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Report On

RTCM Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII

COMMERCIAL-IN-CONFIDENCE

Document 75900217 Report 04 Issue 2 February 2008

Product Service

TUV Product Service Ltd, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuvps.co.uk

REPORT ON

Emergency Beacons Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII

Document 75900217 Report 04 Issue 2

February 2008

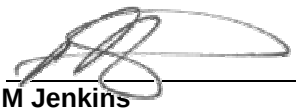
PREPARED FOR

Jotron AS
Østbyveien 1
PO. BOX 54
3280 Tjodalyng
Norway

PREPARED BY

R Hampton
Test Engineer

APPROVED BY



M Jenkins
Authorised Signatory

DATED 05 February 2008

This report has been up-issued to Issue 2 to correct typographical errors.

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SECTION 1

REPORT SUMMARY

Emergency Beacons Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII

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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the Emergency Beacons Testing of the Jotron AS Tron 40GPS MkII and Tron 40S MkII to the requirements of RTCM Paper 77-2002/SC110-STD.

Objective	To perform Emergency Beacons Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Jotron AS
Model Number(s)	Tron 40GPS MkII
Serial Number(s)	001 (Modified to incorporate 50Ω output) 002 003 (Tron 40S MkII, non-GPS variant) 101 (Tron 40S MkII, non-GPS variant, modified to incorporate 50Ω output)
Number of Samples Tested	Four
Additional Model Variant(s)	Tron 40S MkII
Test Specification/Issue/Date	RTCM Paper 77-2002/SC110-STD
Incoming Release Date	Application Form 02 May 2007
Order Number Date	PO0637001 02 October 2007
Start of Test	15 February 2007
Finish of Test	28 January 2008
Name of Engineer(s)	R Hampton C Hedley C Bowles A Castle K Adsetts P Kinally

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Related Document(s)	MIL-STD-810D (19 July 1983), method 509.2.
	COSPAS-SARSAT C/S T.001, Specification for COSPAS-SARSAT 406 MHz Distress Beacons.
	COSPAS-SARSAT C/S T.007, COSPAS-SARSAT 406 MHz Distress Beacon Type Approval Standard.
	International Maritime Organization (IMO), Assembly Resolution A.810(19), Performance Standards for Float-Free Satellite Emergency Position-Indicating Radio Beacons (EPIRBs) Operating on 406 MHz.
	International Maritime Organization (IMO), Assembly Resolution A.662(16), Performance Standards for Float-Free Release and Activation Arrangements for Emergency Radio Equipment.
	International Maritime Organization (IMO), Assembly Resolution A.689(17), Recommendation on Testing of Life-Saving Appliances.
	U.S. Government Printing Office, U.S. Code of Federal Regulations, Title 46, Subpart 160.062, Releases. Lifesaving Equipment, Hydraulic and Manual.
	U.S. Government Printing Office, U.S. Code of Federal Regulations, Title 46, Subpart 164.018, Retroreflective Material for Lifesaving Equipment.
	Naval Publications and Forms Center (NPFC) MIL-STD-81OD, method 509.2, 19 July 1983, Environmental Test Methods and Engineering Guidelines, pp.509.2-5 to 509.2-10.
	Naval Publications and Forms Center (NPFC) MIL-O-55310B, Military Specification, General Specifications for Crystal Oscillators, page 44, paragraph 4.9.34.2.1, 1 April 1987.

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1.2 APPLICATION FORM

1.2.1 Beacon Manufacturer and Beacon Model

Beacon Manufacturer	Jotron AS
Beacon Model	Tron 40GPS MkII / Tron 40S MkII

1.2.2 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)		☐

1.2.3 Beacon Characteristics

Characteristic	**Specification**
Operating temperature range	Tmin = -20°C Tmax = +55°C
Operating lifetime	48 hours
Battery chemistry	Lithium-thionyl chloride
Battery cell size and number of cells	C-size LSH14 light, 4
Battery manufacturer	SAFT
Battery pack manufacturer and part number	Jotron AS, X-83056
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	C-MAC
Oscillator part name and number	C-MAC E4520LF
Oscillator satisfies long-term frequency stability requirements (Yes or No)	Yes

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Characteristic	Specification
Antenna type (Integrated or External)	Integrated
Antenna manufacturer	Jotron AS
Antenna part name and number	X-83053
Navigation device type (Internal, External or None)	None
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	N/A
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	N/A
Navigation device capable of supporting global coverage (Yes, No or N/A)	N/A
For Internal Navigation Devices	
- Geodetic reference system (WGS 84 or GTRF)	WGS 84
- GNSS receiver cold start forced at every beacon activation (Yes or No)	Yes
- Navigation device manufacturer	Fastrax
- Navigation device model name and part Number	Fastrax iTrax03-S
- 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
- Navigation device model and manufacturer (if beacon designed to use specific devices)	N/A

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Characteristic	Specification
Self-Test Mode Characteristics	
- Self-test has separate switch position (Yes or No)	Yes
- Self-test switch automatically returns to normal position when released (Yes or No)	Yes
- Self-test activation can cause an operational mode transmission (Yes or No)	No
- Self-test causes a single beacon self-test message burst only regardless of how long the self-test activation mechanism applied (Yes or No)	Yes
- Results of self-test indicated by (e.g. Pass / Fail Indicator Light, Strobe Light, etc.)	Strobe Light
- Self-test can be activated from beacon remote activation points (Yes or No)	No
- Self-test performs an internal check and indicates that RF power emitted at 406 MHz and 121.5 MHz if beacon includes a 121.5 MHz homer (Yes or No)	Yes
- Self-test transmits a signal(s) other than at 406 MHz (Yes & details or No)	Yes, 121.5 MHz
- Self-test can be activated directly at beacon (Yes or No)	Yes
- List of Items checked by self-test	Included in Manuals
- Self-test transmission burst duration (440 or 520 ms)	Both supported
- Self-test format bit (“0” or “1”)	Both supported
Beacon includes a homer transmitter (if yes identify frequency of transmission)	121.5MHz
-Homer Transmit Power	20dBm
-Homer Duty Cycle	96%
-Duty Cycle of Homer Swept Tone	37%

Characteristic	Specification
Beacon includes a strobe light (Yes or No)	Yes
- Strobe light intensity	Average of 1.9cd
- Strobe light flash rate	21 per minute
Beacon transmission repetition period satisfies C/S T.001 requirement that two beacon's repetition periods are not synchronised closer than a few seconds over 5 minute period, and the time intervals between transmissions are randomly distributed on the interval 47.5 to 52.5 seconds (Yes or No)	Yes
Other ancillary devices (e.g. voice transceiver). List details on a separate sheet if insufficient space to describe.	None
Beacon includes automatic activation mechanism (Yes or No)	Yes

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1.2.4 Applicant Details

Company Name	Jotron AS		
Address	Østbyveien 1 PO Box 54 3280 Tjodalyng Norway		
Category of Applicant	☒ Manufacturer	☐ Importer	
	☐ Distributor	☐ Agent	
Contact Name	Eirik Storjordet	Telephone	+47 33139714
Email	eirik.storjordet@jotron.com	Facsimile	+47 33126780

1.2.5 Manufacturer Details

Company Name	See Applicant Details		
Address	N/A		
Contact Name	N/A	Telephone	N/A
Email	N/A	Facsimile	N/A

1.2.6 Declaration of Build Status

Hardware Version	000
- PCB Revision	MB: 0622, but modified according to 0703 Antenna: 0643
- Battery Model	

1.2.7 Applicant's Declaration

I hereby declare that I am entitled to sign on the behalf of the applicant and that the information supplied is correct and complete

Signed: _____

Name: Eirik Storjordet

Position Held: Certification Manager

Date: 27.04.2007

Product Service

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

The Equipment Under Test (EUT) was a Jotron AS Tron 40GPS MkII and Tron 40S MkII as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test, Sample Serial Number 001

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1.3.2 Test Configuration

Tests requiring a conducted link to the EUT's transmitter were performed on test sample serial number 001 which was modified by the manufacturer to provide two 50Ω output ports, one for 121 MHz measurements, the other for 406 MHz measurements.

The EUT was capable of being mounted in a Float Free Cradle. EUT was tested out of said cradle except where otherwise specified.

The EUT was powered by its internal battery.

1.3.3 Modes of Operation

Modes of operation of the EUT during testing were as follows:

Test Mode 1: Idle; Beacon in quiescent state (main switch set to 'READY').

Test Mode 2: Operating; Beacon activated using the main switch. 406 MHz and 121MHz Transmitters active, EUT programmed with test mode as per Cospas-Sarsat T.007. Note: this is sometimes referred to as "Normal" mode due to the normal frame sync.

Test Mode 3: Self-test mode; Beacon activated using the main switch. Pre-programmed self-test mode runs and beacon subsequently returns to idle mode.

Specific test modes used are detailed in the test procedure for each individual test.

1.3.4 Monitoring of Performance

Aliveness Test comprises successful self-test of beacon into a beacon tester and confirmation strobe flashes on EUT.

1.3.5 Performance Criterion

EUT must successfully complete the aliveness test.

1.3.6 Additional Variants

Variants of the Tron 40GPS MkII include the Tron 40S MkII, a non-GPS version of the EPIRB. For the purposes of this report testing conducted and successfully passed can be considered to indicate a pass for both variants, see customer supplied information ("Similarity of Variants") in Annex A.

Cospas-Sarsat Approval has been sought for the variants subject to the successful completion of the Spurious Emissions, Beacon Coding Software, Satellite Qualitative, Self Test and Digital Message tests (T.007 Issue 4 - Rev 1 October 2006, in accordance with Section 6.4). Separate submissions were made to the Cospas-Sarsat Secretariat.

Product Service

1.4 DEVIATIONS FROM THE STANDARD

The Salt Fog test (section 2.6) was conducted in accordance with another standard to more severe test conditions; see test details for further information.

1.5 MODIFICATION RECORD

The table below details modifications made to the EUT during the test programme. The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer	N/A	N/A
1	Software update to version 1.01 to fix Repetition Rate problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	08 March 2007
2	Software update to version 1.02 to fix 121MHz Spurious Emissions problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	20 March 2007
3	Software update to version 1.03 to fix Encoded position drop problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	25 May 2007
4	Software update to version 1.04 to fix modulation problem on last bit	TÜV Product Service Ltd (SW Supplied by Jotron AS)	05 June 2007
5	Software update to version 1.05 to fix problems encountered during Cospas-Sarsat testing	TÜV Product Service Ltd (SW Supplied by Jotron AS)	20 June 2007
6	Software update to version 1.06 to fix coarse position and delta offset problem	TÜV Product Service Ltd (SW Supplied by Jotron AS)	09 August 2007
7	Hardware change to fix self-test fault measuring 121.5MHz power Note: This modification only applied to EUT serial number 001	Jotron AS	11 September 2007

1.6 ALTERNATIVE TEST SITE

With the exception of the following tests all testing was conducted at TÜV Product Service Ltd's Octagon House Test Facility at Fareham, Hampshire.

TÜV Product Service Ltd conducted the following tests at Bearley, Stratford-upon-Avon Test Laboratory:

2.24 Peak Equivalent Radiated Power

TÜV Product Service Ltd conducted the following tests at MPI Services (UK) Limited, trading as Manor Marine, Portland, Dorset:

2.8 Drop Test in Water

Product Service

SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
Jotron AS
Tron 40GPS MkII and Tron 40S MkII

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TEST RESULTS TABLE

Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments	
			T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)		
1. Initial Aliveness Test (A1.0)						Section 2.1	Result: Pass
• Aliveness Test:	Successful self-test	✓		✓			
2. Dry Heat Cycle (A3.0)						Section 2.2	Result: Pass
• Aliveness Test (during 2 hour period)	Successful self-test	✓			✓		
• Aliveness Test (at end of 2 hour period)	Successful self-test	✓			✓		
3. Damp Heat Cycle (A4.0)						Section 2.3	Result: Pass
• Aliveness Test (during 2 hour period)	Successful self-test	✓			✓		
• Aliveness Test (at end of 2 hour period)	Successful self-test	✓			✓		
4. Vibration Test (A5.0)						Section 2.4	Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓			
• Aliveness Test	Successful self-test	✓		✓			
• Activation	No activation during test	✓		✓			
5. Bump Test (A6.0)						Section 2.5	Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓			
• Aliveness Test	Successful self-test	✓		✓			
• Activation	No activation during test	✓		✓			
6. Salt Fog Test (A7.0)						Section 2.6	Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓			
• Aliveness Test	Successful self-test	✓		✓			

Product Service

Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)	
7-A. Drop Test (A8.1) On Hard Surface						Section 2.7 Result: Pass
• Exterior Mechanical Inspection	No damage	✓	✓			The EUT was soaked at the minimum stowage temperature (-30°C) prior to the drop.
• Aliveness Test	Successful self-test	✓	✓			
• Activation	No activation during test	✓	✓			
7-B. Drop Test (A8.2) In Water						Section 2.8 Result: Pass
• Exterior Mechanical Inspection	No damage	✓		✓		
• Aliveness Test	Successful self-test	✓		✓		
8. Leakage And Immersion Test (A9.0)						Section 2.9 Result: Pass
• Aliveness Test	Successful self-test	✓		✓		
• Interior Inspection	No water	✓		✓		
9. Spurious Emissions Test (A10.0)						Section 2.10 Result: Pass
• 406 MHz	Figure 2-1	✓	✓	✓	✓	
• 121.5 MHz	Figure 2-6	✓	✓	✓	✓	

Product Service

Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
10. Thermal Shock (A11.0)			High-Temperature		Low-Temperature	Sections 2.12 & 2.11 respectively Result: Pass*
• Self-activation in fresh water	5	minutes	0		0*	*Upon removal of ice deposits
• Self-activation in salt water (5% NaCl by mass)	5	minutes	0		0	Where two values are stated these are the minimum and maximum
• Aliveness Test:						
– Carrier Frequency	406.028±0.001	MHz	406.0367474 406.0367476		406.0367688 406.0367688	Note: Apparent failures are due to a band change in the Cospas-Sarsat system, limits are now 406.037±0.001
• Frequency Stability:						
– short term stability	0.002	parts/ million in 100ms	$6.754X10^{-10}$ $6.970X10^{-10}$		$6.254X10^{-10}$ $6.278X10^{-10}$	
– medium term stability:						
– mean slope	0.001	parts/ million/ minute	$-3.687X10^{-10}$ $-3.923X10^{-10}$		$-2.260X10^{-11}$ $4.901X10^{-13}$	
– residual frequency variation	0.003	parts/ million	$5.346X10^{-10}$ $5.624X10^{-10}$		$5.203X10^{-10}$ $5.475X10^{-10}$	
11. Cospas-Sarsat Type Approval (A12.0)						
Cospas-Sarsat Certificate	Provided (attach test report)	Y/N	N			Approval Pending at time of issue of this report

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Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)	
12. Operational Life, Strobe Light and Self-tests (A13.0)						Section 2.13 Result: Pass MU
• Operational Life	Effective* Time to first Failure *see 'Comments'	Hours	67.62			Note: Time to first failure was 80.21 hours. However, this was reduced to an "Effective Time to First Failure" for reasons described in the appropriate section.
• Frequency:						Where two values are stated these are the minimum and maximum up to 80.21 hours
– Nominal Carrier	406.028±0.001	MHz	406.036943 406.036946			Note: Apparent failures are due to a band change in the Cospas-Sarsat system, limits are now 406.037±0.001
– Short-term stability	0.002	parts/ million in 100ms	8.893×10^{-11} 3.104×10^{-10}			
• Medium-term stability:						
– Mean Slope	0.001	parts/ million/ minute	-5.909×10^{-11} 5.917×10^{-11}			
– Residual Variation	0.003	parts/ million	7.664×10^{-11} 3.158×10^{-10}			
• RF output power	35 - 39	dBm	35.34 36.68			
• Auxiliary radio-locating Peak envelope power	14 - 20	dBm	18.93 20.45*			* Measurement uncertainty is 1.2dB
13. Strobe Light Test (A13.2)						Section 2.14 Result: Completed
• Test	Completed	✓	✓*	✓*	✓*	* As per customer supplied information
14. Self-test (A13.3)						Section 2.15 Result: Pass
• RF pulse duration	<444 or <525*	ms	520.2609	520.2706	520.2208	* Range Of Specification dependant on message length. EUT coded with long message, hence limit is <525ms
• Frame synchronisation pattern	0 1101 0000	✓	✓	✓	✓	
• Number of RF bursts	1-burst	✓	✓	✓	✓	

Product Service

Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)	
15. Automatic Release Mechanism Test						Section 2.16 Result: Completed
• Normal mounted orientation	Release and float free before 4 meters; automatic activation	✓	✓*	✓*	✓*	*Completed as per customer supplied information
• Rolling 90° starboard		✓		✓*		
• Rolling 90° port		✓		✓*		
• Rolling 90° bow down		✓		✓*		
• Rolling 90° stern down		✓		✓*		
• Upside down		✓		✓*		
16. Stability and Buoyancy Test (A15.0)						Section 2.17 Result: Pass
• Time to upright	< 2	seconds		< 1		
• Reserve buoyancy	> 5	%		49.4		
• Float upright; Antenna base	≥ 4	cm		4*		*Customer supplied information
17. Inadvertent Activation Test (A16.0)						Section 2.18 Result: Completed
• Test	Completed	✓		✓*		* As per customer supplied information

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Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)	
18. Auxiliary Radio-Locating Device Transmitter Test (A17.0)						Result: Pass
• Carrier frequency	121.5 ± 0.006	MHz	121.4997666		121.4997202	Section 2.19
• Duty cycle	100	%	97.9		97.8	Section 2.20 Note: Duty cycle shown includes the allowed 2s cessation for 406MHz burst, result excluding this is 100% in both instances.
• Modulation:						
– Frequency	700 Hz within the range of 300 - 1600 Hz	✓	✓		✓	Section 2.21
– Range	> 700	Hz	944.30		945.75	
– Minimum	> 300	Hz	387.30		385.36	
– Maximum	< 1600	Hz	1331.6		1331.1	
– Direction	Upward	Upward / Downward	Downward*		Downward*	* EUT capable of both directions. When EUT is coded with “US settings” the direction is Upward.
– Duty cycle	33 - 55	%	33.61		35.73	
– Sweep repetition rate	2 - 4	Hz	2.61		2.70	
– Factor	0.85 - 1.0	#	0.873		0.937	Section 2.22
– Frequency Coherence	30% Power < ±30 Hz	✓	✓		✓	Section 2.23
– Frequency shift after 406 MHz burst	Shift < ±30 Hz	✓	✓		✓	
• PERP	14 - 20	dBm		18.99		Section 2.24
• Antenna:						
– Pattern	Omnidirectional	✓		✓		
– Polarisation	Vertical	✓		✓		
– VSWR	< 1.5:1	✓		N/A		Section 2.25

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Parameter To Be Measured	Range Of Specification	Units	Test Results			Comments
			T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)	
19. Humidity Test (A18.0)						Section 2.26 Result: Pass
• Aliveness Test	Successful self-test	✓			✓	
20. Orientation Test (A19.0)						Section 2.27 Result: Pass
Vertical						
• Aliveness Test	Successful self-test	✓			✓	
Upside Down						
• Aliveness Test	Successful self-test	✓			✓	
Horizontal						
• Aliveness Test	Successful self-test	✓			✓	

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2.1 INITIAL ALIVENESS TEST

2.1.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A1.0

2.1.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.1.3 Date of Test and Modification State

15 February 2007 - Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Operating Modes

The test was performed with the EUT in the following mode(s): Normal

Product Service

2.1.6 Test Results

Beacon Test Report (Normal Message)

Beacon Test Report

1925E847E0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 5/12/05 4:19:58 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: 1925E847E0FFBFF (1925E847E065C07)
Full Hex: FFFE2F8C92F423F032E03BBE5A378E46C33F
Burst Mode: Normal Mode (Long)
Protocol: EPIRB MMSI SLP Protocol
Country 201: Albania
MMSI: 999999
Beacon Number: 0
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°48'36"
Longitude: W 1°38'12"

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 38%
Power Rise Time: < 5 ms
Phase Deviation: -1.2 +1.06 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.7 ms

