB activation.	
Column “Rep. Period”	Value of repetition period fixed after first message.	
Column Slope, Residual variations		Medium Term Frequency Stability computed with Frequency measurement immediately after beacon activation and out off C/S specification limit.

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

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

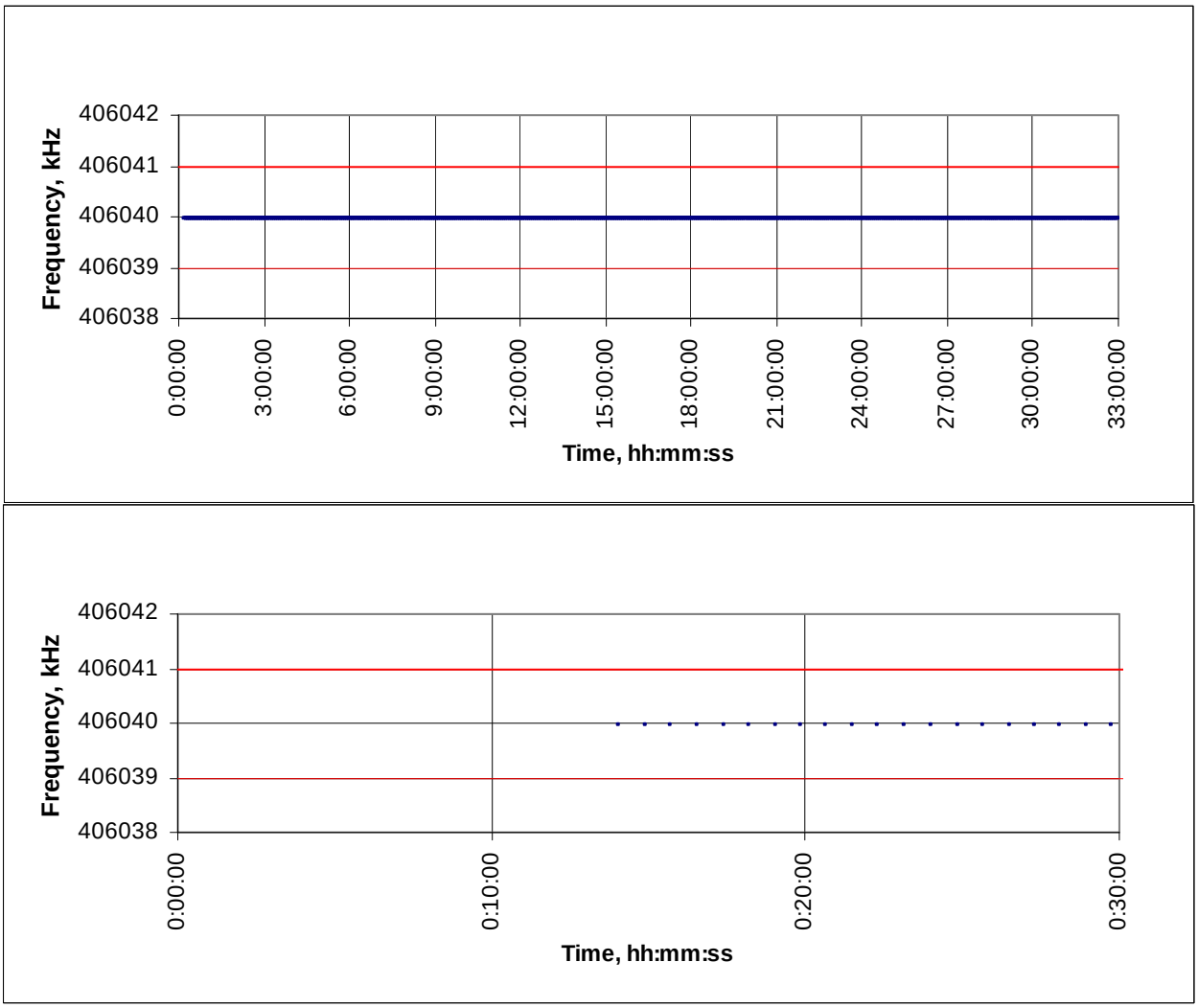