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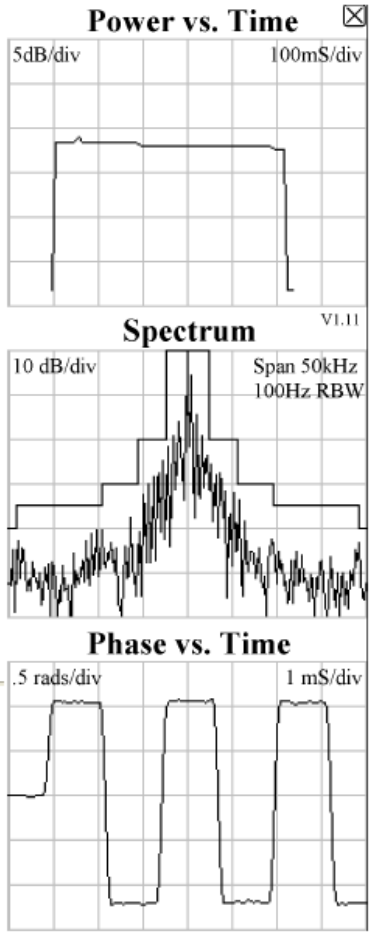

Note: The date shown on the beacon tester is incorrect and should read 15-Feb-07. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

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2.2 DRY HEAT CYCLE

2.2.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A3.0

2.2.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.2.3 Date of Test and Modification State

12 to 13 March 2007 - Modification State 1

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Set-up and Operating Modes

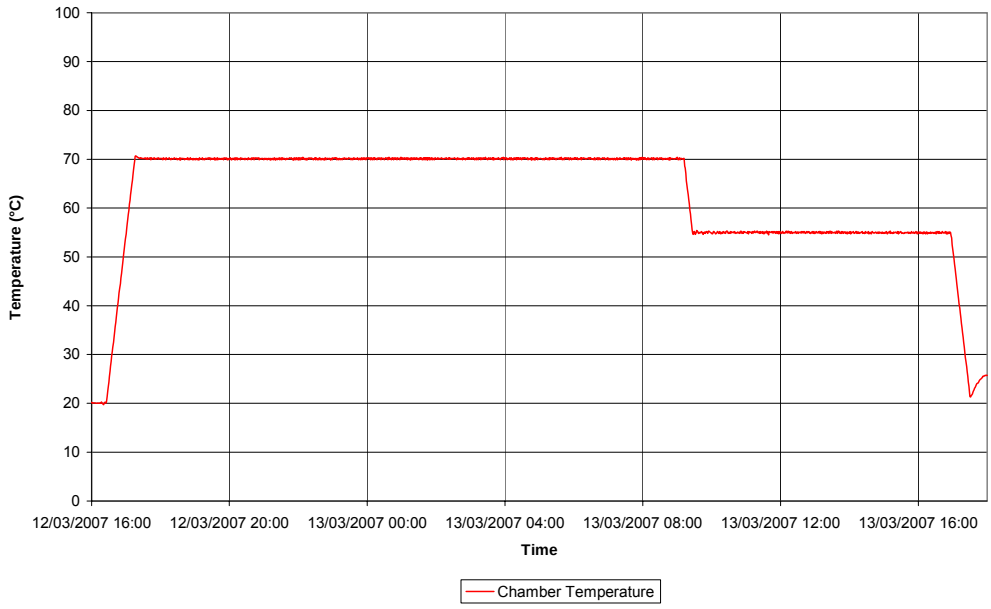
The test was performed with the EUT in the following mode(s): Idle and Operating as per "Specification Reference", above.

Test Set-up

Product Service

2.2.6 Environmental Conditions

Dry Heat Cycle Temperature Plot



2.2.7 Test Results

Summary of Aliveness test results

Stage	Pass / Fail
During Two Hour Dwell	Pass
End Of Two Hour Dwell	Pass

Product Service

Beacon Test Report (Aliveness Test, During Two Hour Dwell)

Beacon Test Report

A03D3CFCF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 10:50:29 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–3
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 21°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

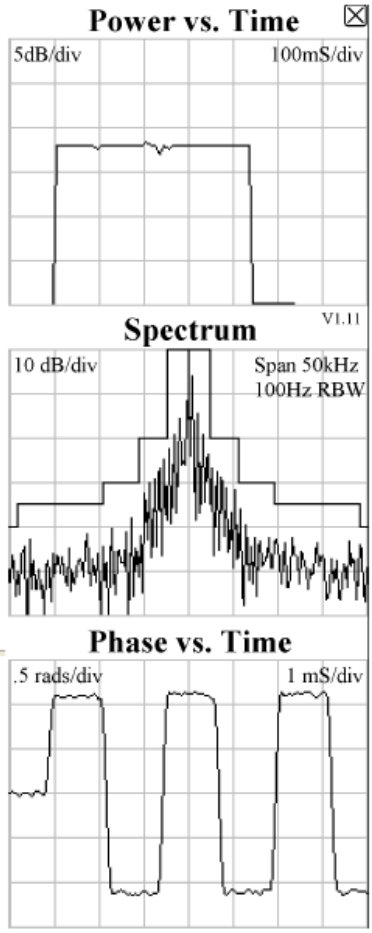
Notes: Add text comments here.

15 Hex ID: A03D3CFCF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 34.9 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.11 +1.12 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps
CW Preamble: 161 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The date shown on the beacon tester is incorrect and should read 13-Mar-07. Furthermore the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Aliveness Test, End Of Two Hour Dwell)

Beacon Test Report

A03D3CFCF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 11:31:51 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–5
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 18°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

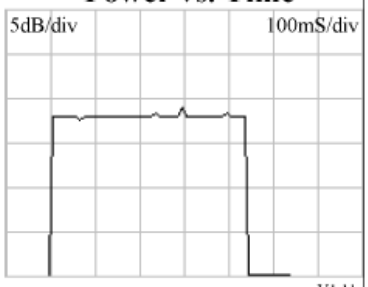
15 Hex ID: A03D3CFCF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

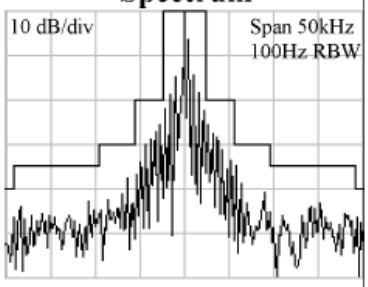
406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 35.1 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.11 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.9 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

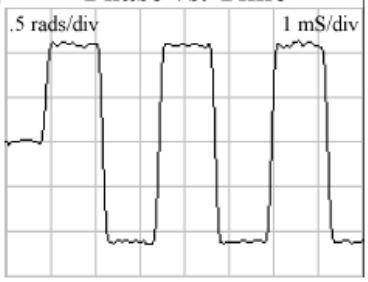
Power vs. Time



Spectrum V1.11



Phase vs. Time



Note: The date shown on the beacon tester is incorrect and should read 13-Mar-07. Furthermore the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.3 DAMP HEAT CYCLE

2.3.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A4.0

2.3.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.3.3 Date of Test and Modification State

15 to 16 February 2007 - Modification State 0

2.3.4 Test Equipment Used

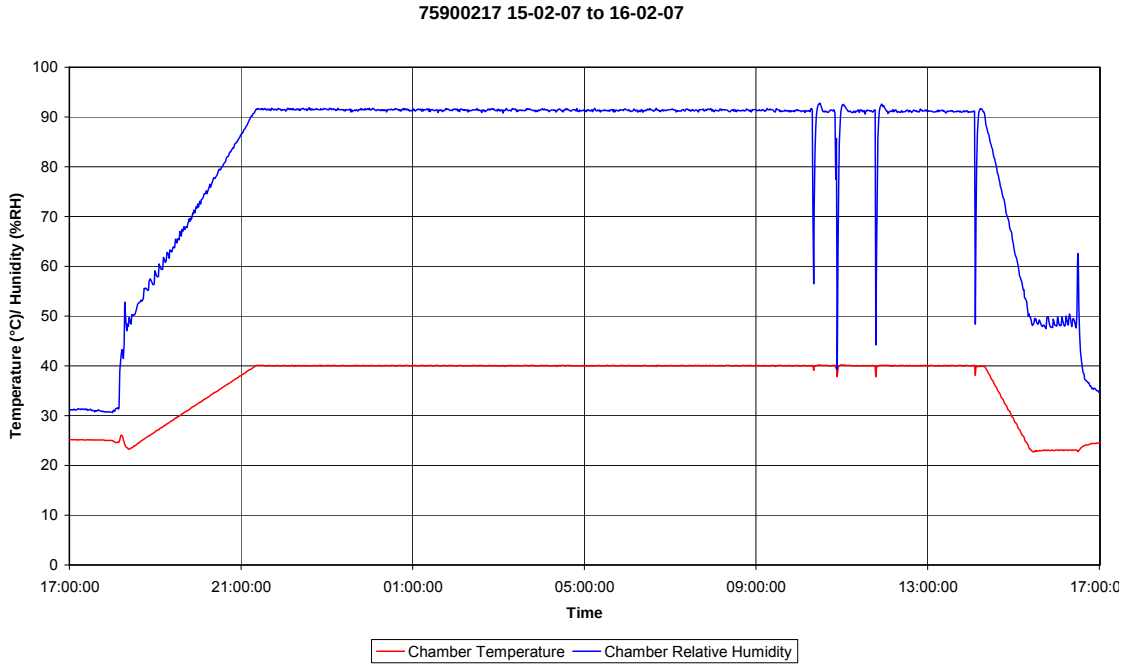
The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle and Operating as per "Specification Reference", above.

2.3.6 Environmental Conditions

Damp Heat Cycle Temperature Plot



Product Service

2.3.7 Test Results

Summary of Aliveness test results

Stage	Pass / Fail
During Two Hour Dwell, Message 1	Pass
During Two Hour Dwell, Message 2	Pass

Product Service

Beacon Test Report (Aliveness Test, During Two Hour Dwell, Message 1)

Beacon Test Report

A03D3CFCF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 16-Feb-07 11:42:51 AM
Tester Model/Serial No./File Name: BT100S/1025/joepirb–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 23°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

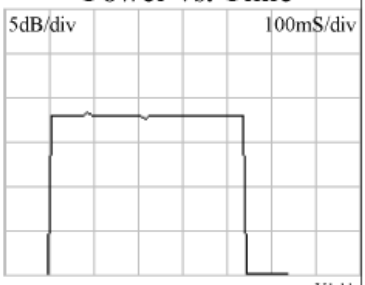
15 Hex ID: A03D3CFCF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 36.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.11 +1.11 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.6 ms

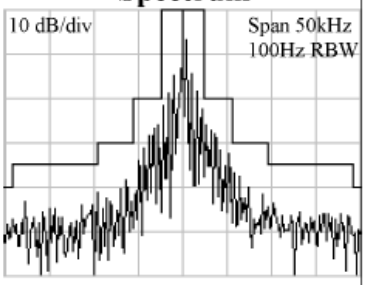
DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Power vs. Time

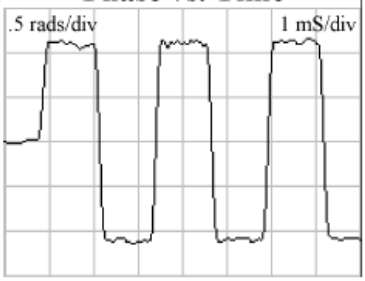


Spectrum

V1.11



Phase vs. Time



Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Aliveness Test, During Two Hour Dwell, Message 2)

Beacon Test Report

A03D3CFCF400001

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 16-Feb-07 11:43:39 AM
Tester Model/Serial No./File Name: BT100S/1025/joepirb–2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 25°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

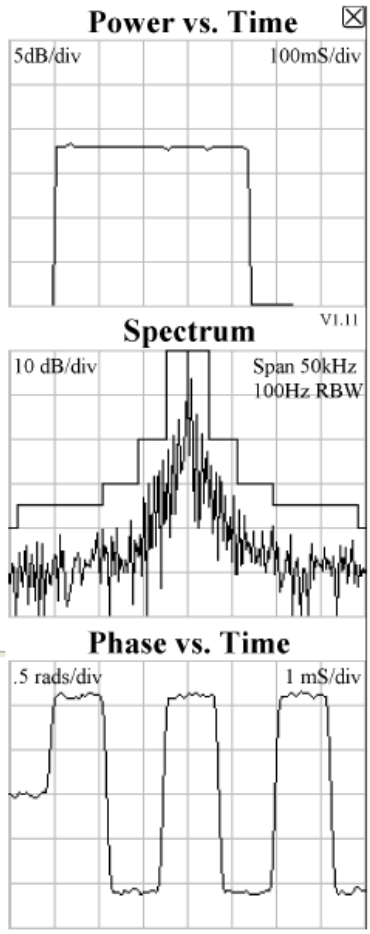
Notes: Add text comments here.

15 Hex ID: A03D3CFCF400001
Full Hex: FFFE2F501E9E7E7A00000D504837
Burst Mode: Normal Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (5 Watt): 36.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.08 +1.11 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 165 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.5 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.4 VIBRATION TEST

2.4.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A5.0

2.4.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.4.3 Date of Test and Modification State

28 February and 01 March 2007 - Modification State 1

2.4.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.4.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle

Test Set-up

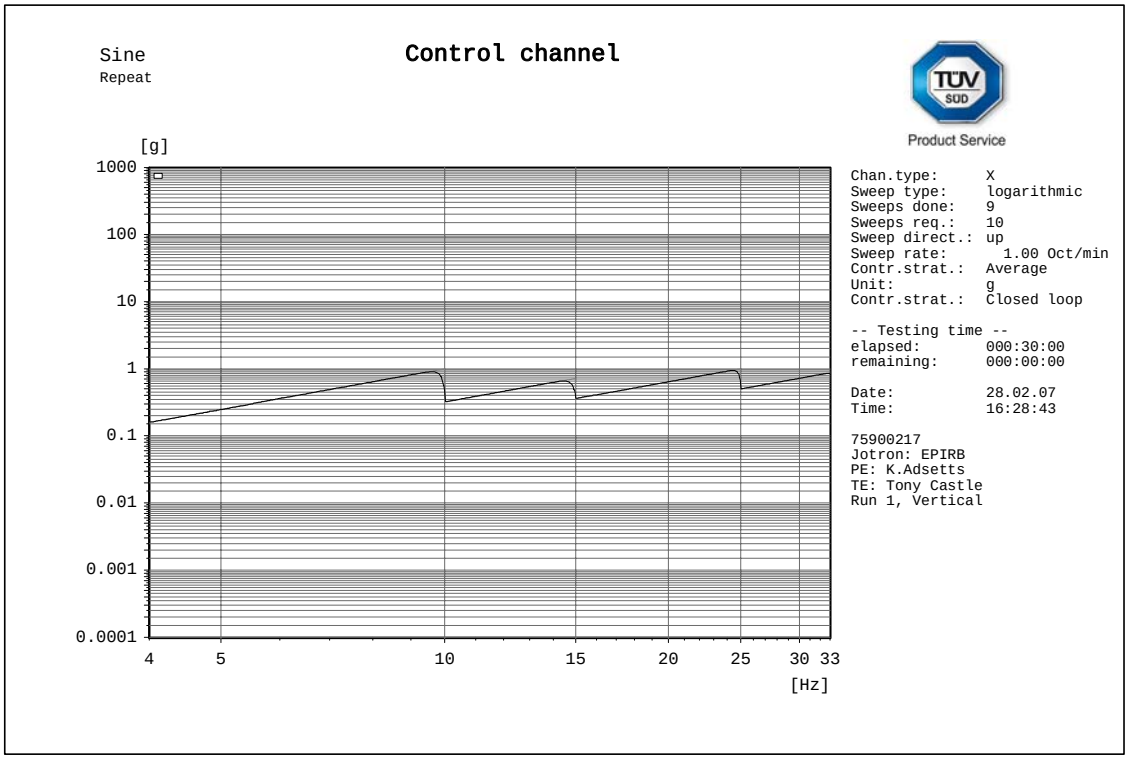
Product Service

2.4.6 Environmental Conditions

	28 February PM	01 March AM	01 March PM
Ambient Temperature	21.9°C	19.4°C	21.4°C
Relative Humidity	35%	39%	34%
Atmospheric Pressure	987mbar	988mbar	990mbar

2.4.7 Test Results

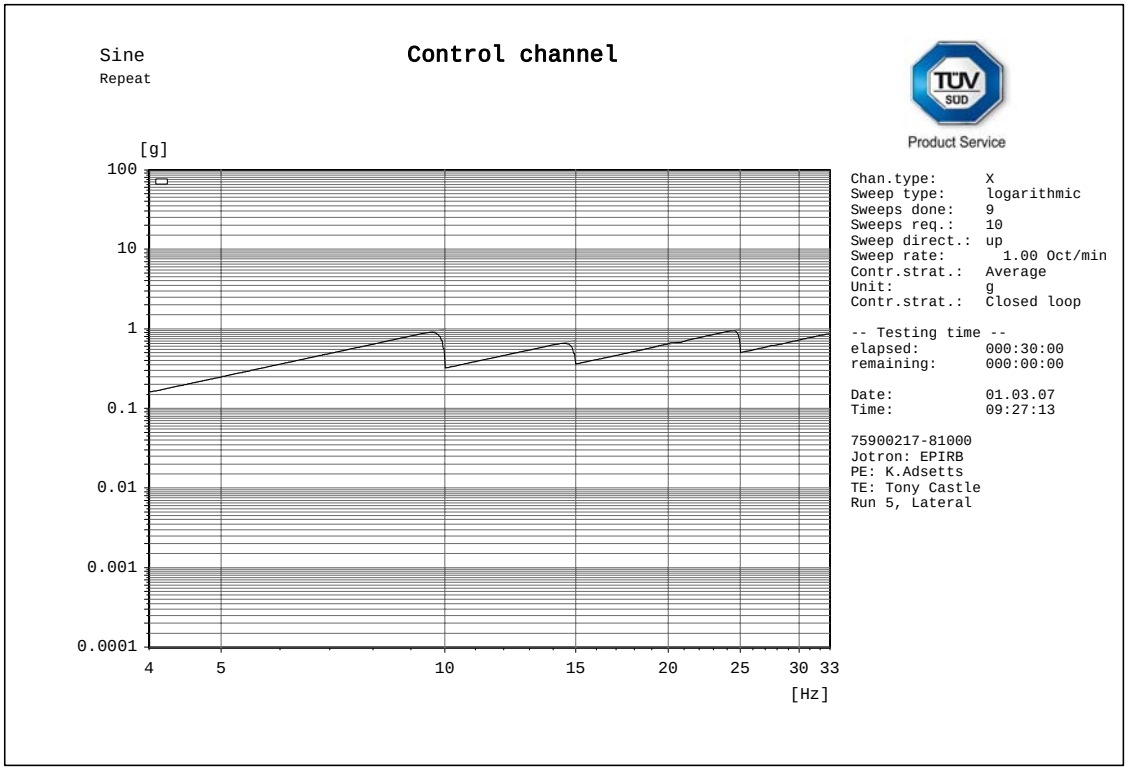
Vertical axis



C:\VcoNT\Daten\m+p\Jotron\Swept Sine 30 Mins 010.rsn

Product Service

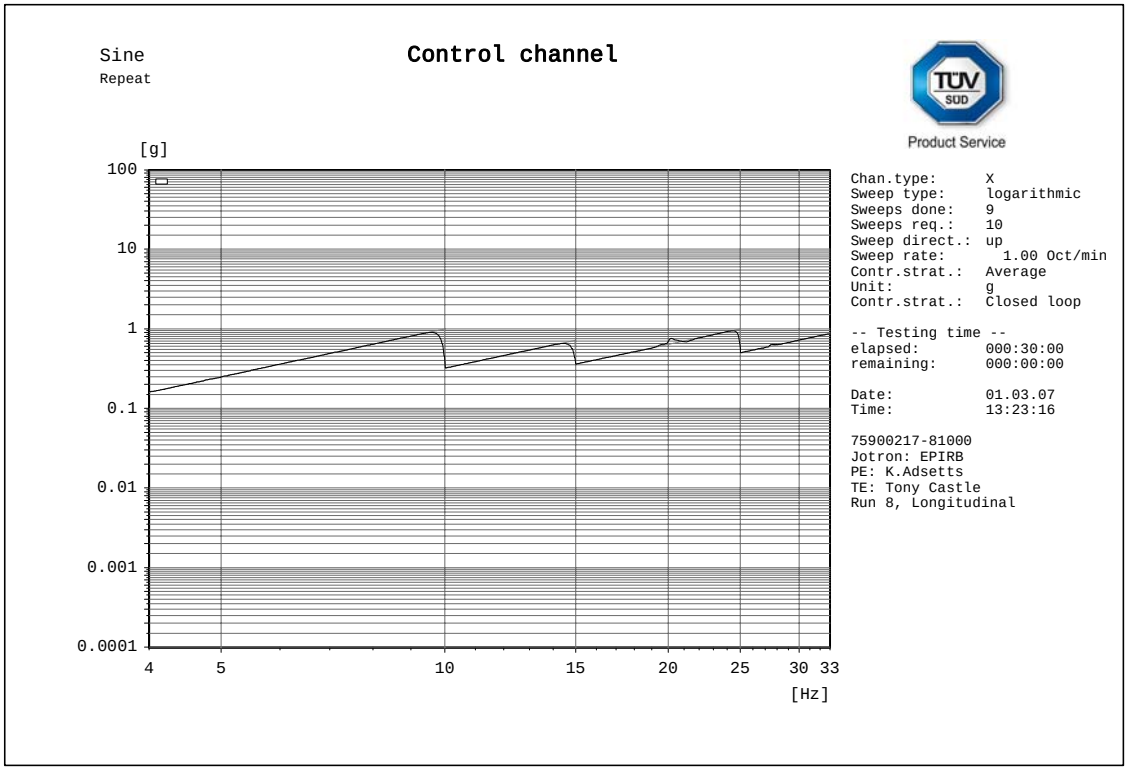
Lateral axis



C:\VcoNT\Daten\m+p\Jotron\Swept Sine 30 Mins 1 002.rsn

Product Service

Longitudinal axis



C:\VcoNT\Daten\m+p\Jotron\Swept Sine 30 Mins 1 003.rsn

Mechanical Inspection

No signs of mechanical degradation could be witnessed.

Summary of Aliveness test results

Stage	Pass / Fail
Post-Vertical Axis	Pass
Post-Lateral Axis	Pass
Post- Longitudinal Axis	Pass

Product Service

Beacon Test Report (Aliveness Test, Post-run 1)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 2:51:48 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb vib–15
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 25°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

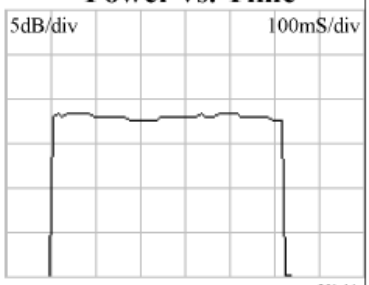
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

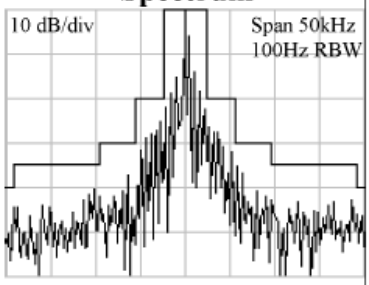
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * ***°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 83%
Power Rise Time: < 5 ms
Phase Deviation: -1.03 +1.15 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps
CW Preamble: 161 ms

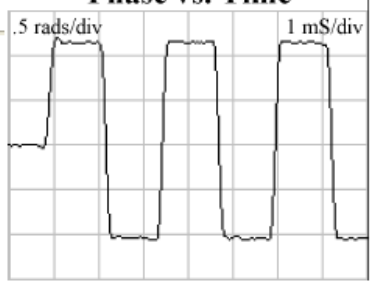
Power vs. Time



Spectrum



Phase vs. Time



DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.

Note: The date shown on the beacon tester is incorrect and should read 01-Mar-07. The time is also incorrect and actual time is after the time/date displayed on the appropriate plot above. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Aliveness Test, Post-Lateral Axis)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 4:11:39 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb vib–16
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 21°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

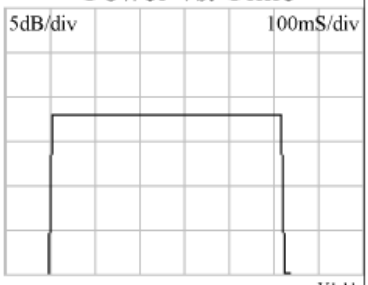
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * ***°**.**

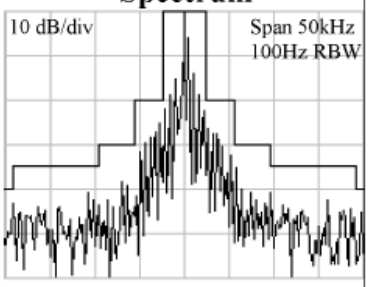
406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 89%
Power Rise Time: < 5 ms
Phase Deviation: -1.04 +1.14 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 161 ms

Power vs. Time

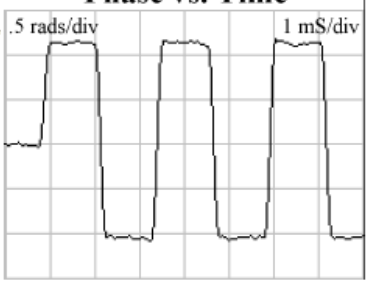


Spectrum

V1.11



Phase vs. Time



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Note: The date shown on the beacon tester is incorrect and should read 01-Mar-07. The time is also incorrect and actual time is shortly after the time displayed on the appropriate plot above. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 8:21:11 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb sweep vib–19
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 23°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

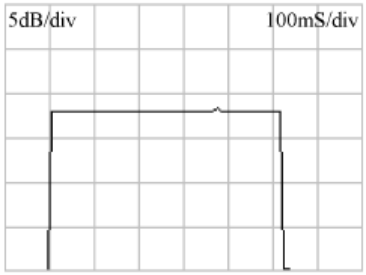
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

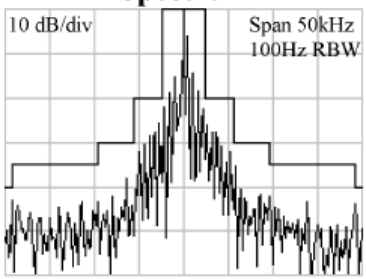
406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 88%
Power Rise Time: < 5 ms
Phase Deviation: -1.05 +1.13 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.6 ms

Power vs. Time

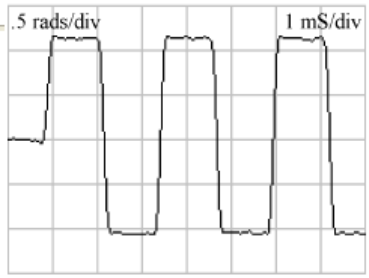


V1.11

Spectrum



Phase vs. Time



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Note: The date shown on the beacon tester is incorrect and should read 01-Mar-07. The time is also incorrect and actual time is shortly after the time displayed on the appropriate plot above. Furthermore, the “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.5 BUMP TEST

2.5.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A6.0

2.5.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.5.3 Date of Test and Modification State

01 March 2007 - Modification State 1

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle

Physical test configuration: as per Vibration Test, above.

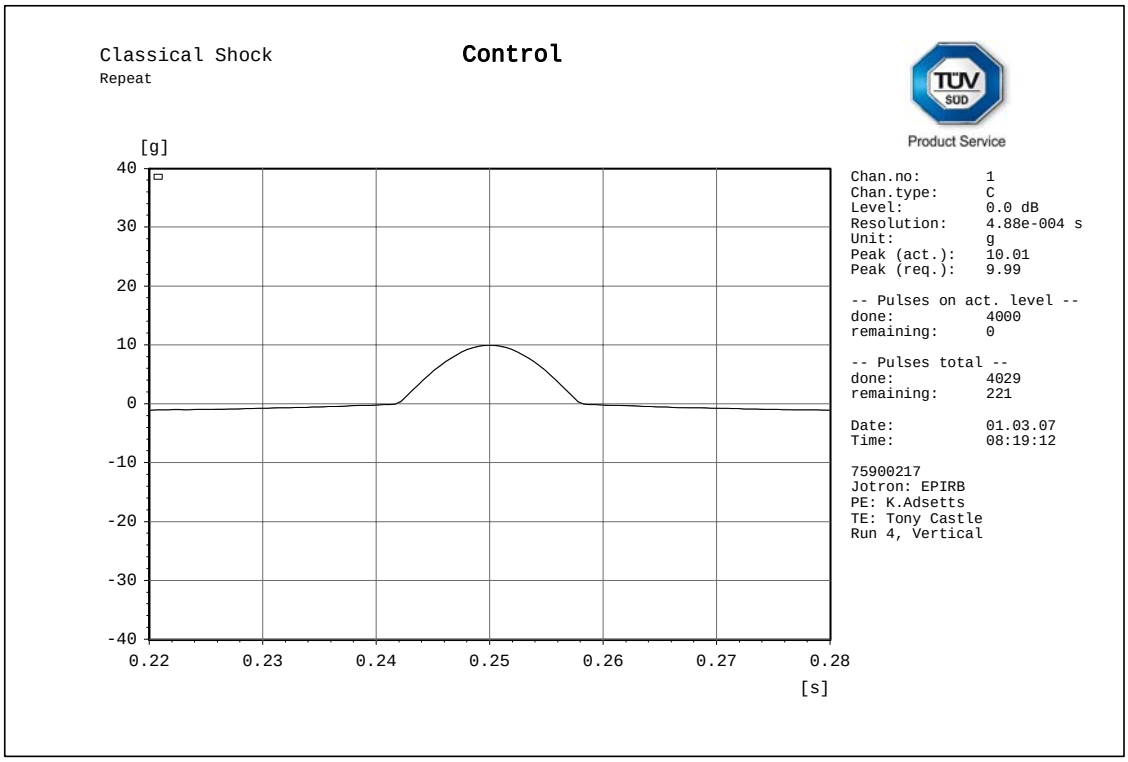
2.5.6 Environmental Conditions

Ambient Temperature	19.4°C
Relative Humidity	39%
Atmospheric Pressure	988mbar

Product Service

2.5.7 Test Results

Vertical Axis, 4000 Bumps



C:\VcpNT\Daten\m+p\Jotron\Bump 10g 16ms 003.rcs

Mechanical Inspection

No signs of mechanical degradation could be witnessed.

Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 3/9/07 8:14:06 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron epirb presalt–72
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 31°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

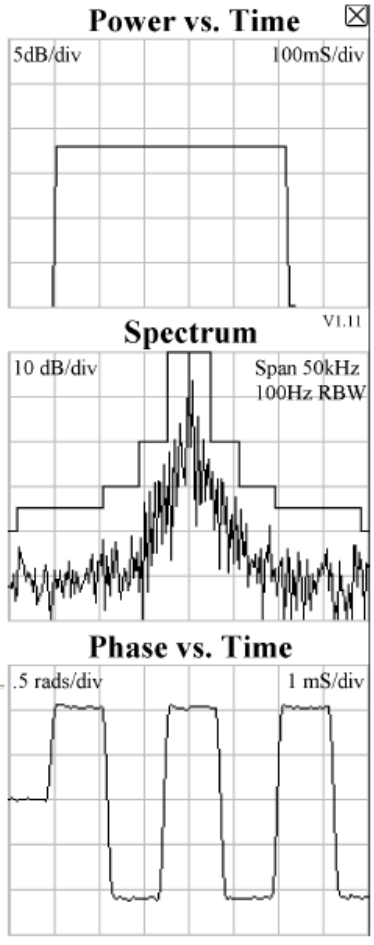
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF
Full Hex: FFFED0901EF3F3D07FDFF81CA77783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0369 MHz
406 Power (INT ANT): 87%
Power Rise Time: < 5 ms
Phase Deviation: -1.09 +1.02 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.9 ms

DISCLAIMER: IN NO EVENT SHALL WS TECHNOLOGIES INC. OR ITS DISTRIBUTORS OR AGENTS BE LIABLE FOR ANY DAMAGES OR LOSSES INCURRED AS A RESULT OF THE USE OR FAILURE OF THIS MEASUREMENT EQUIPMENT.



Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.6 SALT FOG TEST

2.6.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A7.0

Note: Test performed in accordance with IEC 60945: 2002, Clause 8.7, analysis conducted indicates that the aforementioned clause outlines test conditions more severe than those of RTCM Paper 77-2002/SC110-STD, Clause A7.0. Test duration is much longer and storage times are at high humidity and temperature allowing ionic solution (salt spray) to remain more active (high temperature) on the surface of the EUT for longer without evaporating (high humidity). Hence, the EUT was “over tested”.

2.6.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.6.3 Date of Test and Modification State

09 March to 06 April 2007 - Modification State 1

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Set-up and Operating Modes

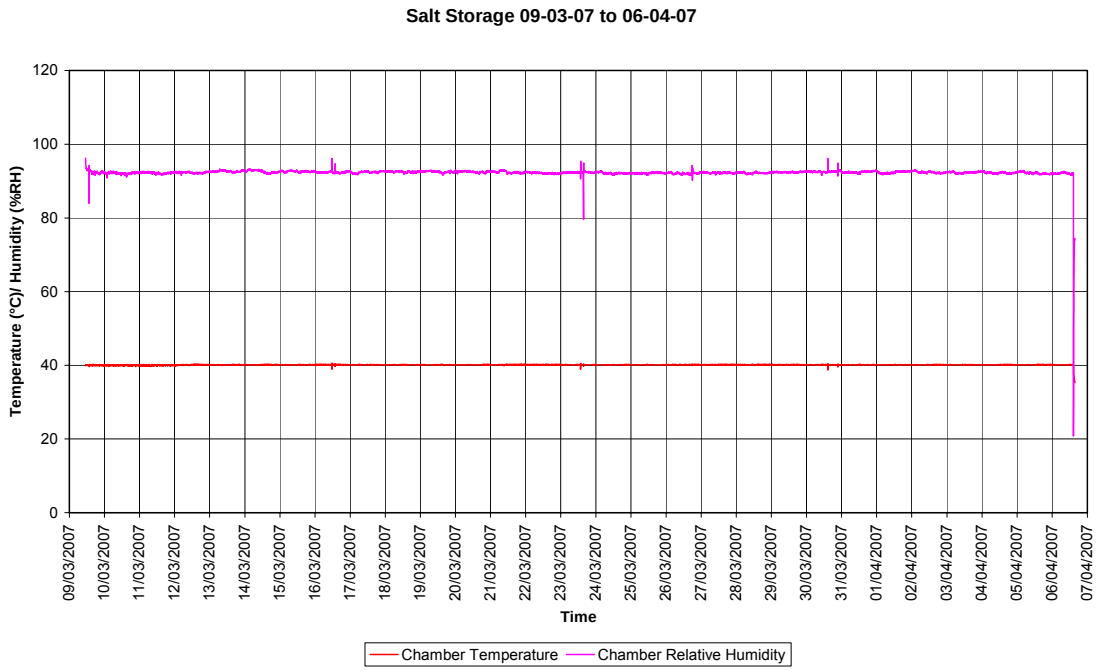
The test was performed with the EUT in the following mode(s): Idle

Test Set-up

Product Service

2.6.6 Environmental Conditions

Salt Spray Temperature Plot



Note: Plot shows several 'spikes' throughout the test – these were the result of removal of the test sample for the 2 hour salt sprays at 7 day intervals.

2.6.7 Test Results

Before the test the EUT was visually inspected for any signs of deterioration, none was found. The EUT was also subjected to an Aliveness Test, see Beacon Test Report below.

Posttest the EUT was inspected, no undue deterioration or corrosion of metal parts was noted. An Aliveness test was completed satisfactorily, see Beacon Test Report below

Product Service

Beacon Test Report (Aliveness Test, Pre-test)

Beacon Test Report

1925E847E0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 5/12/05 4:19:58 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

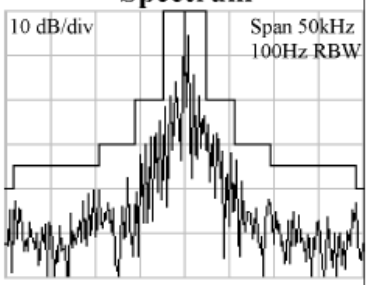
Notes: Add text comments here.

15 Hex ID: 1925E847E0FFBFF (1925E847E065C07)
Full Hex: FFFE2F8C92F423F032E03BBE5A378E46C33F
Burst Mode: Normal Mode (Long)
Protocol: EPIRB MMSI SLP Protocol
Country 201: Albania
MMSI: 999999
Beacon Number: 0
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°48'36"
Longitude: W 1°38'12"

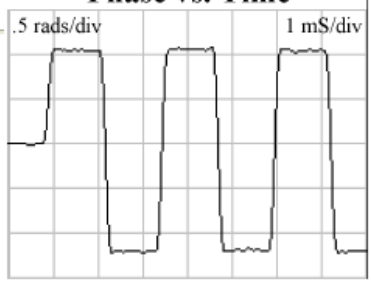
406 MHz Measurements
406 Frequency (INT REF): 406.037 MHz
406 Power (INT ANT): 38%
Power Rise Time: < 5 ms
Phase Deviation: -1.2 +1.06 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 399.5 bps
CW Preamble: 160.7 ms

Power vs. Time

Spectrum



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

A03D3CFCF400001

Organization:
Tested By:
Date: 21-Dec-07 4:14:53 PM
Tester Model/Serial No./File Name: BT100S/1025/00217-60945Tshock-SN003–2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 22°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: A03D3CFCF400001
Full Hex: FFFED0501E9E7E7A00000D504837
Burst Mode: Self Test Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 84%
Power Rise Time: < 5 ms
Phase Deviation: -1.1 +1.14 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 165 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 159.8 ms

121.5 MHz Measurements
121 Frequency (INT REF): Detected.
121 Power (INT ANT): 37%
Signal was unmodulated.

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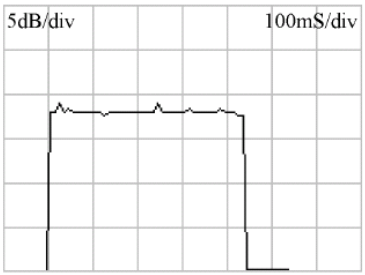
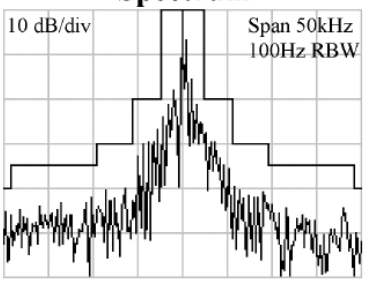
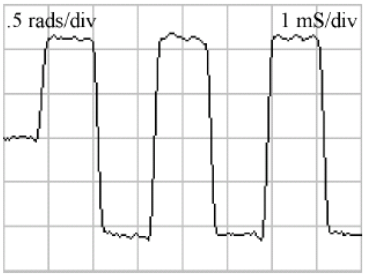
Power vs. Time



Spectrum



Phase vs. Time



Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.7 DROP TEST (ON HARD SURFACE)

2.7.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A8.1

2.7.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.7.3 Date of Test and Modification State

19 April 2007 - Modification State 2

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Test Set-up and Operating Modes

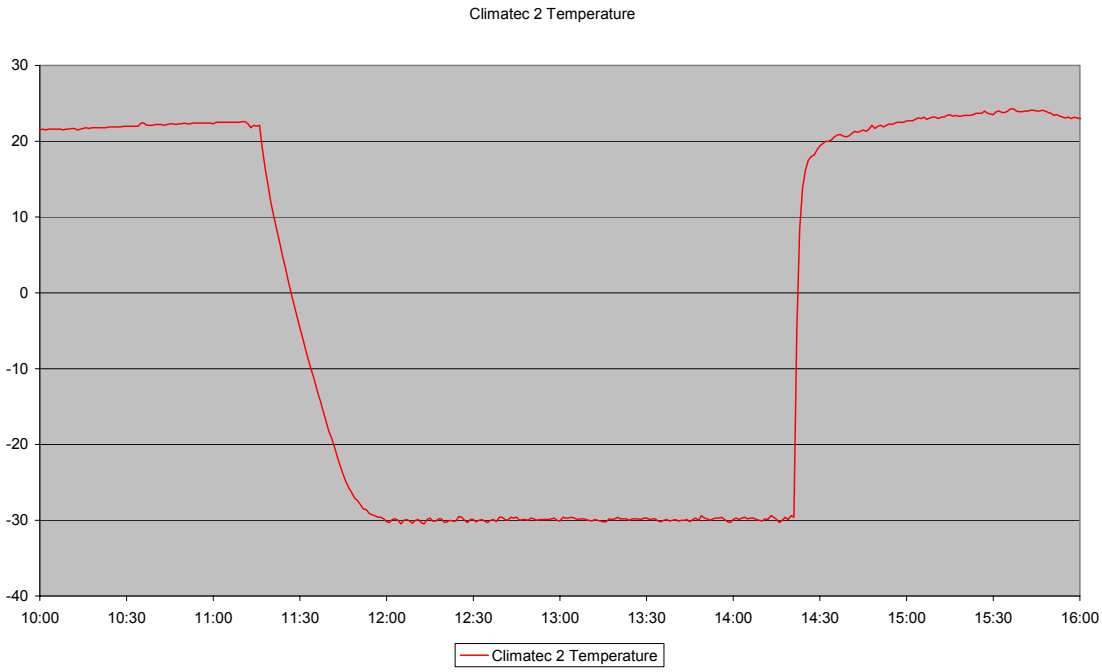
The test was performed with the EUT in the following mode(s): Idle

Test Set-up

Product Service

2.7.6 Environmental Conditions

Preconditioning Temperature Plot



2.7.7 Test Results

The test piece was located into the test chamber which was set to -30°C for 2 hours 21 minutes.