Figure 4. 4 – Nominal Value of frequency

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

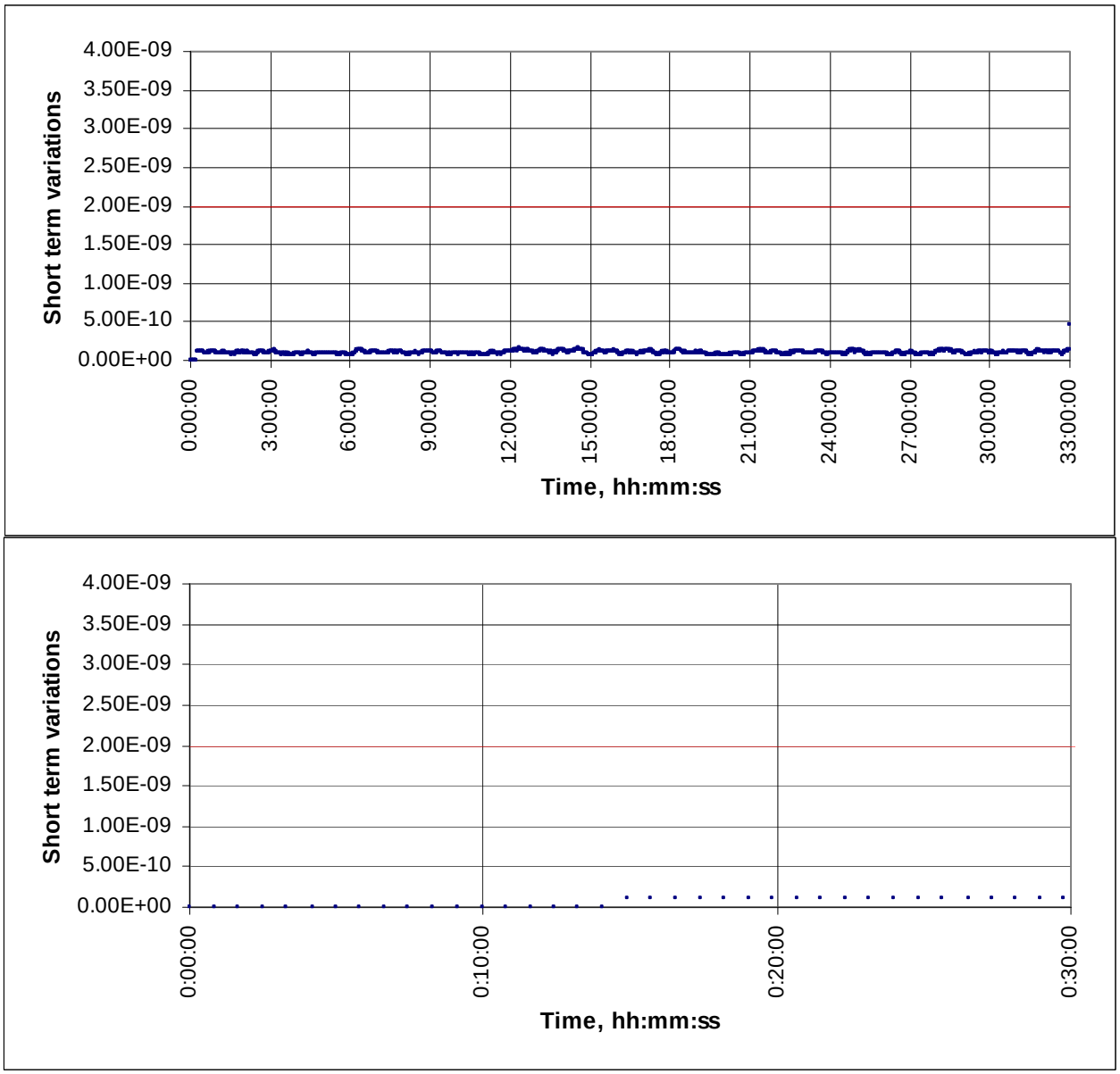
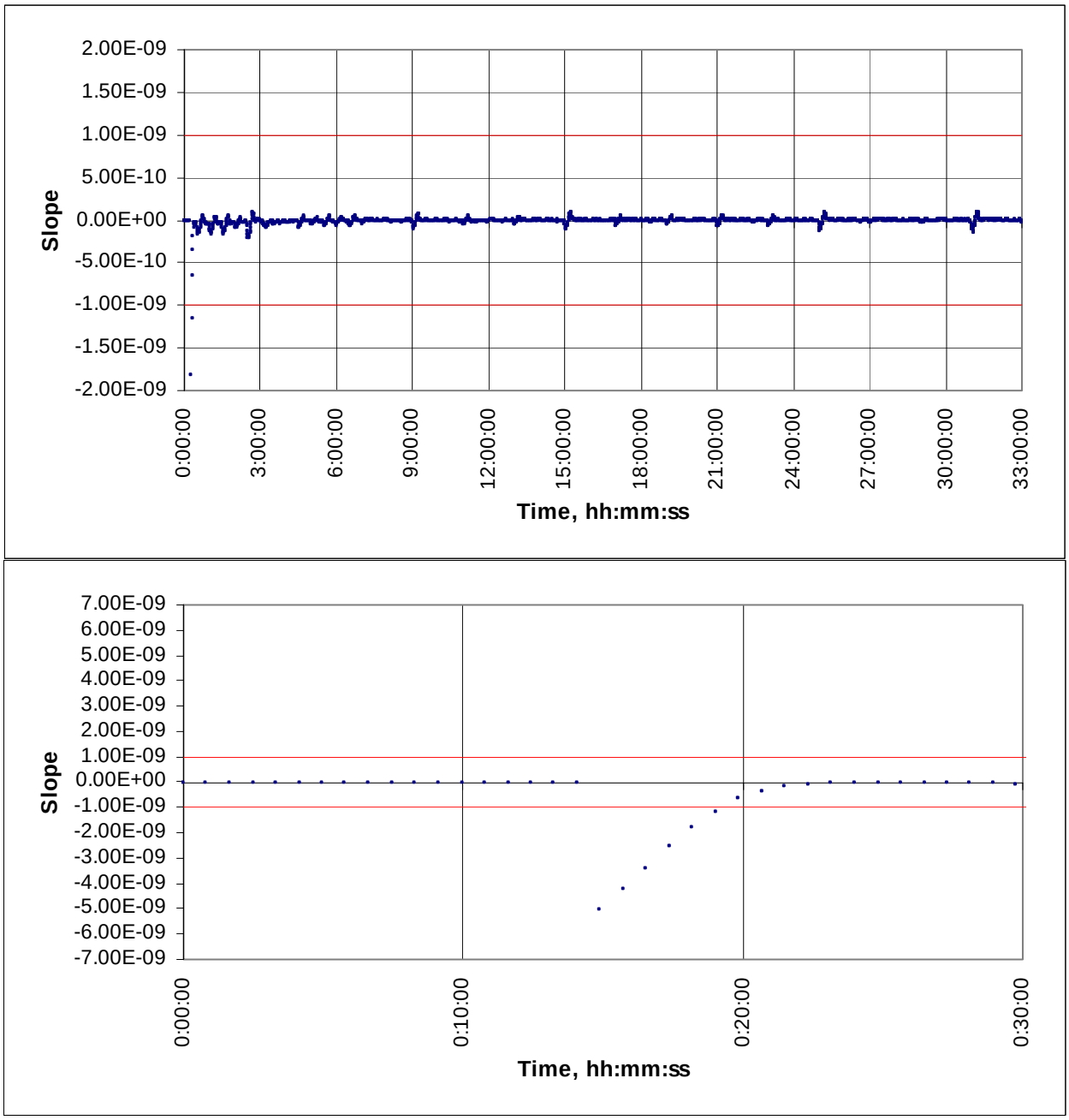