The test piece was removed and the Drop-test was performed as follows:

- 1 drop from a height of 1 metre onto the test surface

On completion of the drop test the EUT was subjected to an Aliveness Test; it continued to operate correctly.

Product Service

2.8 DROP TEST (IN WATER)

2.8.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A8.2

2.8.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.8.3 Date of Test and Modification State

26 June 2007 - Modification State 5

2.8.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.8.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle*

*Note: EUT activated (entered Operating mode automatically) on contact with water.

2.8.6 Test Results

Summary of Aliveness test results

Stage	Pass / Fail
Pre-Upright Test	Pass
Post-Upright Test	Pass
Pre-Inverted Test	Pass
Post-Inverted Test	Pass
Pre-Horizontal Test	Pass
Post-Horizontal Test	Pass

Product Service

Beacon Test Report (Aliveness Test, Pre-Upright Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:03:13 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPre–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 28°C

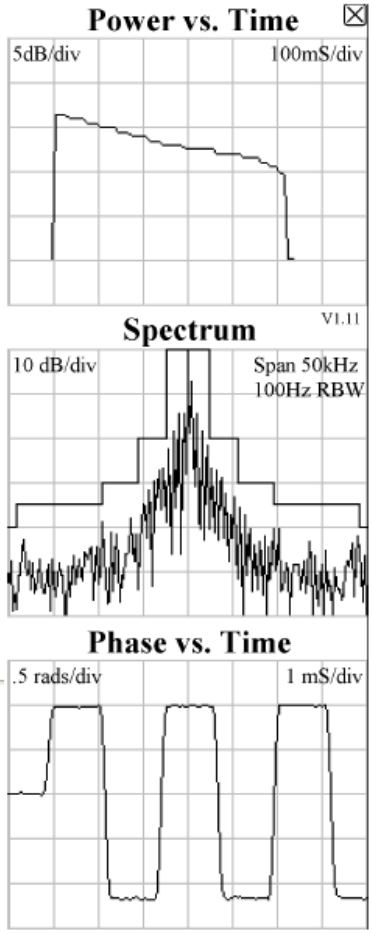
☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°30'00"
Longitude: W 2°30'00"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 34%
Power Rise Time: < 5 ms
Phase Deviation: -1.16 +0.98 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 1.2%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms



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Product Service

Beacon Test Report (Aliveness Test, Post-Upright Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:06:36 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPost–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

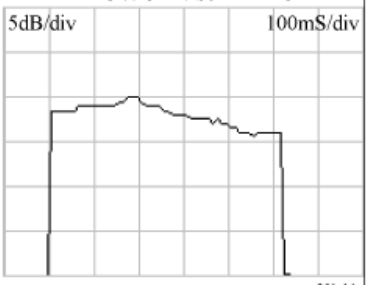
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

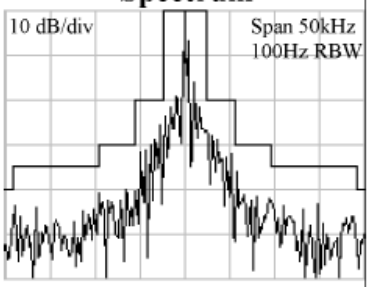
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°30'00"
Longitude: W 2°30'00"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 49%
Power Rise Time: < 5 ms
Phase Deviation: -0.98 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

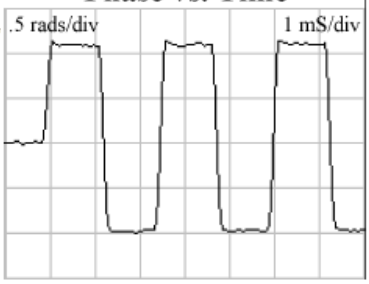
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, Pre-Inverted Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:19:55 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBinvertPre–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 28°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

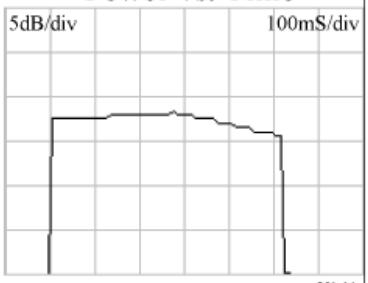
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB79083BE4F
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

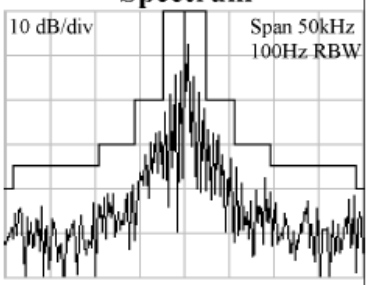
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°34'8"
Longitude: W 2°26'16"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 45%
Power Rise Time: < 5 ms
Phase Deviation: -0.97 +1.1 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

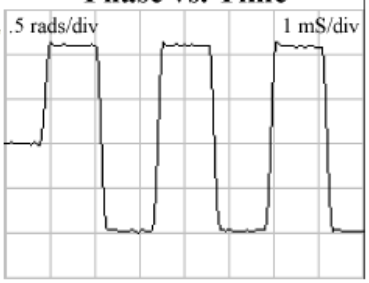
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, Post-Inverted Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 3:24:56 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBinvertPost–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 29°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

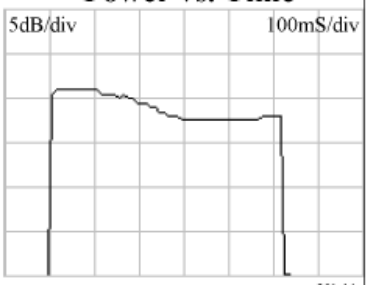
Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB79083BE4F
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°34'8"
Longitude: W 2°26'16"

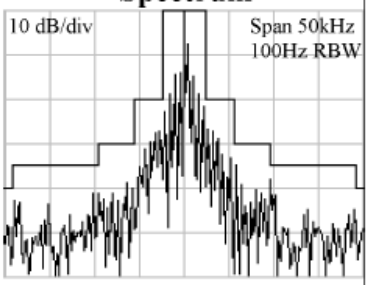
406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 62%
Power Rise Time: < 5 ms
Phase Deviation: -1 +1.07 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms

Power vs. Time

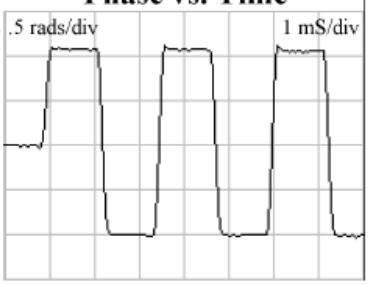


Spectrum

V1.11



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, Pre-Horizontal Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:50:15 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPre–4
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

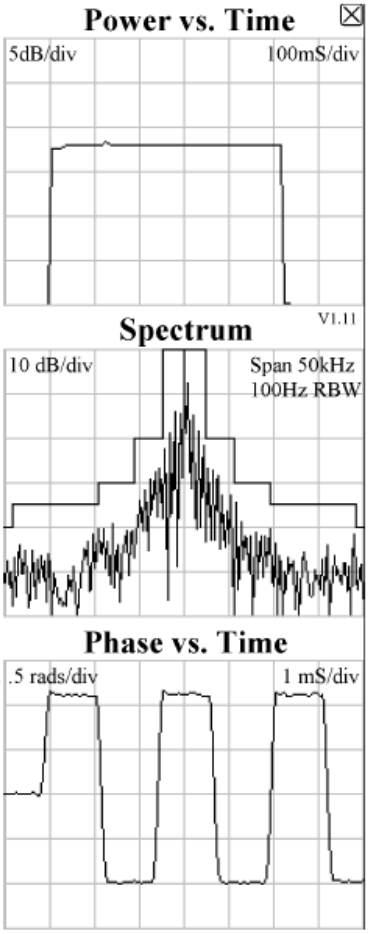
☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB79083BE4F
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°34'8"
Longitude: W 2°26'16"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 52%
Power Rise Time: < 5 ms
Phase Deviation: -0.98 +1.12 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 153 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.8 ms



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Product Service

Beacon Test Report (Aliveness Test, Post-Horizontal Test)

Beacon Test Report

203DE7E7A0FFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:56:13 PM
Tester Model/Serial No./File Name: BT100S/2383/EPIRBuprightPost–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 26°C

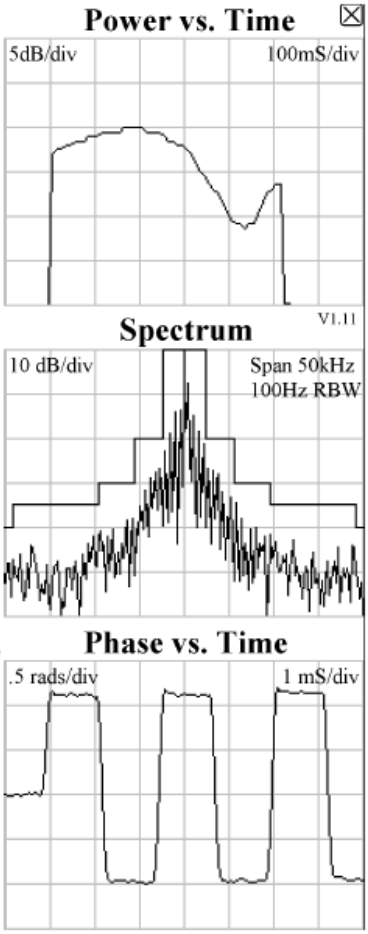
☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: 203DE7E7A0FFBFF (203DE7E7A06540A)
Full Hex: FFFED0901EF3F3D032A05203BAB7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 15987664

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: N 50°30'00"
Longitude: W 2°30'00"

406 MHz Measurements
406 Frequency (INT REF): 406.0368 MHz
406 Power (INT ANT): 52%
Power Rise Time: > 5 ms
Phase Deviation: -0.96 +1.11 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 1.1%
Modulation Bit Rate: 399.7 bps



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Product Service

2.9 LEAKAGE AND IMMERSION TEST

2.9.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A9.0

2.9.2 Equipment Under Test

Tron 40S MkII, Serial Number 003

2.9.3 Date of Test and Modification State

25 to 28 January 2008 - Modification State 7

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle*

*Note: EUT activated (entered Operating mode automatically) on contact with water.

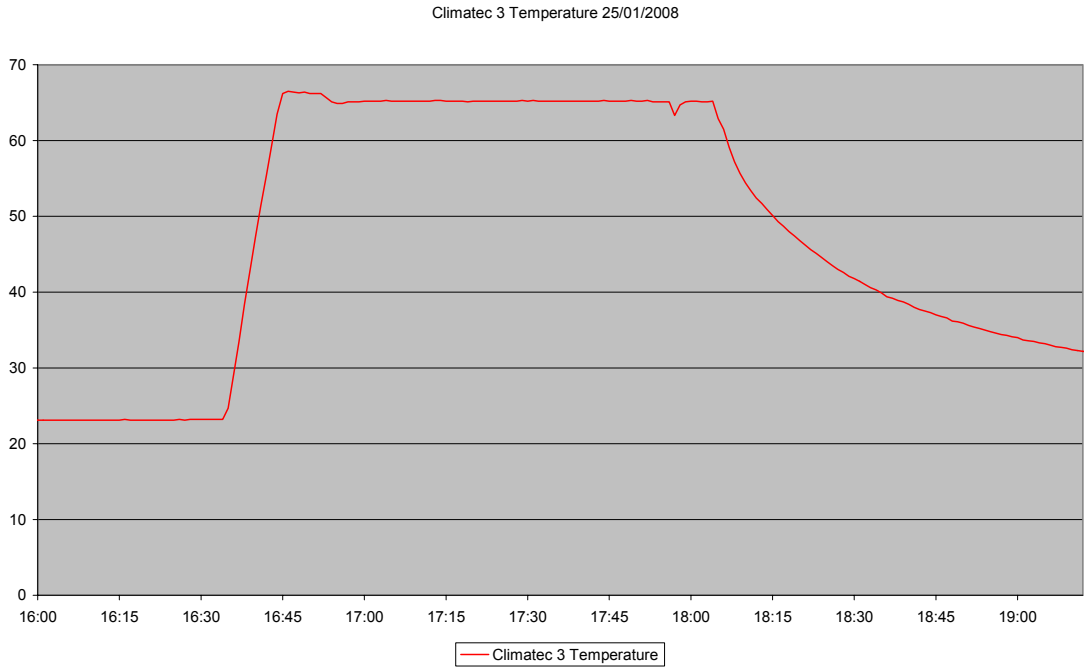
Product Service

Test Set-up

Product Service

2.9.6 Environmental Conditions

EUT Pre-conditioning



Product Service

2.9.7 Test Results

25 January 2008

Prior to the commencement of the testing the EUT was subjected to an Aliveness Test and weighed:

- The test item operated correctly.
- Dry weight = 1.920 kg

The EUT was placed in the climatic chamber and preconditioned at a temperature of +65°C for 1 hour.

The EUT was located into the pressure vessel which had been filled with water (water temperature 19.8°C). The unit activated the moment it was immersed. The unit was prevented from floating to the surface with the use of a 5kg mass as seen in Test Setup, above.

28 January 2008

>48 hours after immersion the pressure was increased to +981 mbar (relative to atmospheric pressure) and maintained for a duration of 5 minutes 21 seconds.

The EUT was removed from the pressure vessel for post-test inspection. The test item was dried and its weight was recorded:

- Unit weight (post-test): 1.933 kg
- An Aliveness Test was conducted (see Beacon Test Report, below).

Detailed inspection of the EUT (involving partial dismantling) was conducted and, as no moisture was found inside, the additional 13g of water was attributed to water contained within the tether and outer portion of seals and switches.

Product Service

Beacon Test Report (Aliveness Test, Pre-test)

Beacon Test Report

A03D3CFCF400001

Organization:
Tested By:
Date: 25-Jan-08 4:20:27 PM
Tester Model/Serial No./File Name: BT100S/1025/00217_003-PreLeakage–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 20°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: A03D3CFCF400001
Full Hex: FFFED0501E9E7E7A00000D504837
Burst Mode: Self Test Mode (Short)
Protocol: Test User Protocol
Country 257: Norway
National Use: 21783256236033

Emergency type: Non-Maritime
Activation type: Auto

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 89%
Power Rise Time: > 5 ms
Phase Deviation: -1.11 +1.12 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.5 bps

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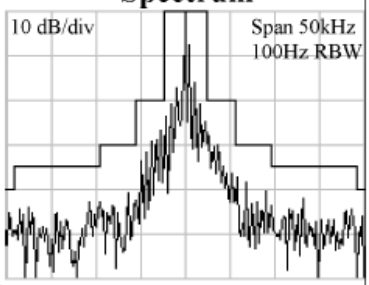
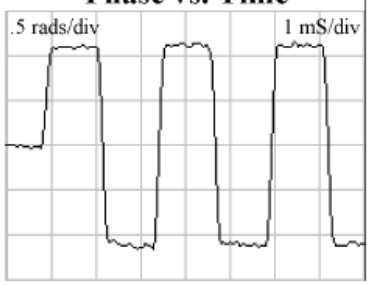
Power vs. Time

Spectrum



Phase vs. Time



Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

2025E7E7A0FFBFF

Organization:
Tested By:
Date: 28-Jan-08 10:42:56 AM
Tester Model/Serial No./File Name: BT100S/1025/00217_003-PostLeakage–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 20°C

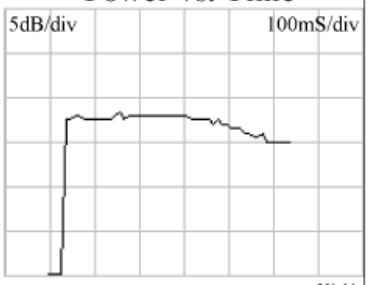
☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

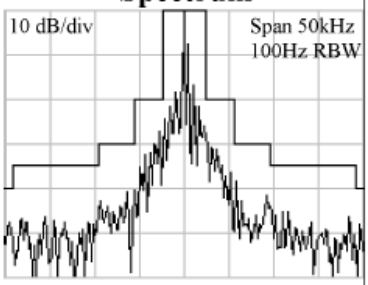
15 Hex ID: 2025E7E7A0FFBFF
Full Hex: FFFED09012F3F3D07FDFF964A0B7
Burst Mode: Self Test Mode (Short)
Protocol: EPIRB MMSI SLP Protocol
Country 257: Norway
MMSI: 999229
Beacon Number: 0
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * ***°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 88%
Power Rise Time: > 5 ms
Phase Deviation: -1.02 +1.07 radians
Modulation Rise Time: 153 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps

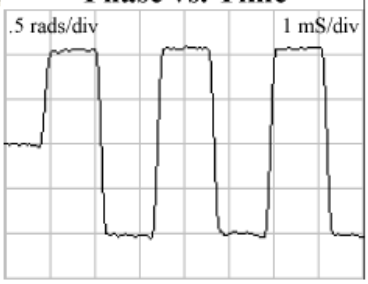
Power vs. Time



Spectrum



Phase vs. Time



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Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.10 SPURIOUS EMISSIONS TEST

2.10.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A10.0

2.10.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.10.3 Date of Test and Modification State

406 MHz Test at Ambient:	13 July 2007	- Modification State 5
121 MHz Test at Ambient:	30 August 2007	- Modification State 6
406 MHz Test at +55°C:	03 July 2007	- Modification State 5
121 MHz Test at +55°C:	14 September 2007	- Modification State 7
406 MHz Test at -20°C:	04 July 2007	- Modification State 5
121 MHz Test at -20°C:	12 September 2007	- Modification State 7

2.10.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

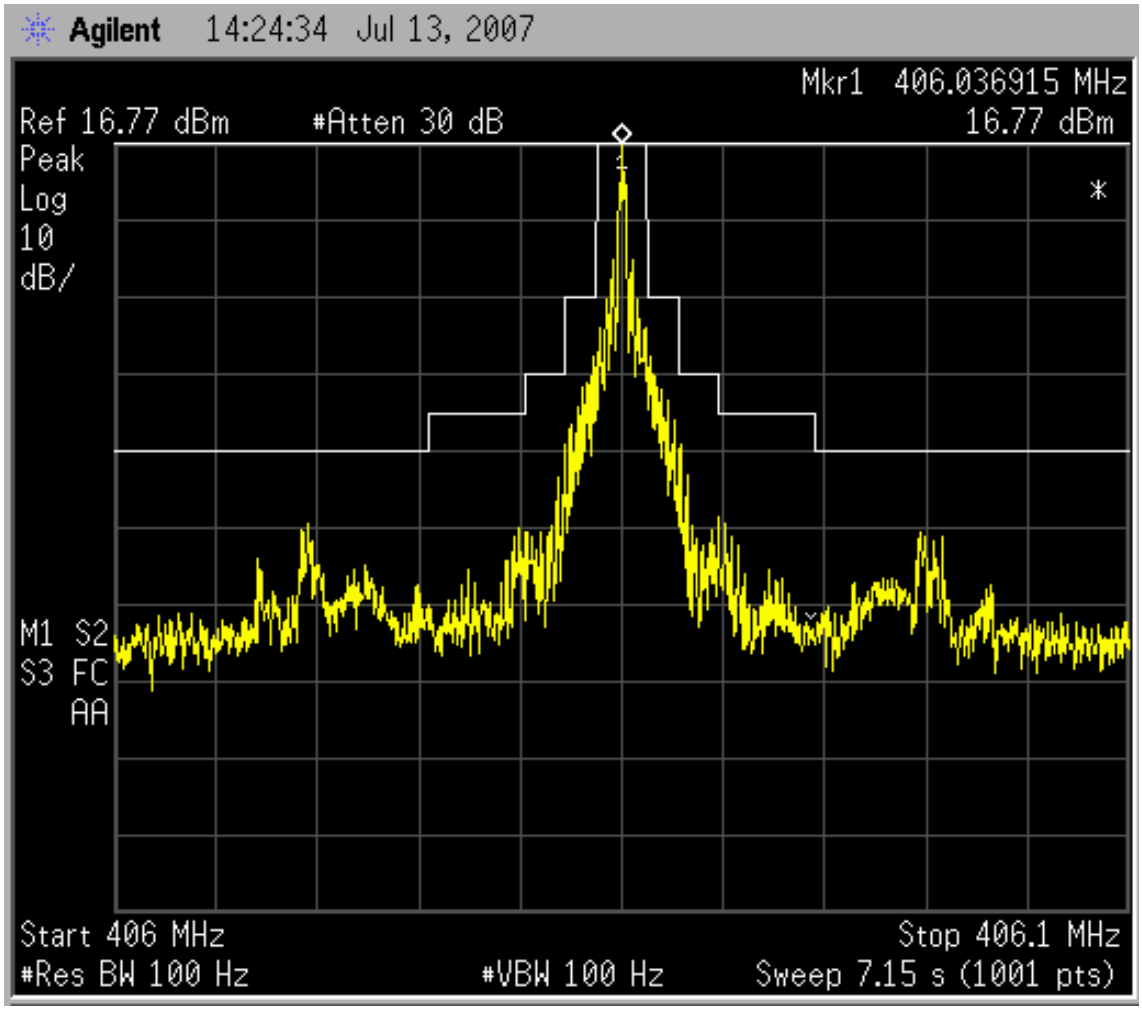
2.10.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

Product Service

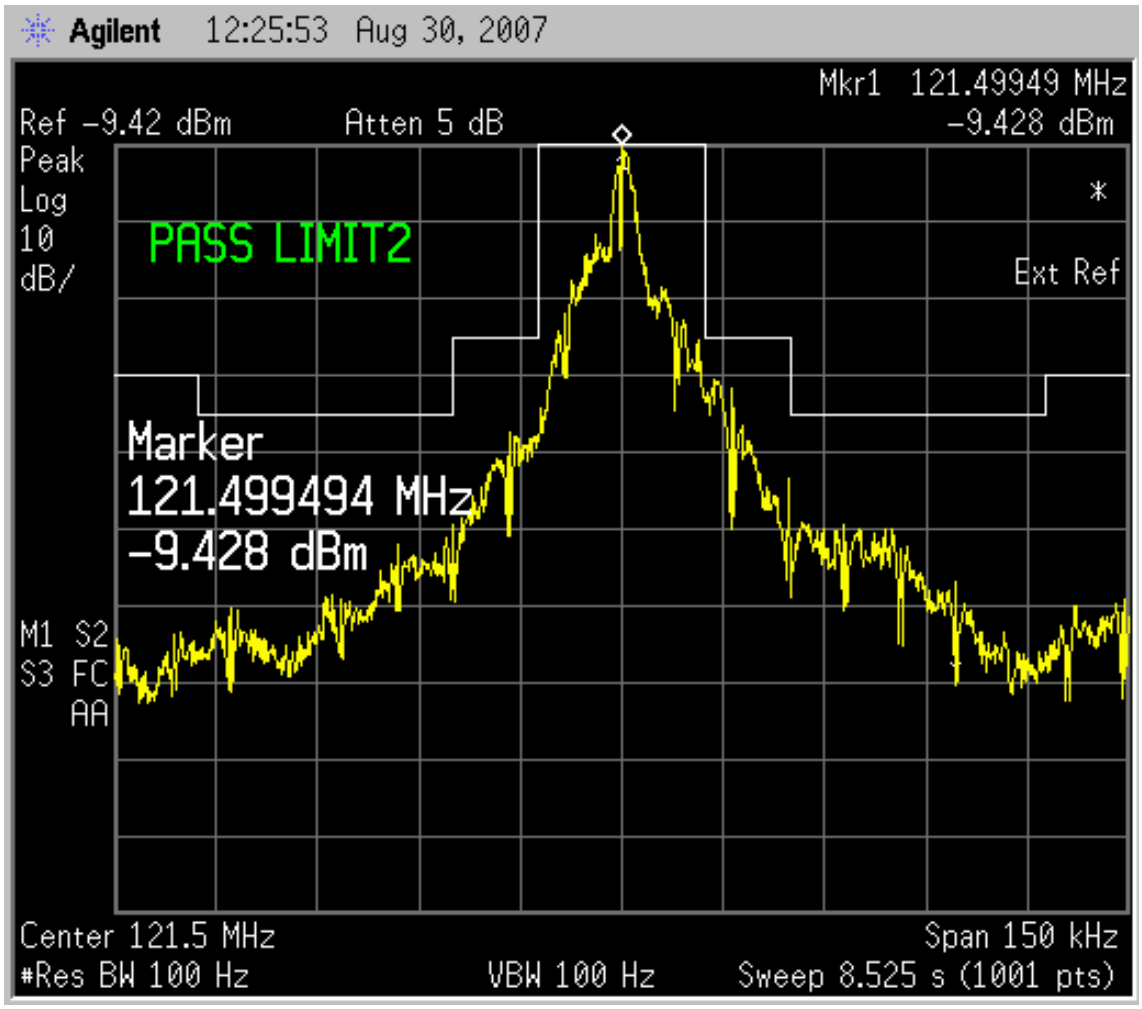
2.10.6 Test Results

406 MHz Test at Ambient



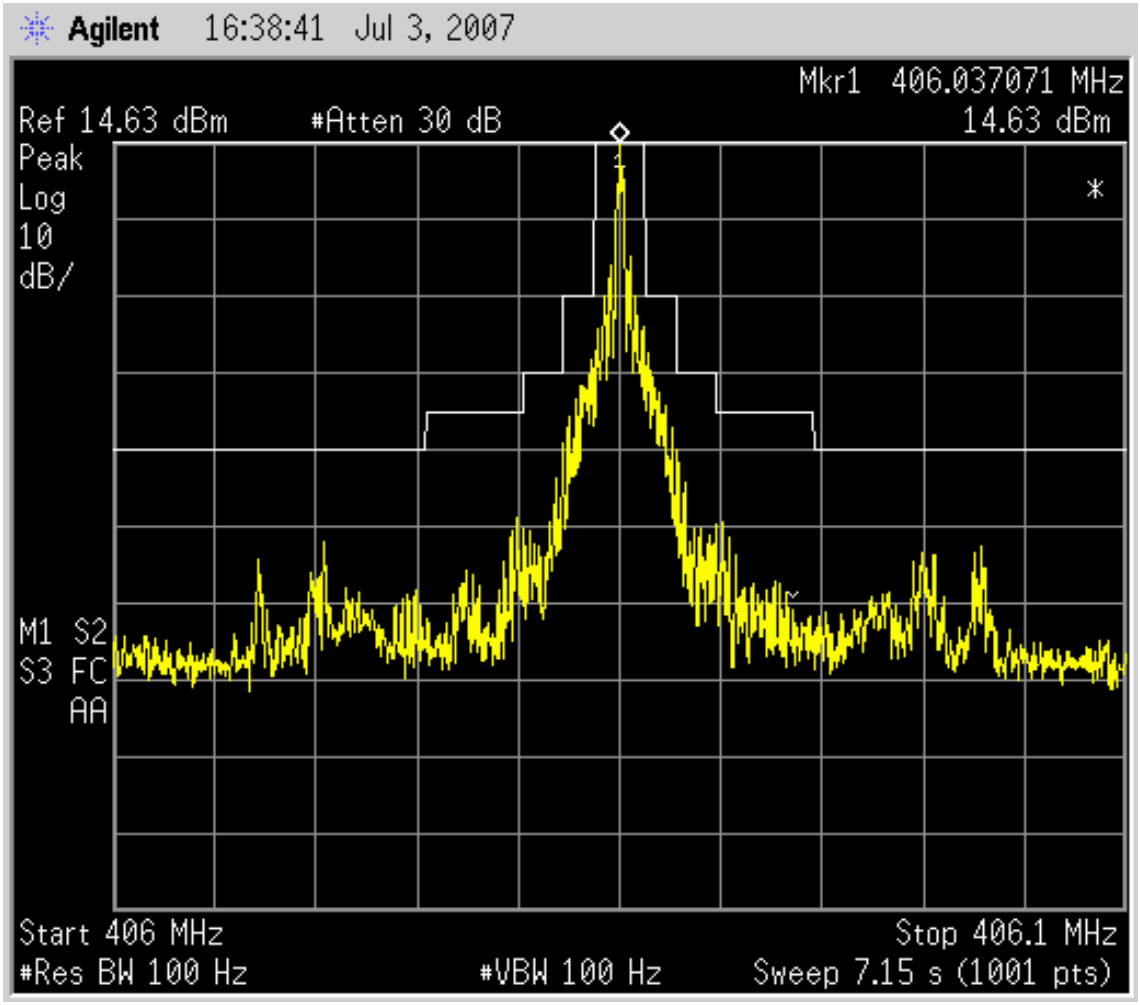
Product Service

121 MHz Test at Ambient



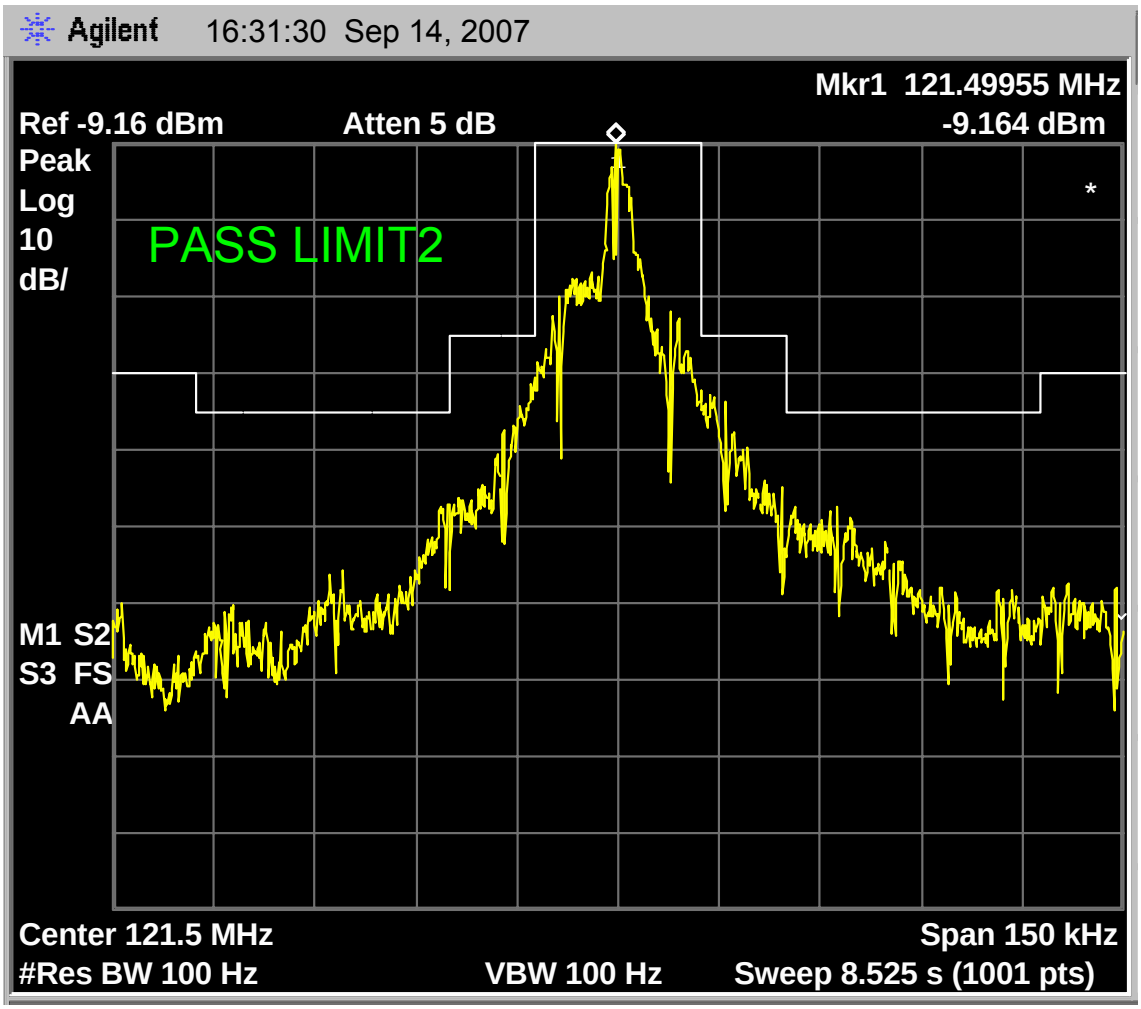
Product Service

406 MHz Test at +55°C



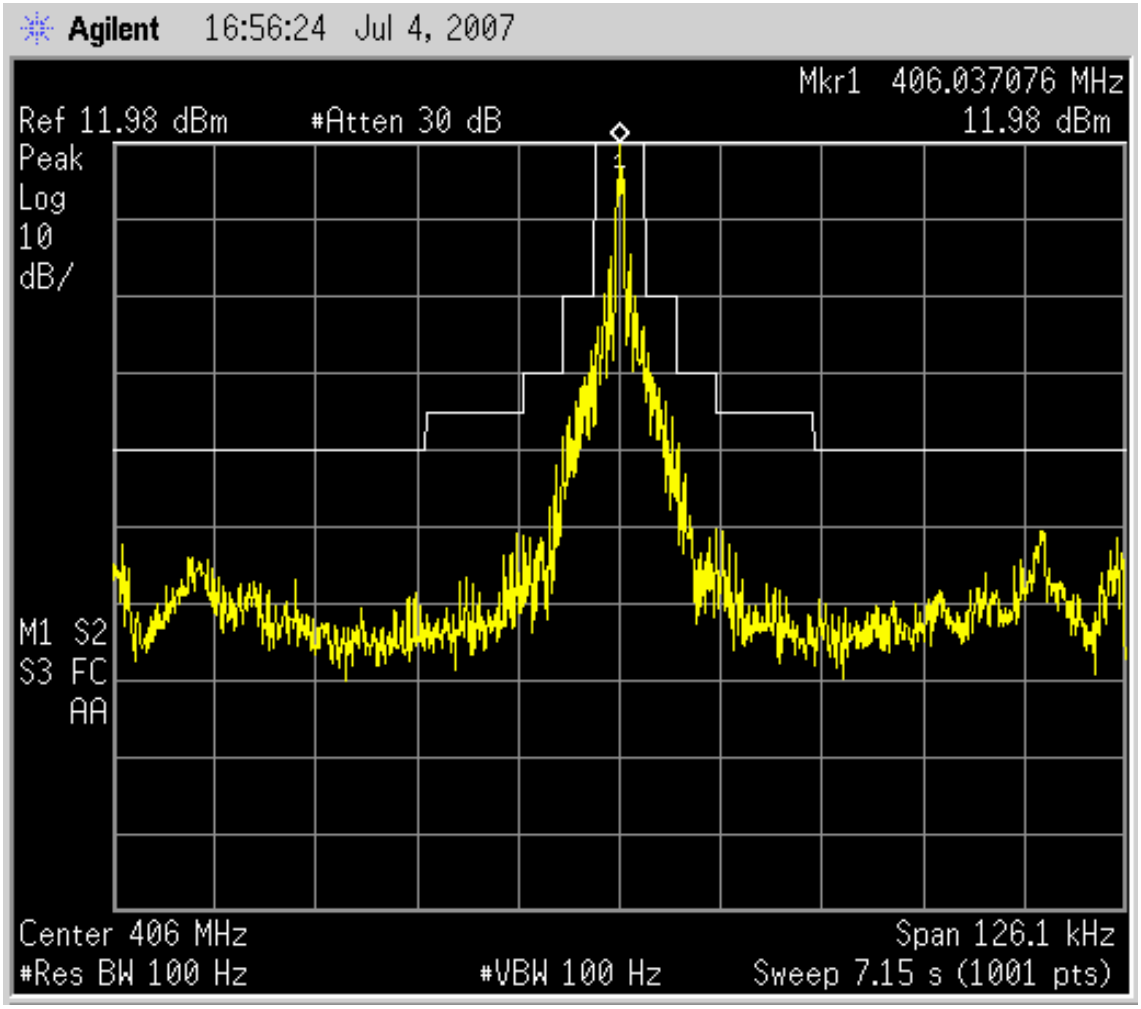
Product Service

121 MHz Test at +55°C



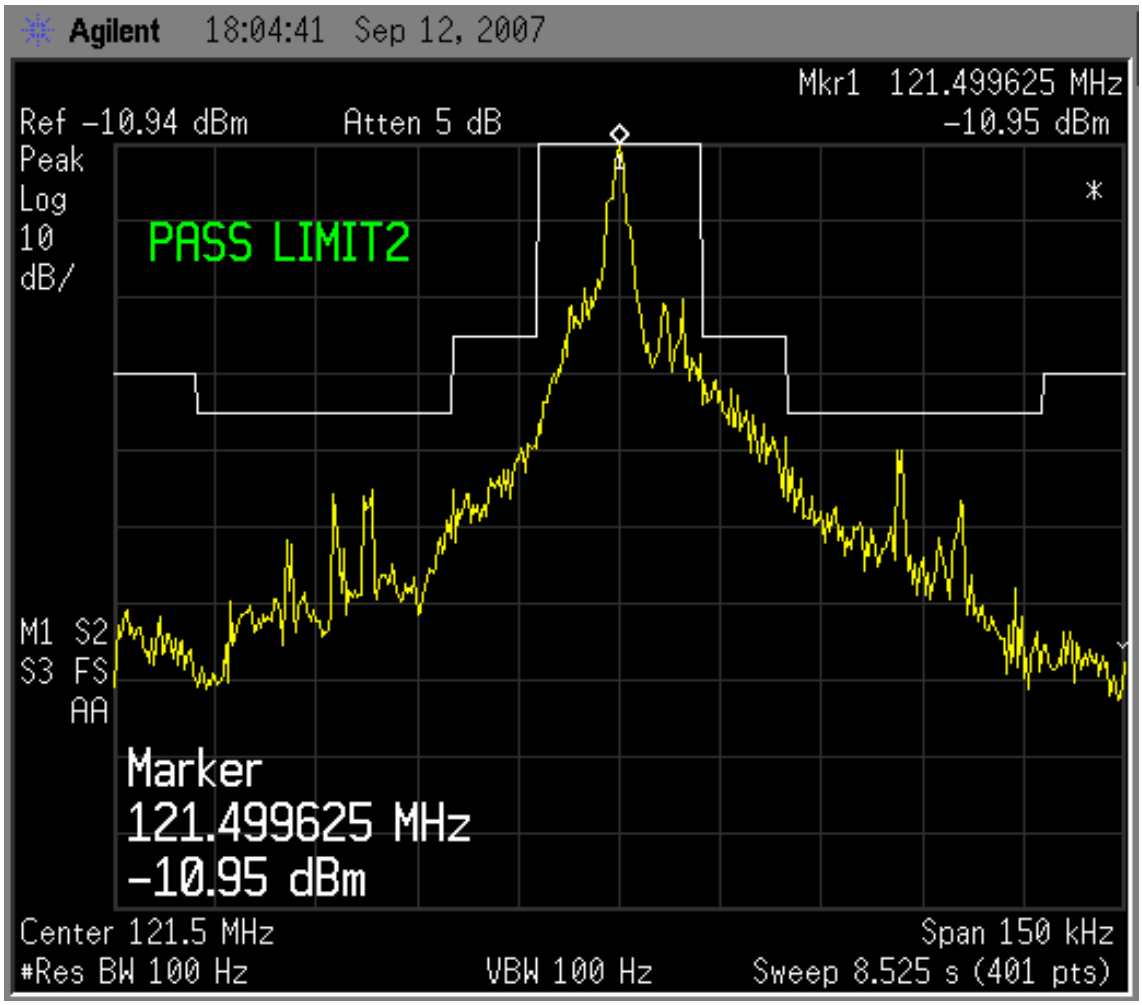
Product Service

406 MHz Test at -20°C



Product Service

121 MHz Test at -20°C



Product Service

2.11 LOW-TEMPERATURE THERMAL SHOCK TEST

2.11.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A11.1

2.11.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.11.3 Date of Test and Modification State

11 September 2007 - Modification State 6

2.11.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.11.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle (“Ready Condition”)*

*Note: EUT activated (entered Operating mode automatically) on contact with water – see Test Results for details.