Figure 4. 5 – Short-Term Stability

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



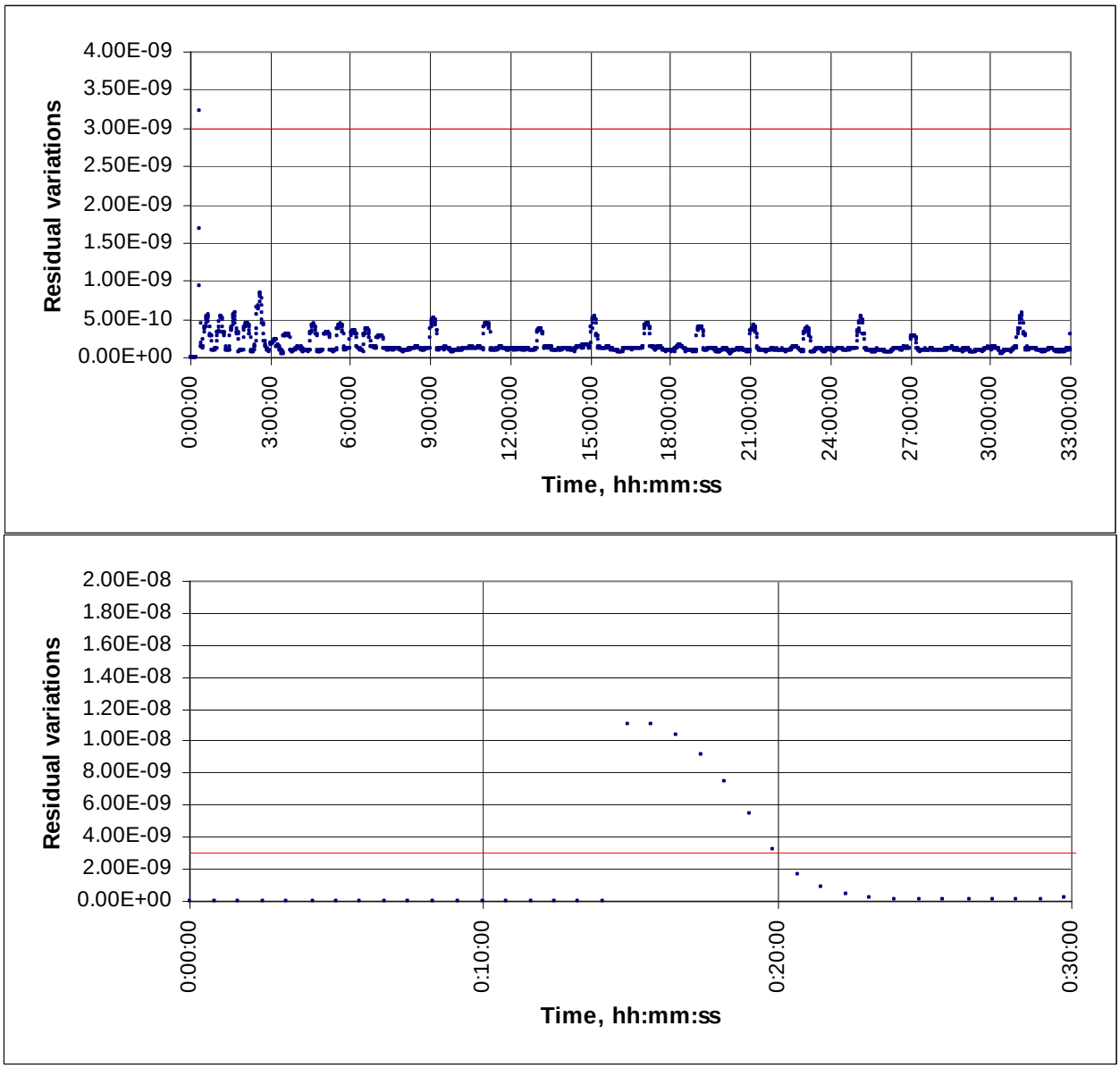
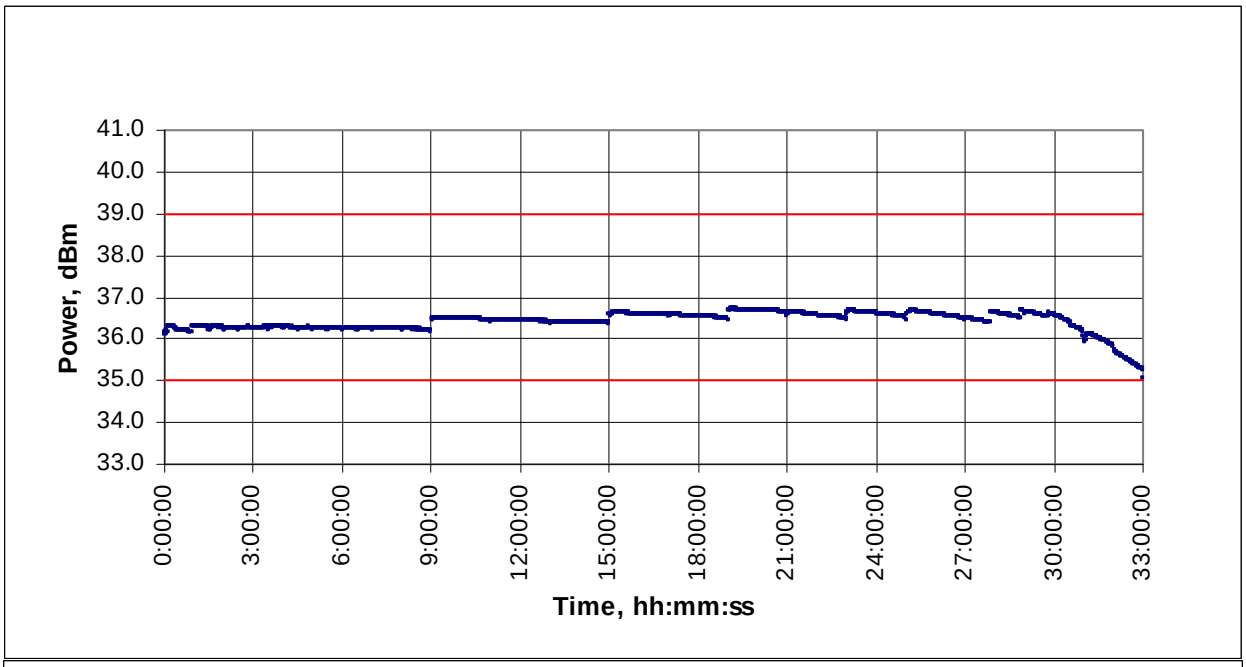


Figure 4. 6 – Medium-Term Stability

b) Transmitter Power Output (according to C/S T.007 – section A.3.2.2.1).

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



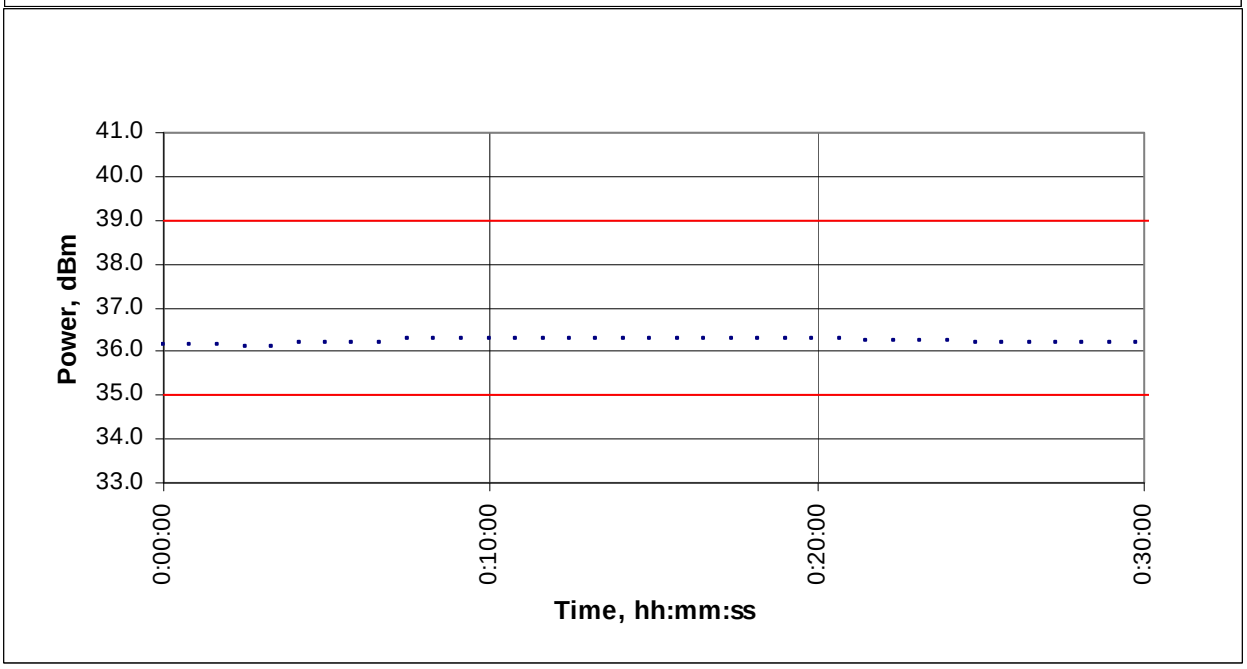


Figure 4. 7– Transmitter power during test

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

Bursts received	2396
BCH error	0
Self test message	0
Full HEX message with default position data	FFFE2F8C9E0000037FDFFC13353783E0F66C
Full HEX message with position data	FFFE2F8C9E0000032C8436F74FB79500A39A

Decoding Beacon Message with default position data

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
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	10000100110011010100
BCH 1 Calculated:	N/A	10000100110011010100
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	193C000006FFBFF

Decoding Beacon Message with position data

ITEM	BITS	VALUE
Message format: long format	25	1
Protocol: Location Protocol	26	0
Country code: 201	27-36	0011001001
Type of location protocol: Standard Location - Test	37-40	1110
Test Protocol: Test Protocol (No Decode information in bits 41 to 64)	41-64	000000000000000000000011
Latitude Sign: North	65	0
Latitude Degrees: 44	66-72	0101100
Latitude Minutes: 30	73-74	10
Longitude Sign: East	75	0
Longitude Degrees: 33	76-83	00100001
Longitude Minutes: 30	84-85	10
BCH 1 Encoded:	86-106	11011110111010011110
BCH 1 Calculated:	N/A	11011110111010011110
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: +	113	1
Latitude Offset Minutes: 5	114-118	00101
Latitude Offset Seconds: 16	119-122	0100
Longitude Offset Sign: -	123	0
Longitude Offset Minutes: 0	124-128	00000
Longitude Offset Seconds: 40	129-132	1010
BCH 2 Encoded:	133-144	001110011010
BCH 2 Calculated:	N/A	001110011010
Composite Latitude: 44.58777777777778 Degrees North	N/A	Composite Longitude: 33.48888888888889 Degrees East
15 Hex ID:	N/A	193C000006FFBFF

ANNEX 5.

BEACON ANTENNA TEST

(According to C/S T.007 - Annex B)

ANNEX 5.1.