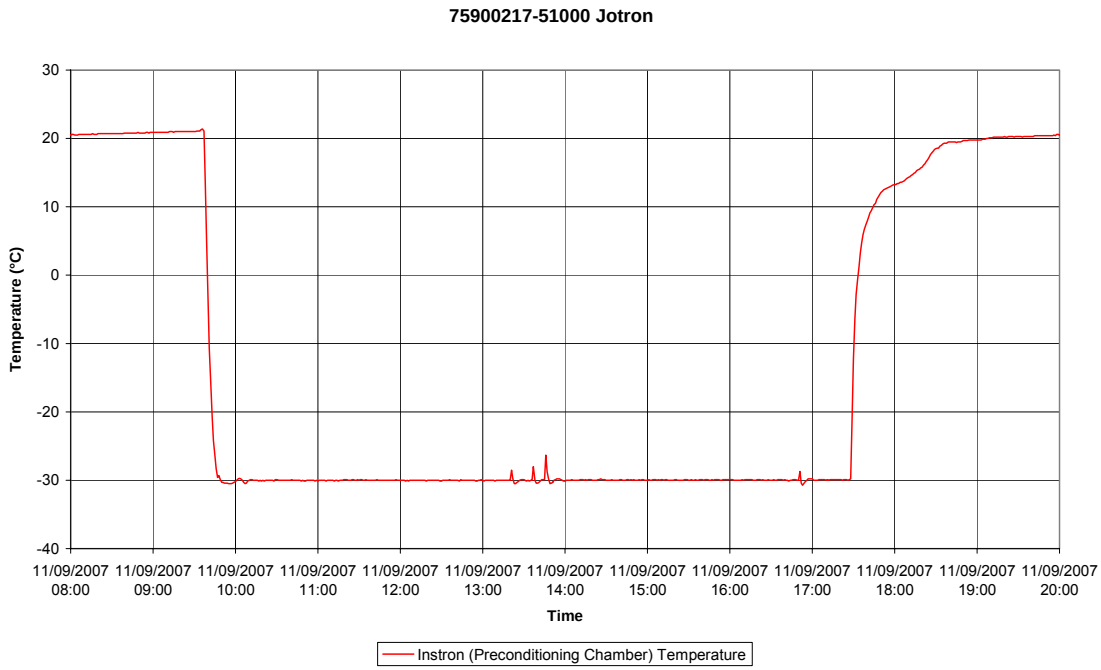
Test Set-up – Preconditioning

Product Service

Test Set-up – During Test

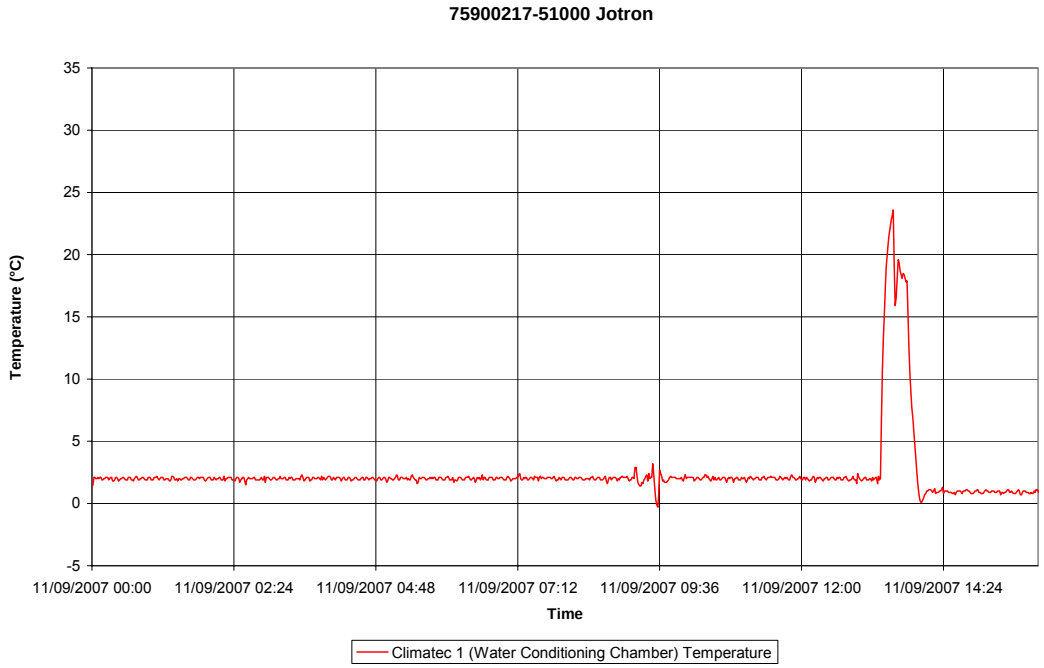
2.11.6 Environmental Conditions

Preconditioning Temperature Plot



Product Service

Water Conditioning Temperature Plot



2.11.7 Test Results

EUT set to the Ready Condition and placed in the climatic chamber set to -30°C for a stabilisation of approximately 3 hours 30 minutes.

EUT removed from chamber and totally immersed in fresh water at 2.0°C for 10 seconds then allowed to float in the same water for a further 5 minutes. EUT activated but deactivated approximately one minute later.

EUT removed from water. Ice observed on self-activation contacts, ice removed from one of the contacts and EUT placed back into the water. EUT self-activated immediately and remained active for 5 minutes until EUT was removed from water.

EUT removed from water, dried and deactivated automatically then set to the Ready condition then replaced in the climatic chamber, chamber temperature still at -30°C.

EUT removed from chamber after stabilisation of approximately 3 hours 20 minutes and totally immersed in salt water at 1.6°C for 10 seconds then allowed to float in the same water. EUT self-activated immediately as it was immersed and an Aliveness Test was performed, see Beacon Test Report below.

After 20 minutes the following measurements were conducted (results can be found in the Test Results Table, starting on page 15):

- Short-term frequency stability
- Medium-term frequency stability
    - Mean slope
    - Residual frequency variation

EUT was removed from water, dried and deactivated.

Product Service

Beacon Test Report (Activation In Fresh Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 11-Sep-07 1:26:34 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Cold-Fresh–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 26°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

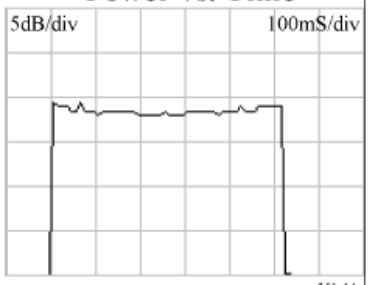
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFED08C9EF423F07FDFFA53F7F783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

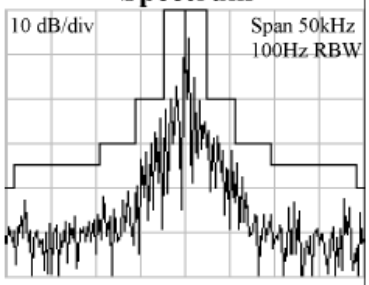
406 MHz Measurements
406 Frequency (INT REF): 406.0371 MHz
406 Power (INT ANT): 64%
Power Rise Time: < 5 ms
Phase Deviation: -1.05 +1.13 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 117 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.6 ms

Power vs. Time

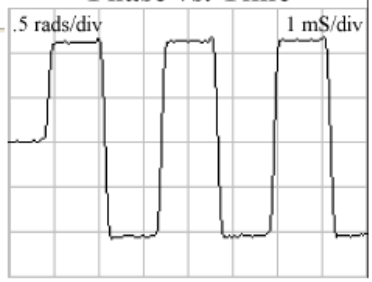


V1.11

Spectrum



Phase vs. Time



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Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Activation In Salt Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 11-Sep-07 4:50:57 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Cold-Salt-EPIRB–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 28°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

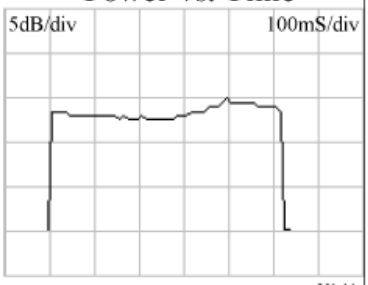
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFE2F8C9EF423F07FDFFA53F7F783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

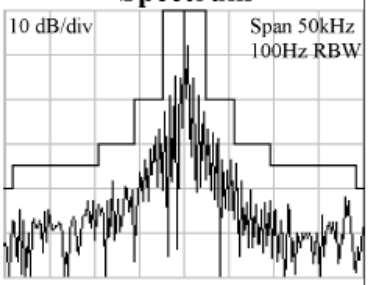
406 MHz Measurements
406 Frequency (EXT REF): 406.036808 MHz
406 Power (INT ANT): 29%
Power Rise Time: < 5 ms
Phase Deviation: -0.93 +1.12 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.8%
Modulation Bit Rate: 399.7 bps
CW Preamble: 161 ms

Power vs. Time

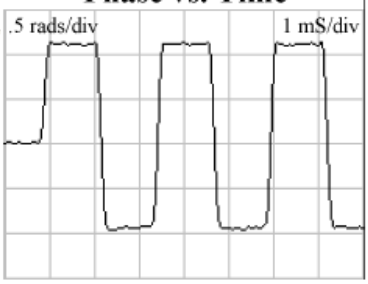


Spectrum

V1.11



Phase vs. Time



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Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.12 HIGH-TEMPERATURE THERMAL SHOCK TEST

2.12.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A11.1

2.12.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.12.3 Date of Test and Modification State

12 September 2007 - Modification State 6

2.12.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.12.5 Test Set-up and Operating Modes

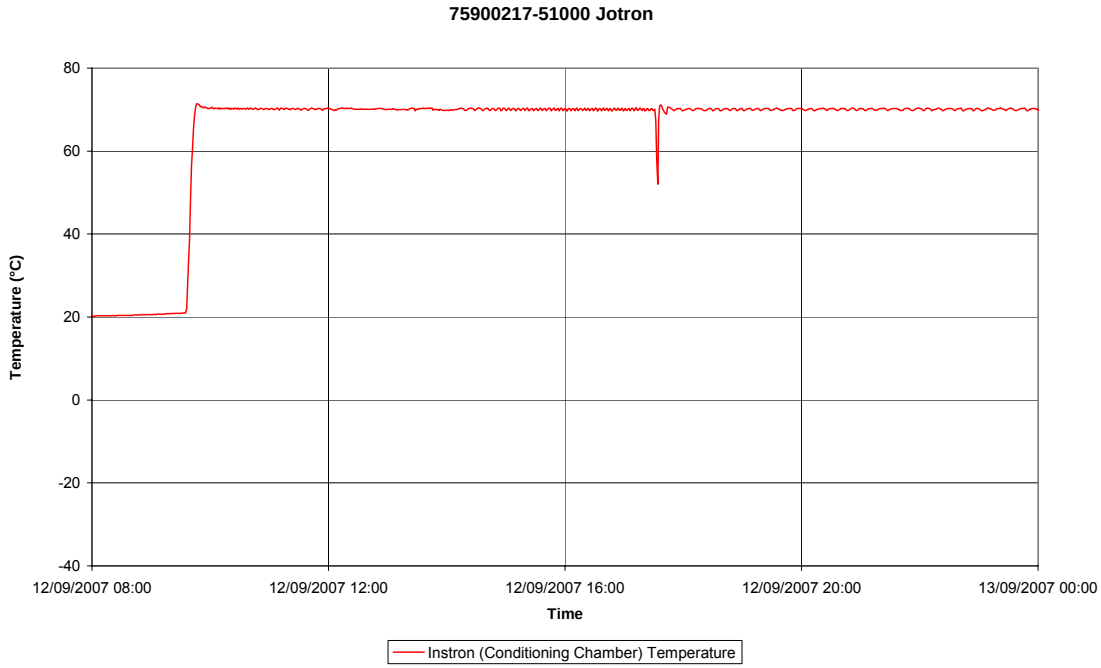
The test was performed with the EUT in the following mode(s): Idle (“Ready Condition”)*

*Note: EUT activated (entered Operating mode automatically) on contact with water.

Physical test configuration: as per Low-Temperature Thermal Shock Test, above.

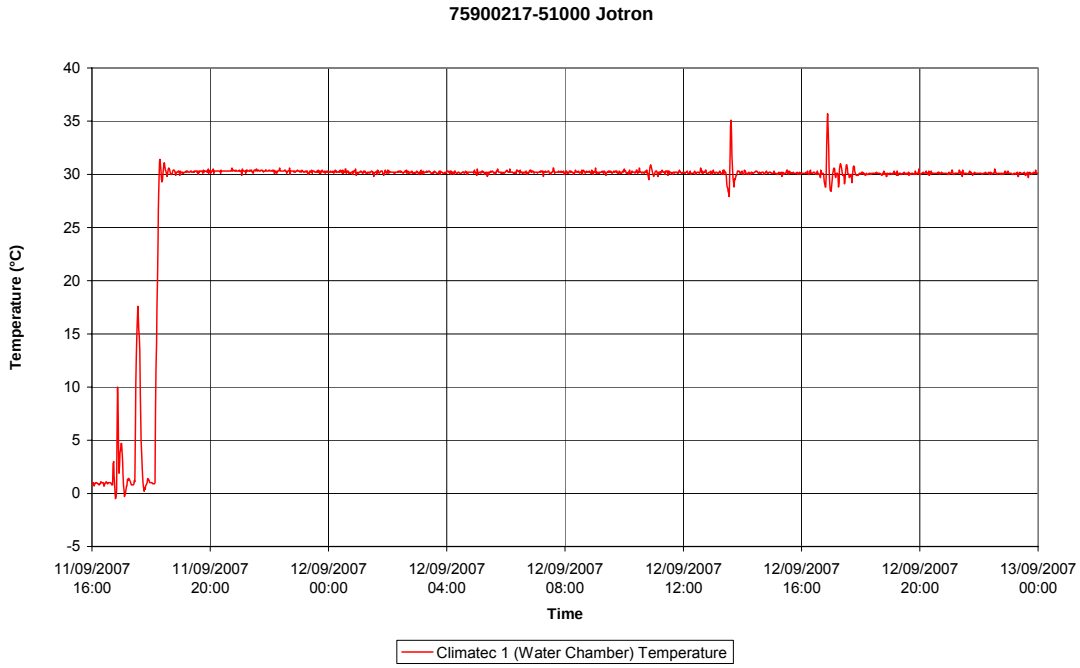
2.12.6 Environmental Conditions

Preconditioning Temperature Plot 1



Product Service

Water Conditioning Temperature Plot 1



2.12.7 Test Results

EUT set to the Ready condition then placed in the climatic chamber. Chamber set to +70°C for a stabilisation of approximately 3 hours 40 minutes.

EUT removed from chamber and totally immersed in fresh water at 28.7°C for 10 seconds then allowed to float in the same water for a further 5 minutes. EUT self-activated immediately as it was immersed and an Aliveness Test was performed, see Beacon Test Report below.

EUT removed from water, dried and deactivated automatically then set to the Ready condition then replaced in the climatic chamber, chamber temperature still +70°C.

EUT removed from chamber after stabilisation of approximately 3 hours 10 minutes and totally immersed in salt water at 29.0°C for 10 seconds then allowed to float in the same water. EUT self-activated immediately as it was immersed and an Aliveness Test was performed, see Beacon Test Report below.

After 20 minutes the following measurements were conducted (results can be found in the Test Results Table, starting on page 15):

- Short-term frequency stability
- Medium-term frequency stability
    - Mean slope
    - Residual frequency variation

EUT was removed from water, dried and deactivated.

Product Service

Beacon Test Report (Aliveness Test, In Fresh Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 12-Sep-07 1:26:54 PM
Tester Model/Serial No./File Name: BT100S/1025/00217-Shock-Hot–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 27°C

☐ **PASS** ☐ **FAIL** **INITIALS:_____**

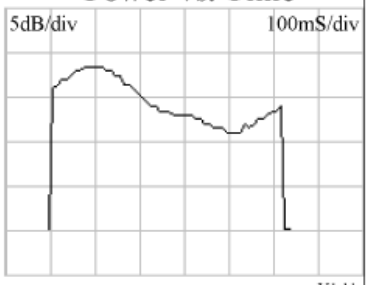
Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFED08C9EF423F07FDFFA53F7F7
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

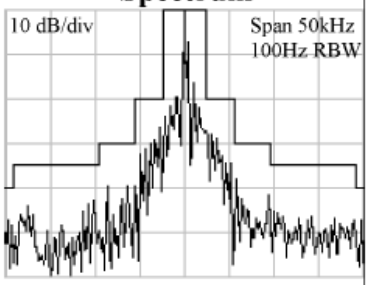
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0371 MHz
406 Power (INT ANT): 41%
Power Rise Time: < 5 ms
Phase Deviation: -1.03 +1.09 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 142 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms

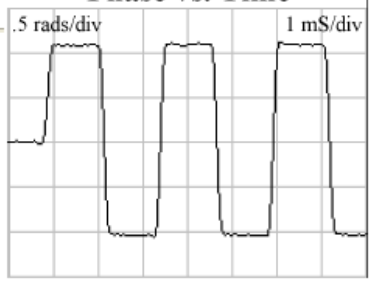
Power vs. Time



Spectrum



Phase vs. Time



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Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

Beacon Test Report (Aliveness Test, In Salt Water)

Beacon Test Report

193DE847E0FFBFF

Organization:
Tested By:
Date: 12-Sep-07 4:47:33 PM
Tester Model/Serial No./File Name: BT100S/1025/00217-Hot-Salt–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 29°C

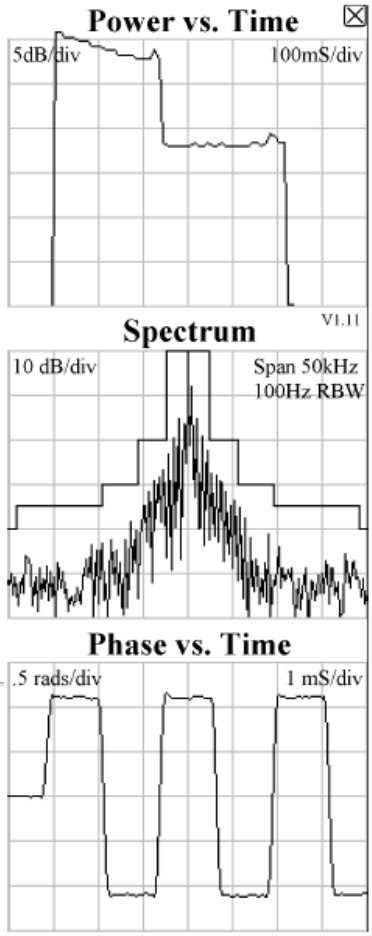
☐ **PASS** ☐ **FAIL** **INITIALS:_____**

Notes: Add text comments here.