TEST CONFIGURATION 3: BEACON SITTING ON GROUND PLANE

Figure B.2 C/S T.007

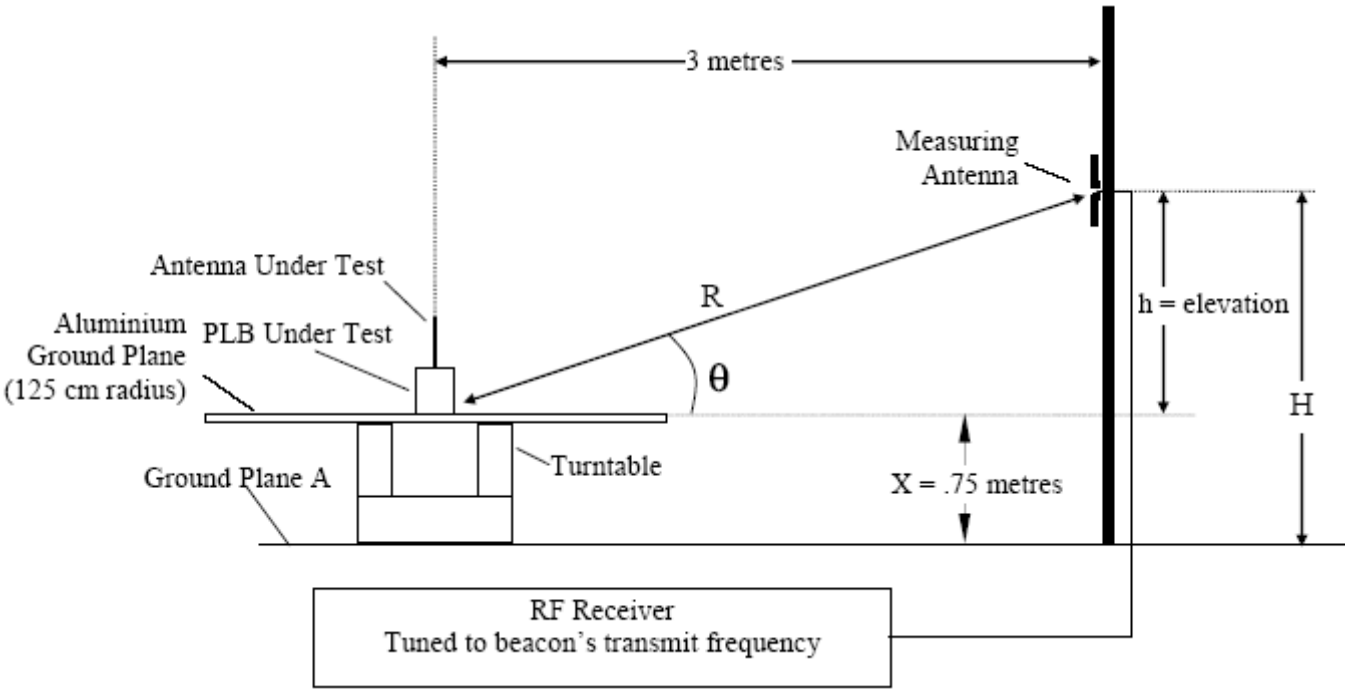
(According to C/S T.007 - Annex B)

Model: rescueME PLB1
Serial number: TA5
Antenna model: Integral antenna
Beacon SW: 00.06
Test Date: 20.12.2012

Test condition:

- Ambient laboratory temperature: 16 °C;
- Relative air humidity: 71 %.
- Atmospheric pressure: 753 mm/Hg.
- The measurement was performed in accordance with Figure B.2 C/S T.007.

Test site:



406 MHz BEACON ANTENNA TEST RESULTS

Table F-B.1: Effective isotropically radiated power (dBm) / antenna gain (dBi)

Azimuth Angle (degrees)	Elevation Angle (degrees)				
	10	**20**	**30**	**40**	**50**
0	38.38 / 2.53	39.28 / 3.42	41.70 / 5.84	38.89 / 3.03	34.19 / -1.66
30	38.54 / 2.69	39.07 / 3.22	41.72 / 5.87	38.72 / 2.86	33.37 / -2.49
60	38.47 / 2.62	39.38 / 3.52	42.18 / 6.33	38.41 / 2.55	33.45 / -2.40
90	37.80 / 1.95	38.37 / 2.52	41.79 / 5.94	38.57 / 2.71	32.87 / -2.99
120	38.31 / 2.45	38.96 / 3.11	41.89 / 6.03	38.63 / 2.77	34.06 / -1.79
150	38.92 / 3.07	39.10 / 3.25	41.58 / 5.73	38.02 / 2.17	33.94 / -1.92
180	37.98 / 2.12	38.81 / 2.95	41.65 / 5.80	38.19 / 2.33	33.29 / -2.56
210	37.79 / 1.94	38.16 / 2.31	41.72 / 5.86	38.64 / 2.78	32.92 / -2.94
240	38.51 / 2.65	39.30 / 3.44	41.95 / 6.10	38.32 / 2.47	33.05 / -2.80
270	38.48 / 2.62	38.70 / 2.85	41.80 / 5.95	38.59 / 2.73	34.43 / -1.43
300	38.75 / 2.89	39.39 / 3.54	42.05 / 6.20	39.07 / 3.22	33.20 / -2.66
330	37.88 / 2.02	38.80 / 2.94	42.20 / 6.34	39.27 / 3.41	33.22 / -2.63

$EIRP_{LOSS} = Pt_{ambient} - Pt_{EOL} = 36.10 - 36.06 = 0.04$ dB

$EIRP_{max\ EOL} = MAX [EIRP_{max} , (EIRP_{max} - EIRP_{LOSS})] = MAX(42.20;\ 42.16) = 42.20$ dBm ($\leq$ 43 dBm)

$EIRP_{min\ EOL} = MIN [EIRP_{min} , (EIRP_{min} - EIRP_{LOSS})] = MIN (32.87; 32.83) = 32.83$ dBm ($\geq$ 32 dBm)

* For $EIRP_{LOSS}$ calculations was used minimum of output power value determined during 25 hours 58 minutes beacon operating.