15 Hex ID: 193DE847E0FFBFF
Full Hex: FFFE2F8C9EF423F07FDFFA53F7F7
Burst Mode: Normal Mode (Short)
Protocol: Standard Test Protocol
Country 201: Albania
Bits 41 - 64: 15999984

Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0372 MHz
406 Power (INT ANT): 81%
Power Rise Time: < 5 ms
Phase Deviation: -1.09 +1.1 radians
Modulation Rise Time: 130 uS
Modulation Fall Time: 130 uS
Modulation Symmetry: 0.4%
Modulation Bit Rate: 399.7 bps
CW Preamble: 160.7 ms



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Note: The “Tester Cal Due Date” is expired; this item of test equipment is “TU”: Traceability Unscheduled.

Product Service

2.13 OPERATIONAL LIFE TEST

2.13.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A13.1

2.13.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.13.3 Date of Test and Modification State

16 to 20 August 2007 - Modification State 6

2.13.4 Test Equipment Used

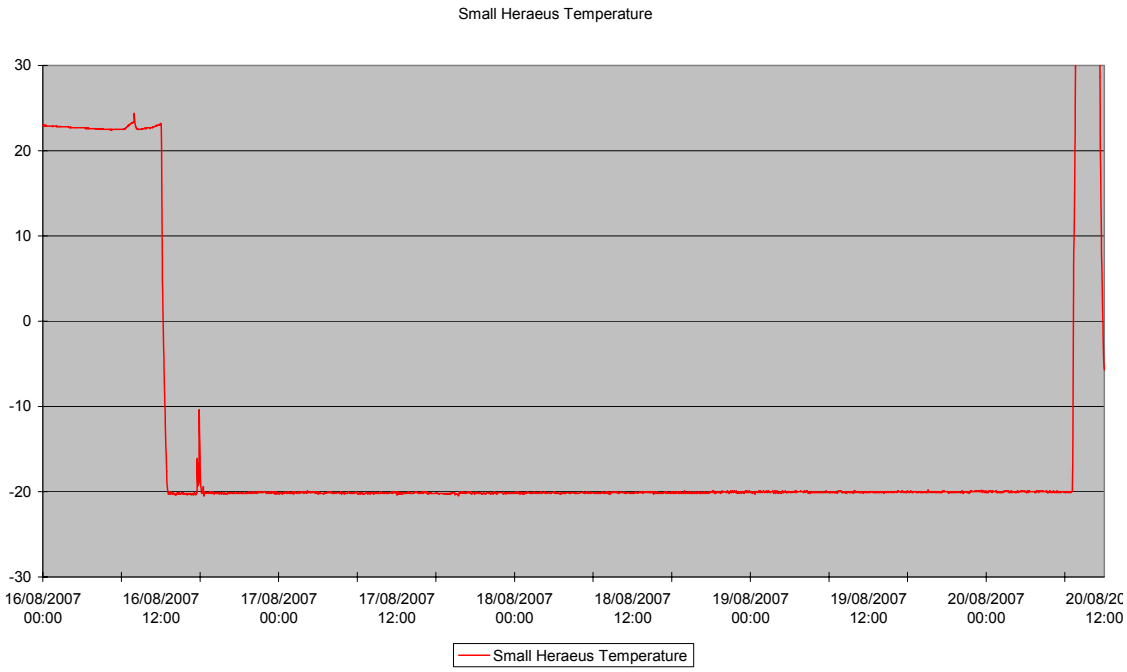
The major items of test equipment used for the above tests are identified in Section 3.1.

2.13.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.13.6 Environmental Conditions

Temperature Plot



Product Service

2.13.7 Pre-Test Results

Battery Discharge Current

The discharge current for the batteries was measured for each of the following beacon states.

Beacon in the Off or Standby State, "Standby Current"
Beacon performing a Self-test, "Self-test Current"
Beacon activated and transmitting, "Operating Current"

The individual tests were conducted for the following durations:

Standby Current	:	30 minutes	(1799920 ms)
Self-test Current	:	7.92 seconds	(7920 ms)
Operating Current	:	30 minutes	(1799920 ms)

Assumptions / Supplied Data

Battery Replacement Interval*	: 5 years	* "Expiry Date"
Useful Battery Life	: 10 years	
Battery Capacity	: 7.2 Ah	
Battery Self Drain	: 3.00 % per year	
Self-test Interval	: 12 tests per year	

Test Results

Mode Current	= Accumulated Charge	/ Time		
Standby Current	= 1195585605 pC	/ 1799920 ms	= 664.24	nA
Self-test Current	= 905591.2 uC	/ 7920 ms	= 114.34	mA
Operating Current	= 121755156 uC	/ 1799920 ms	= 67.64	mA

Battery Preconditioning / Discharge Time Calculations

Battery Self Drain = Capacity - [(100% - Self Drain/Year%)$^{\text{Replacement Interval}}$ x Capacity]
= 7.2- ((1- 0.0300) ^{10} x 7.2) = 1.8905 Ah

Standby Drain = Hours per year x Battery Replacement Interval x Standby Current
= 365 x 24 x 5 x 664.24 x 10^{-9} = 0.0291 Ah

Self-test Drain = Self-tests per battery x Self-test Current x Self-test duration (in hours)
= 12 x 5 x 114.34 x 10^{-3} x (7.92 / 3600) = 0.0151 Ah

Total Drain = Self Drain + Standby Drain (Worst Case) + Self-test Drain (Worst Case)
= 1.8905 + 0.0291 + 0.0151 = 1.9347 Ah

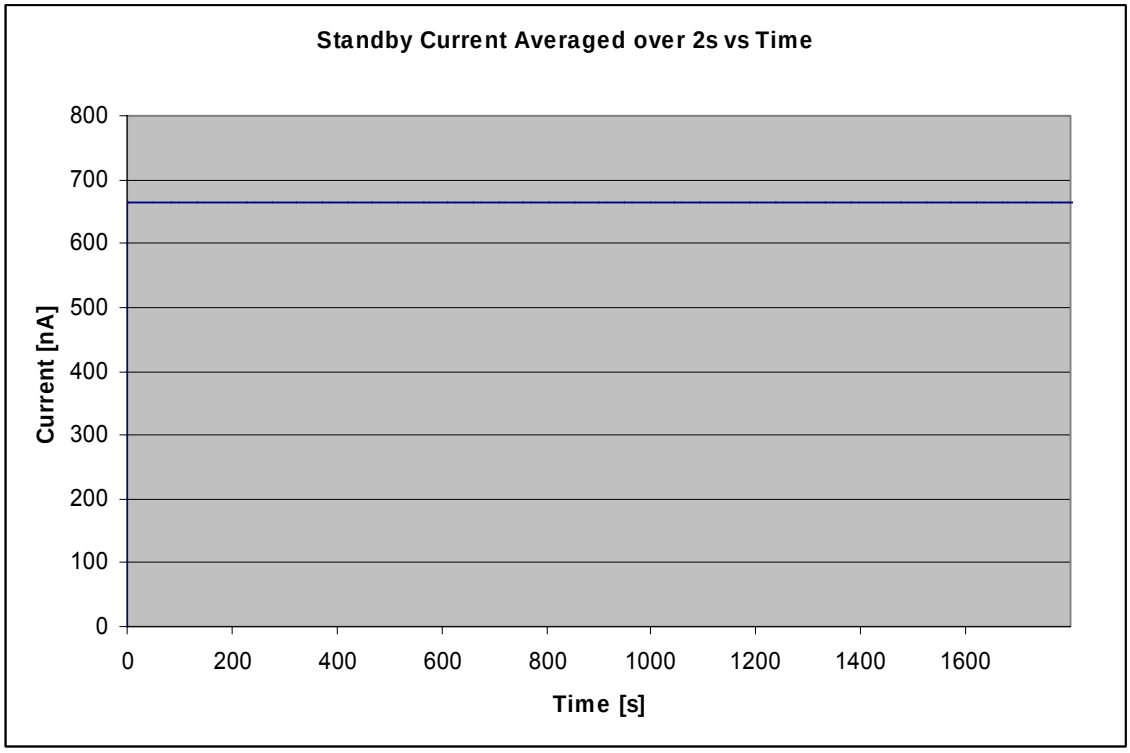
Battery Preconditioning / Discharge Time = Worst Case drain / Operational Current
= 1.9347 / (67.64 x 10^{-3})
= 28.60 hours

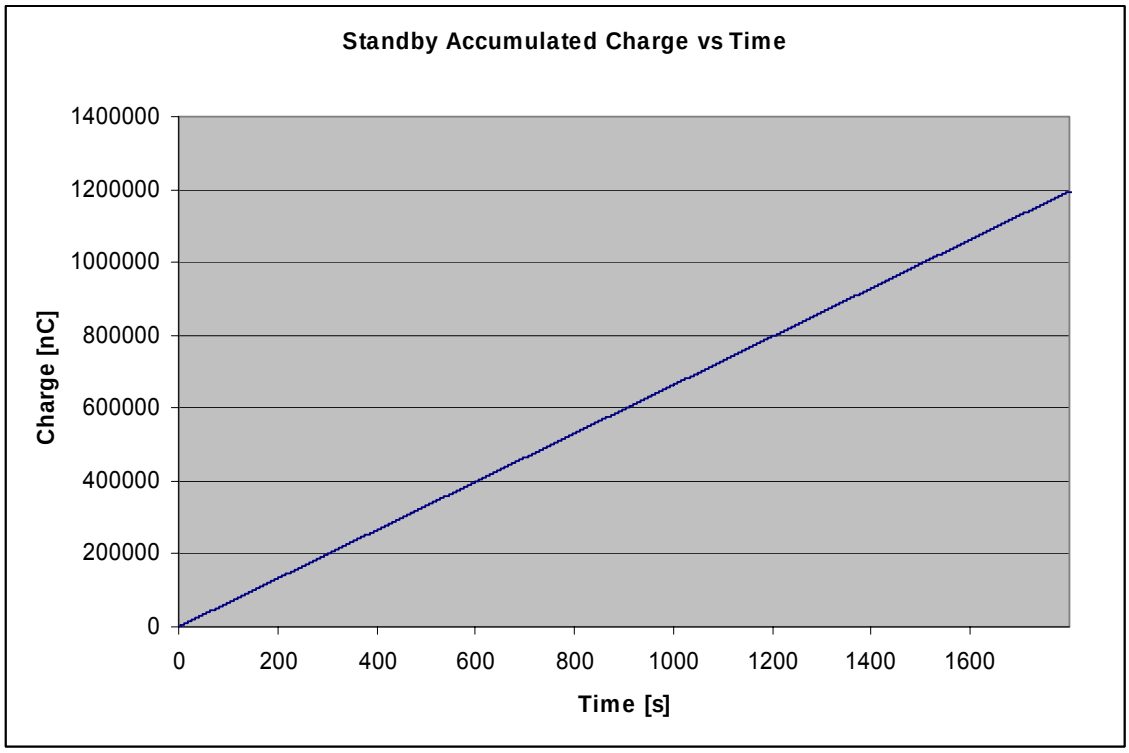
Product Service

Note: Beacon was only discharged for 16.11 hours as test was run in conjunction with operational life time test under CS T.007 hence 12.49 hours (28.60 – 16.11) must be removed from the “Time to First Failure” in order to get Equivalent Operational Lifetime Duration.

Product Service

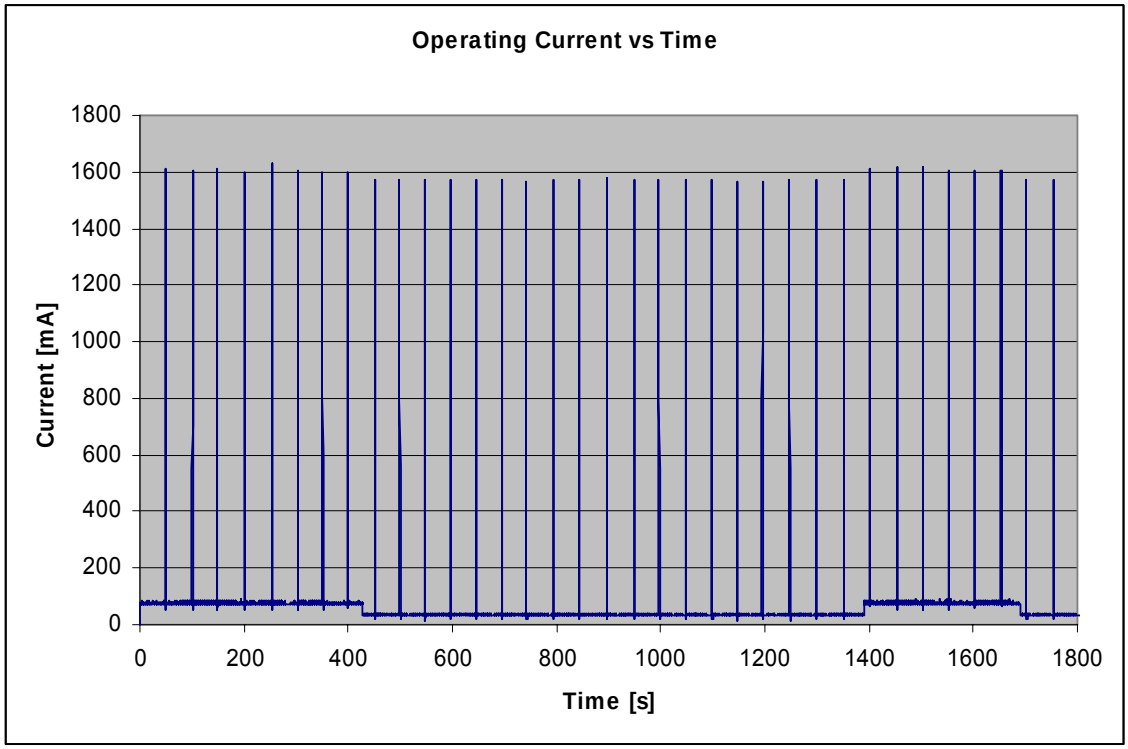
Battery Current Measurement Results – Standby Current

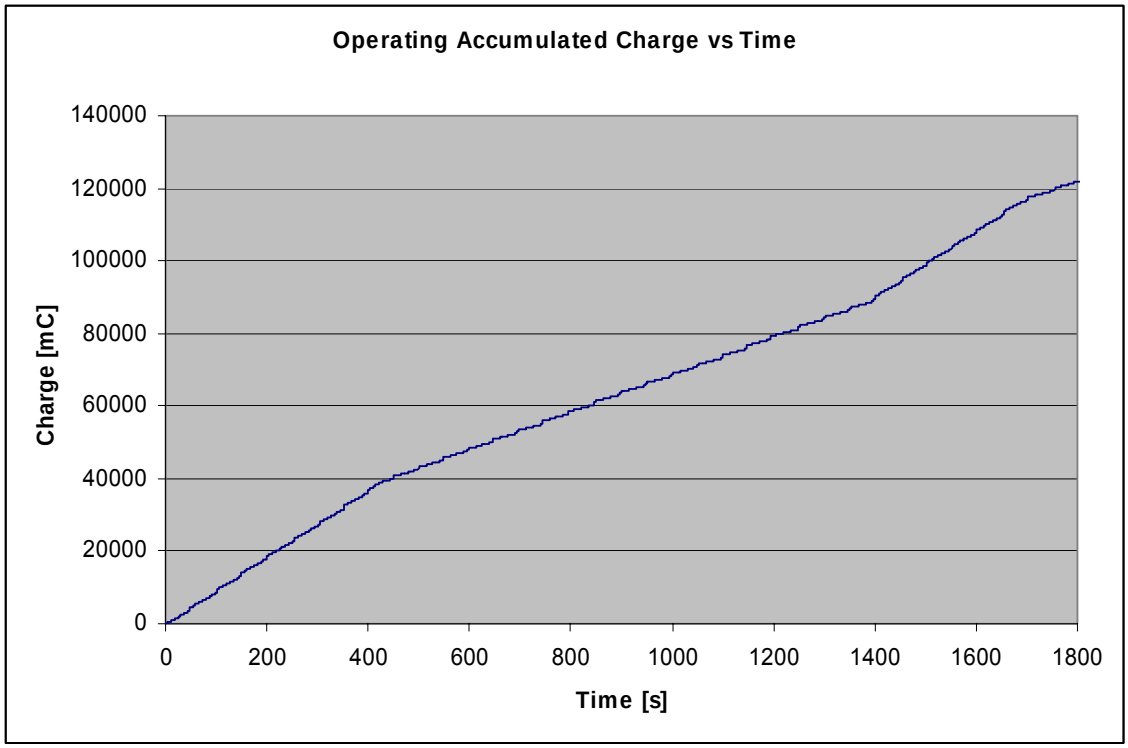




Product Service

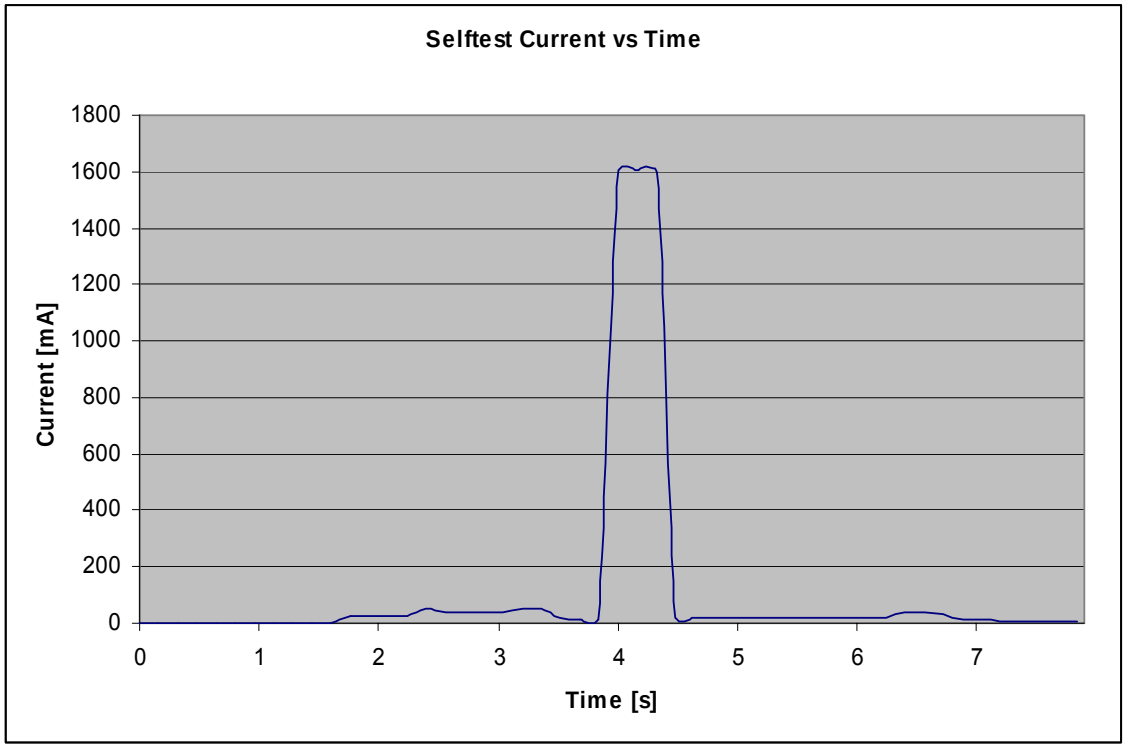
Battery Current Measurement Results- Operating Current