Table F-B.2: Induced Voltage Measurements Vv / Vh (dBuV)

Azimuth Angle (degrees)	Elevation Angle (degrees)				
	10	**20**	**30**	**40**	**50**
0	109.1 / 90.4	109.5 / 90.1	111.0 / 86.3	106.9 / 82.0	100.4 / 77.2
30	109.2 / 91.5	109.2 / 92.1	111.1 / 88.1	106.7 / 86.6	99.6 / 79.5
60	109.1 / 92.8	109.5 / 92.6	111.5 / 85.6	106.4 / 82.5	99.7 / 81.1
90	108.5 / 90.2	108.6 / 88.8	111.1 / 86.5	106.6 / 79.9	99.0 / 83.3
120	109.0 / 92.0	109.1 / 91.3	111.2 / 86.3	106.6 / 86.6	100.3 / 78.0
150	109.6 / 90.2	109.3 / 90.6	110.9 / 78.6	106.1 / 83.5	100.1 / 82.6
180	108.7 / 86.8	109.0 / 89.5	111.0 / 82.1	106.2 / 87.0	99.4 / 83.5
210	108.5 / 90.1	108.3 / 89.4	111.1 / 81.5	106.7 / 85.8	99.2 / 77.6
240	109.2 / 90.2	109.5 / 90.8	111.3 / 85.2	106.3 / 85.5	99.2 / 83.8
270	109.2 / 88.6	108.9 / 87.6	111.1 / 83.0	106.6 / 85.6	100.6 / 82.4
300	109.5 / 91.3	109.6 / 91.3	111.4 / 87.7	107.1 / 82.8	99.4 / 80.5
330	108.6 / 91.4	109.0 / 91.8	111.5 / 87.8	107.3 / 87.8	99.4 / 82.5
Min(Vv-Vh)	16.4	16.9	22.9	19.1	15.4

Note. The antenna has vertical polarization

ANNEX 5.2.

TEST CONFIGURATION 4: BEACON ABOVE GROUND PLANE

Figure B.5 C/S T.007

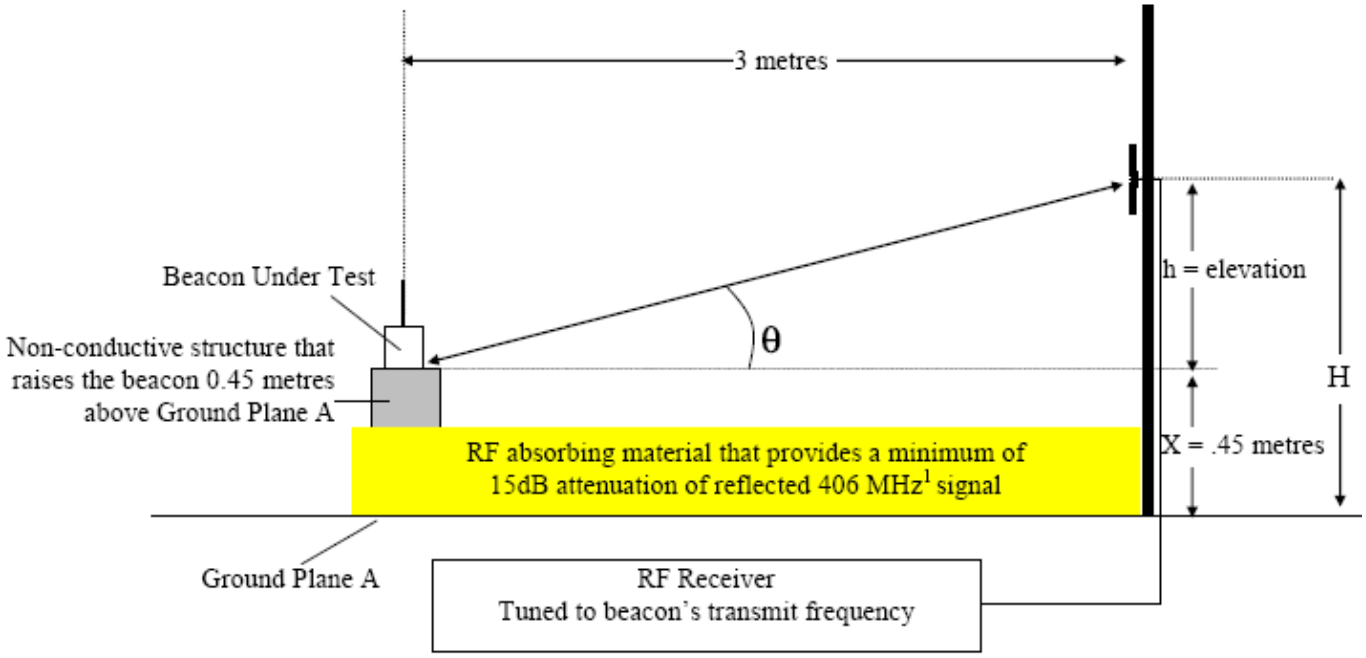
(According to C/S T.007 - Annex B)

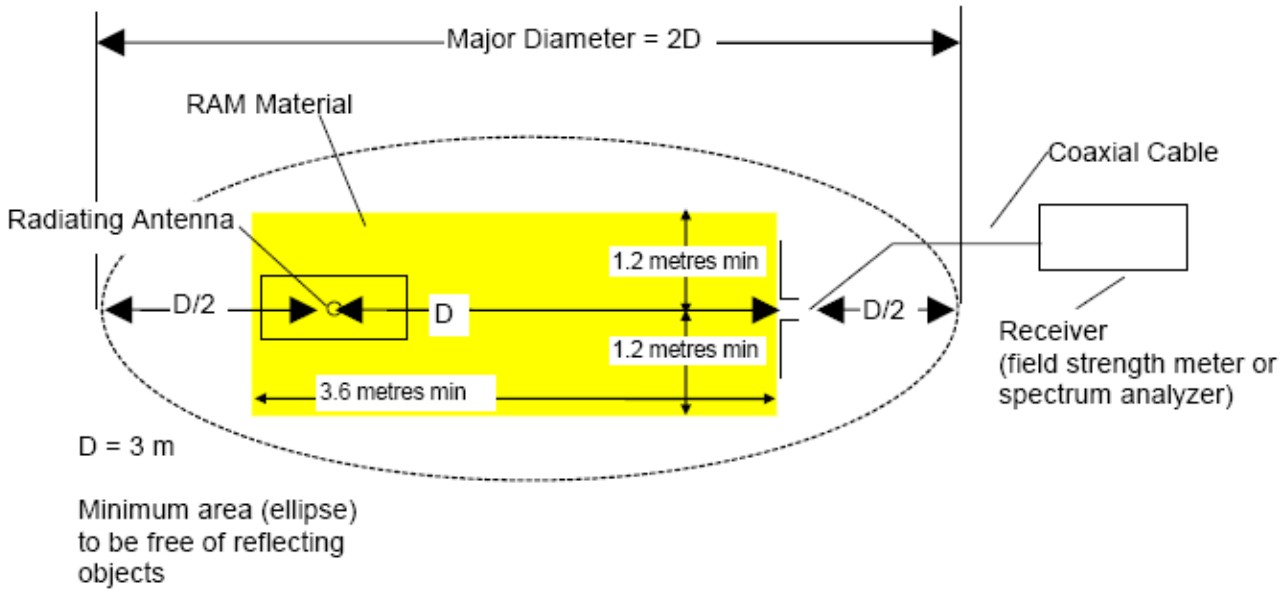
Model: rescueME PLB1
Serial number: TA5
Antenna model: Integral antenna
Beacon SW: 00.06
Test Date: 20.12.2012

Test Conditions:

- Ambient laboratory temperature: 16 °C;
- Relative air humidity: 73 %.
- Atmospheric pressure: 753 mm/Hg.
- The measurement was performed in accordance with Figure B.5 C/S T.007.

Test site.





406 MHz BEACON ANTENNA TEST RESULTS

Table F-B.3: Equivalent Isotropically Radiated Power (dBm) / Antenna Gain (dBi)

Azimuth Angle (degrees)	Elevation Angle (degrees)				
	10	20	30	40	50
0	39.10 / 3.25	41.12 / 5.27	42.36 / 6.51	39.84 / 3.98	36.71 / 0.85
90	39.61 / 3.76	41.33 / 5.48	42.50 / 6.65	39.81 / 3.96	36.94 / 1.08
180	39.67 / 3.82	41.14 / 5.28	42.52 / 6.66	39.89 / 4.04	37.44 / 1.59
270	39.41 / 3.55	40.95 / 5.10	42.62 / 6.76	39.91 / 4.05	37.41 / 1.56

$EIRP_{LOSS} = Pt_{ambient} - Pt_{EOL} = 36.10 - 36.06 = 0.04$ dB

$EIRP_{max\ EOL} = MAX [EIRP_{max} , (EIRP_{max} - EIRP_{LOSS})] = MAX (42.52; 42.48) = 42.52$ dBm ($\leq$ 43 dBm)

$EIRP_{min\ EOL} = MIN [EIRP_{min} , (EIRP_{min} - EIRP_{LOSS})] = MIN (36.71; 37.67) = 36.67$ dBm ($\geq$ 30 dBm)

* For $EIRP_{LOSS}$ calculations was used minimum of output power value determined during 25 hours 58 minutes beacon operating.

ANNEX 6.

BEACON CODING SOFTWARE

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

Beacon coding software test was carried out by beacon manufacturer as it is allowed by CS T.007 and test result provided below.

Pages of test report of Standard Location and National Location protocols

		Page No.		
Protocol type		**Decoded operational message, location A**	**Decoded operational message, location B**	**Decoded self-test mode message**
1.	Standard Location: EPIRB with MMSI	113	127	114
2.	Standard Location: PLB with Serial Number	115	128	116
3.	Standard Location: Test	117	129	118
4.	National Location: PLB	119	130	120
5.	National Location: Test	121	131	122

Pages of test report of User Location protocols

		Page No.		
Protocol type		**Decoded operational message, location A**	**Decoded operational message, location B**	**Decoded self-test mode message**
1.	Maritime Protocol with MMSI	123	132	124
2.	User Location: Test	125	133	126