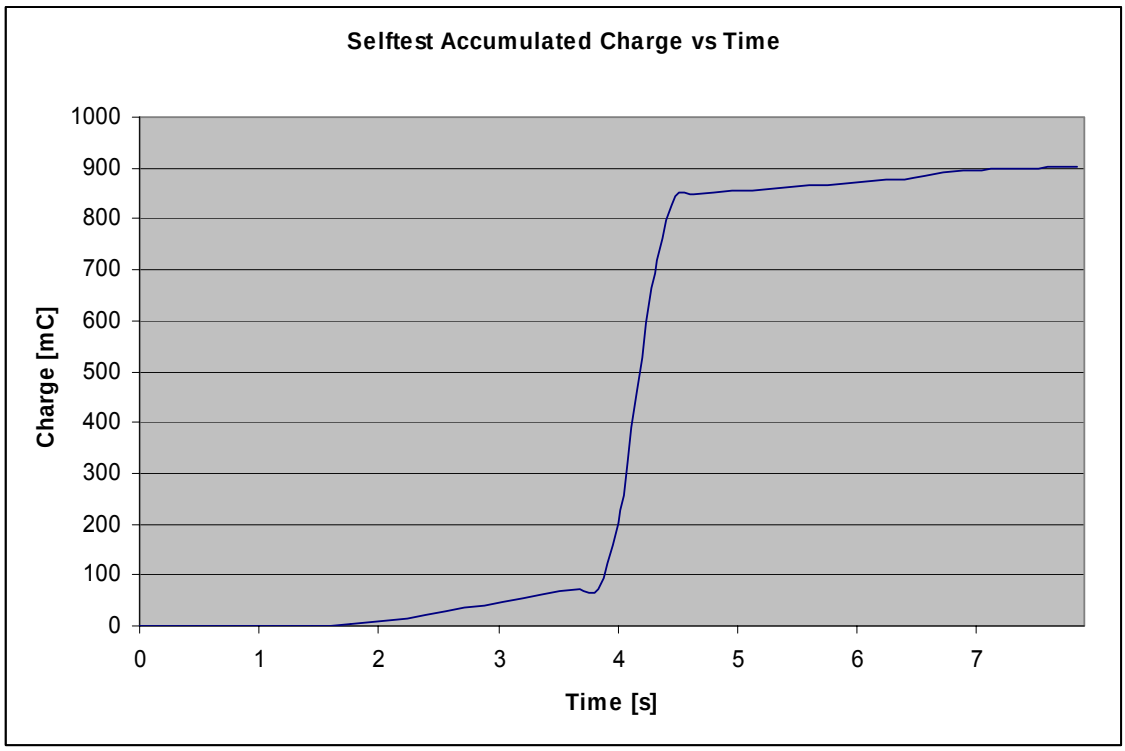




Product Service

Battery Current Measurement Results – Self-test Current

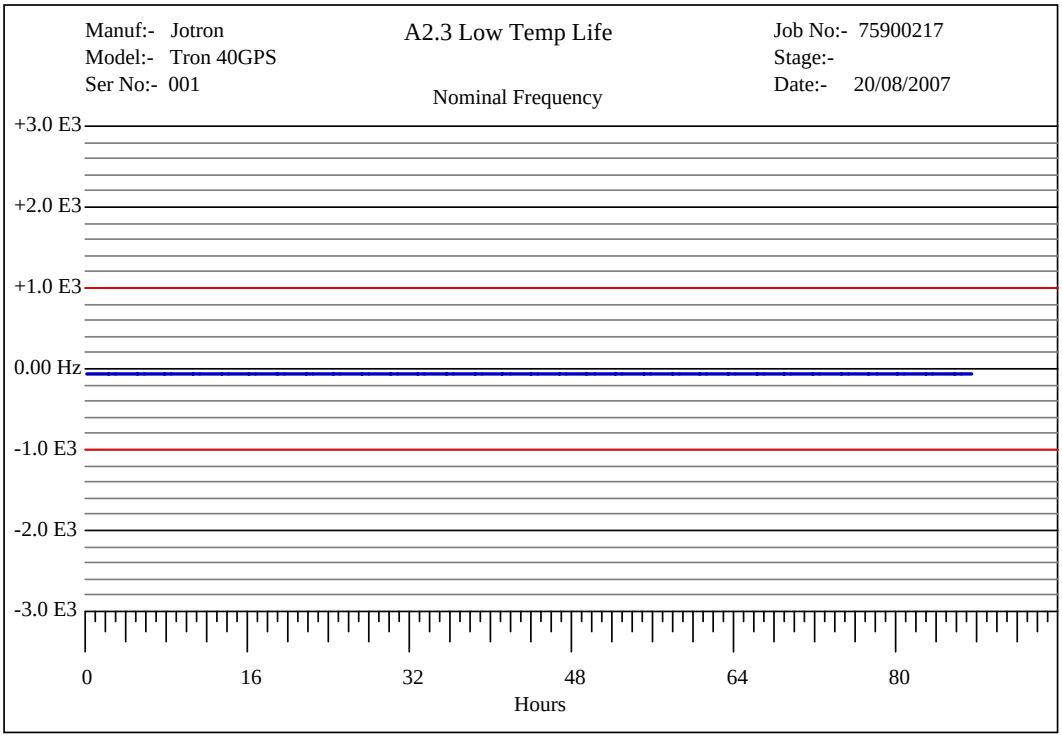




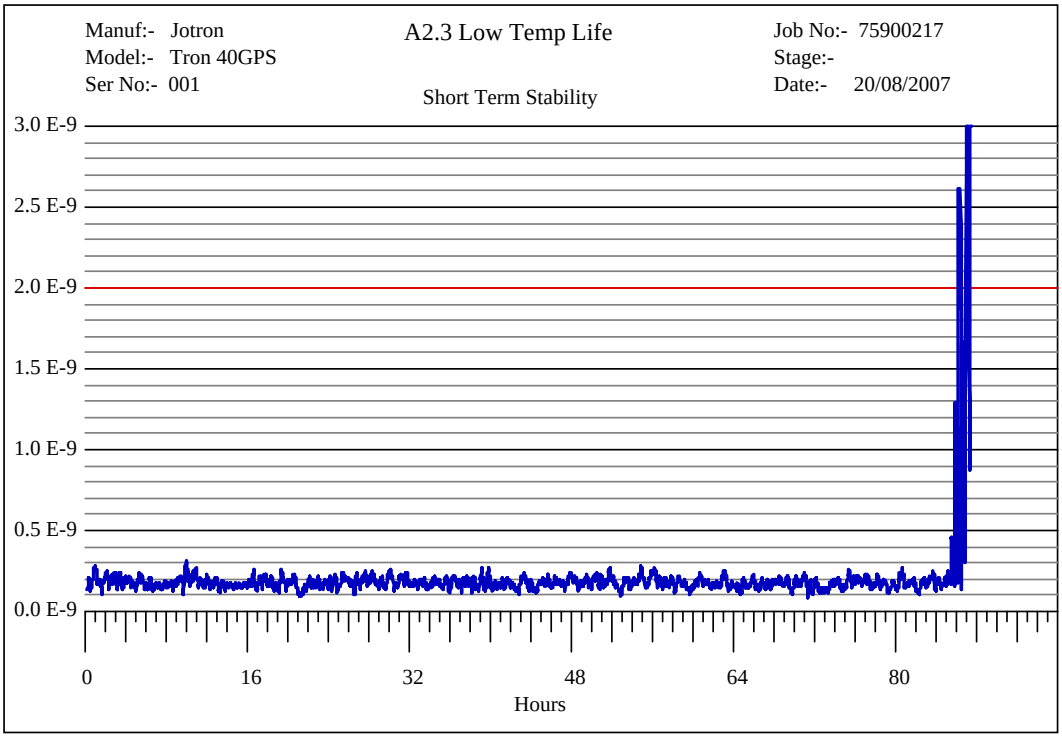
Product Service

2.13.8 Test Results

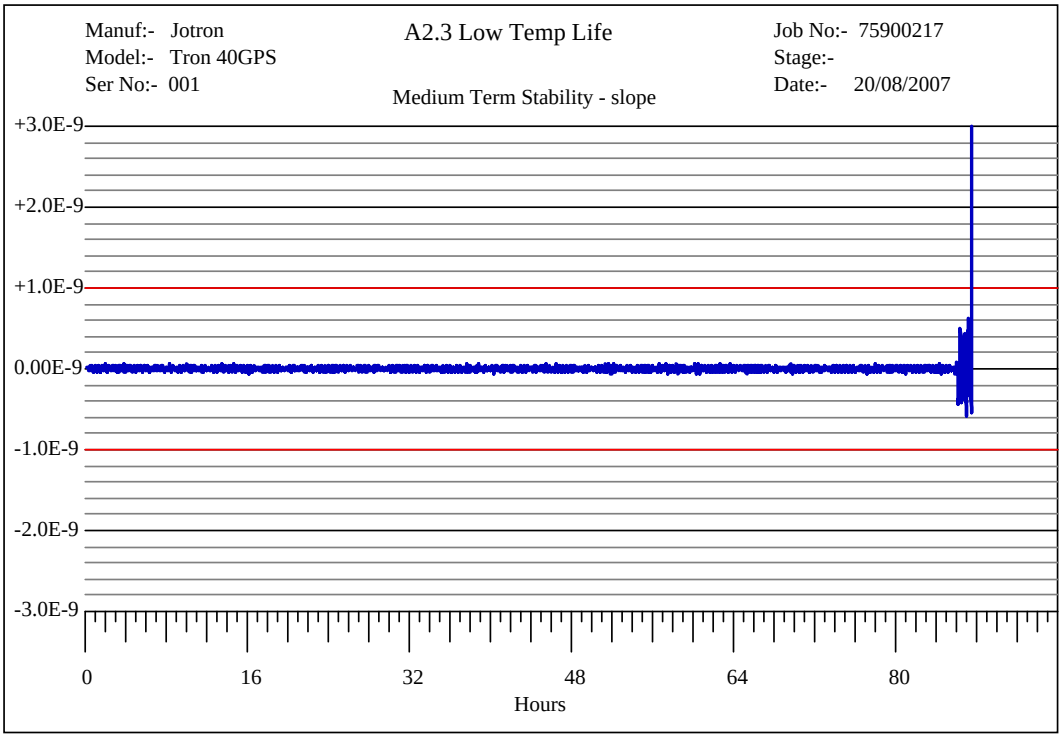
406 MHz Test Results



Nominal Frequency Offset

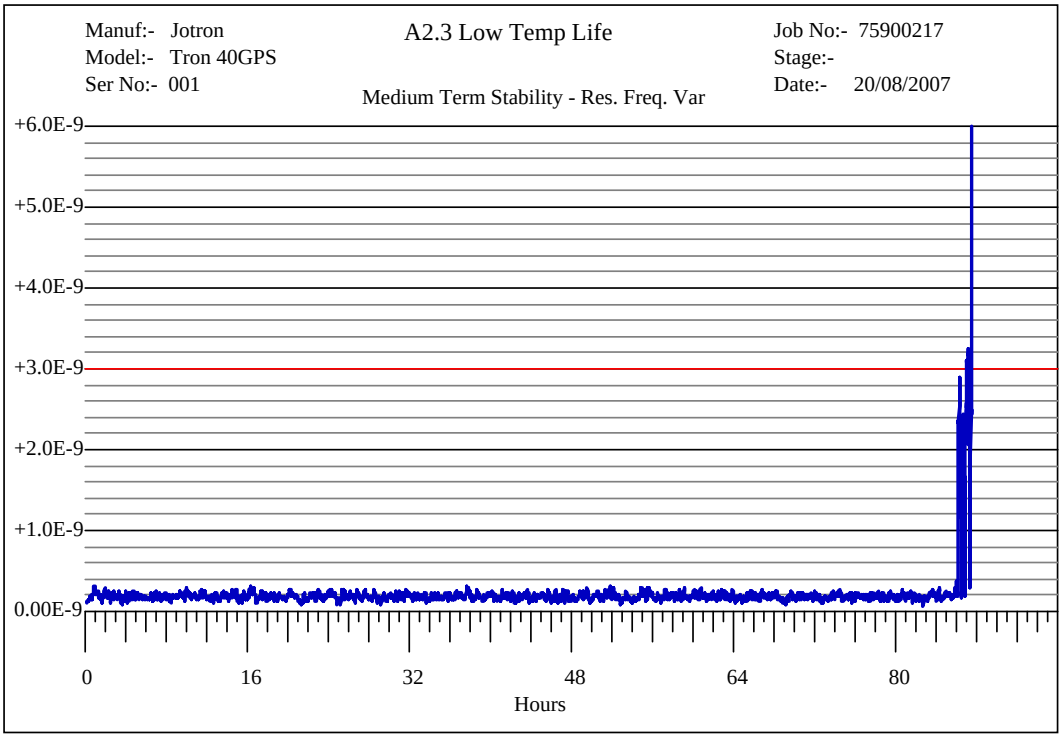


Short Term Stability

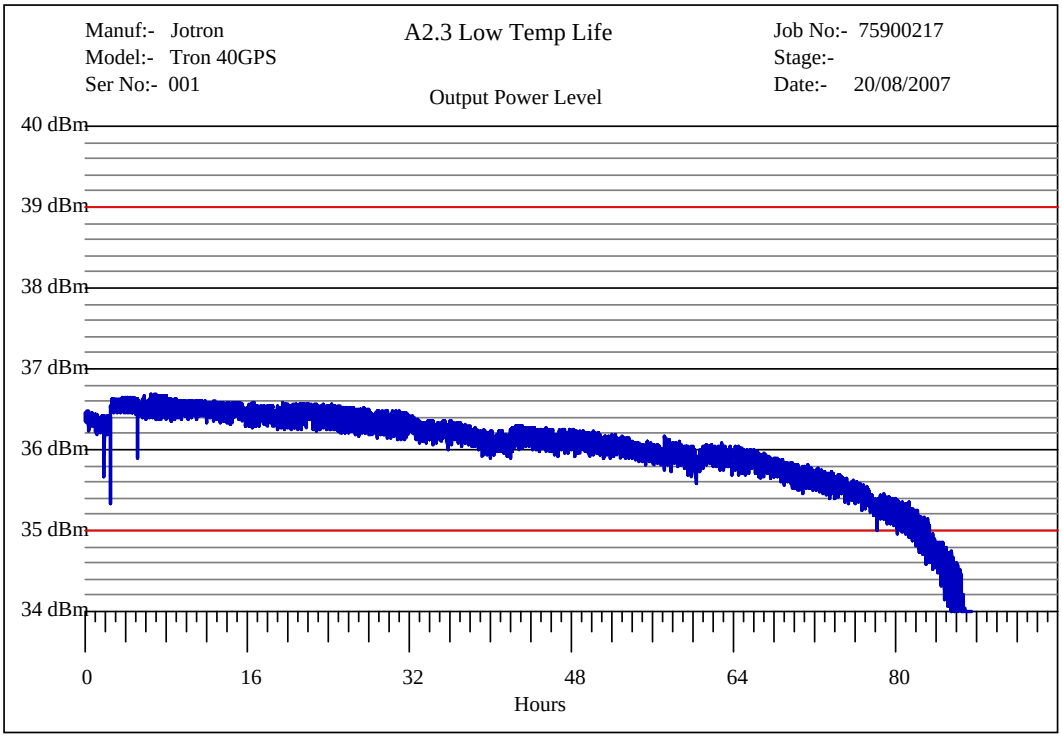


Medium Term Stability – Slope

Product Service



Medium Term Stability – Residual Frequency Variation

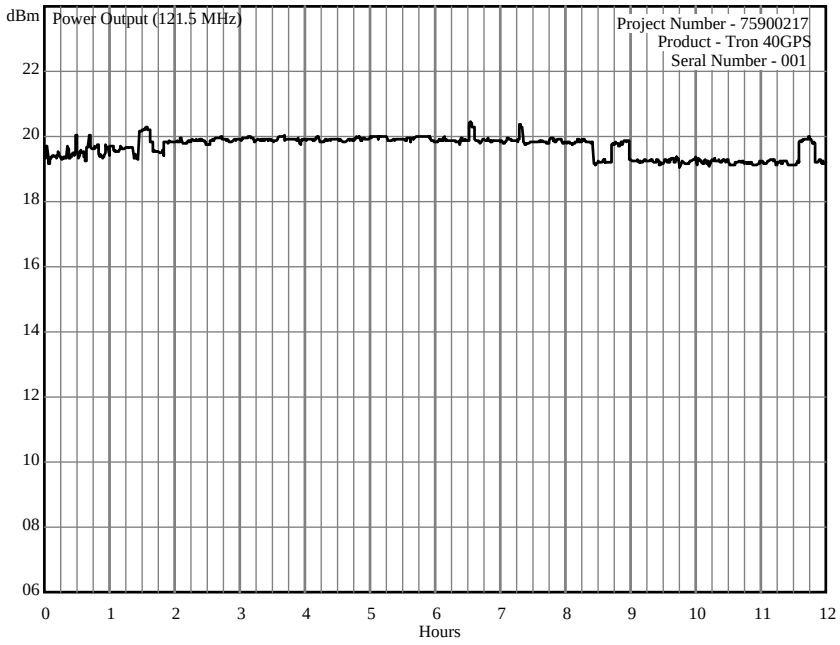


Output Power

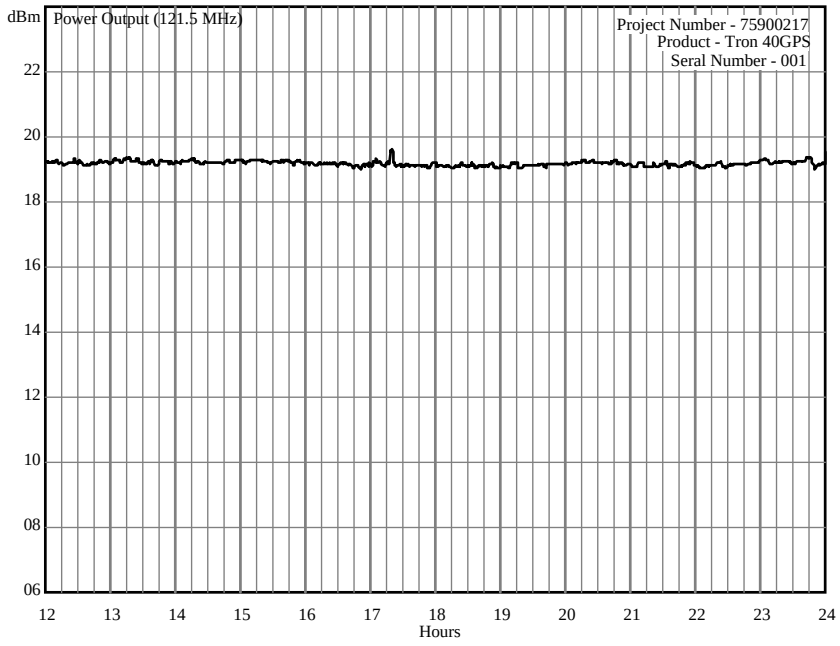
Product Service

121 MHz Test Results (Auxiliary Radio-locating Device Peak Envelope Output Power)

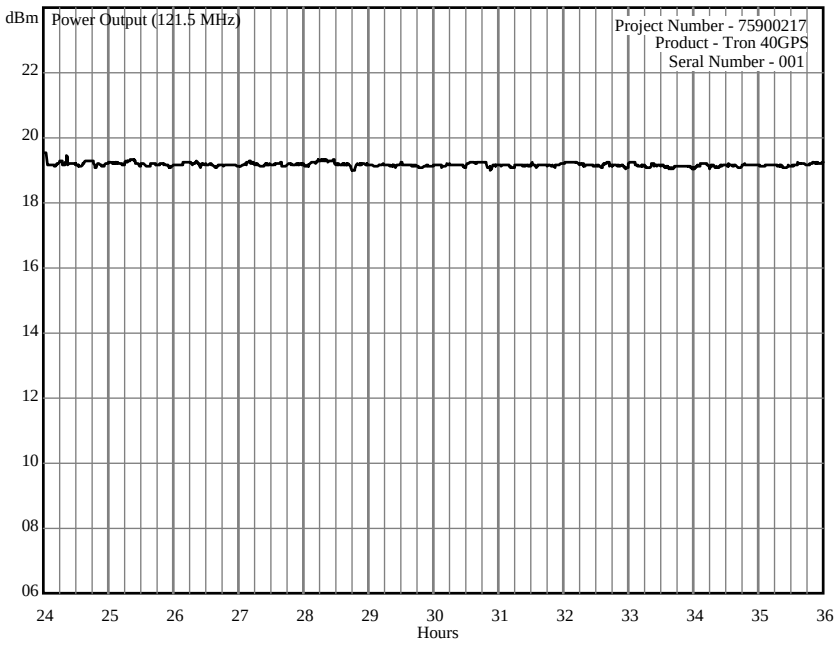
Summary of results can be found in the Test Results Table, starting on page 15.



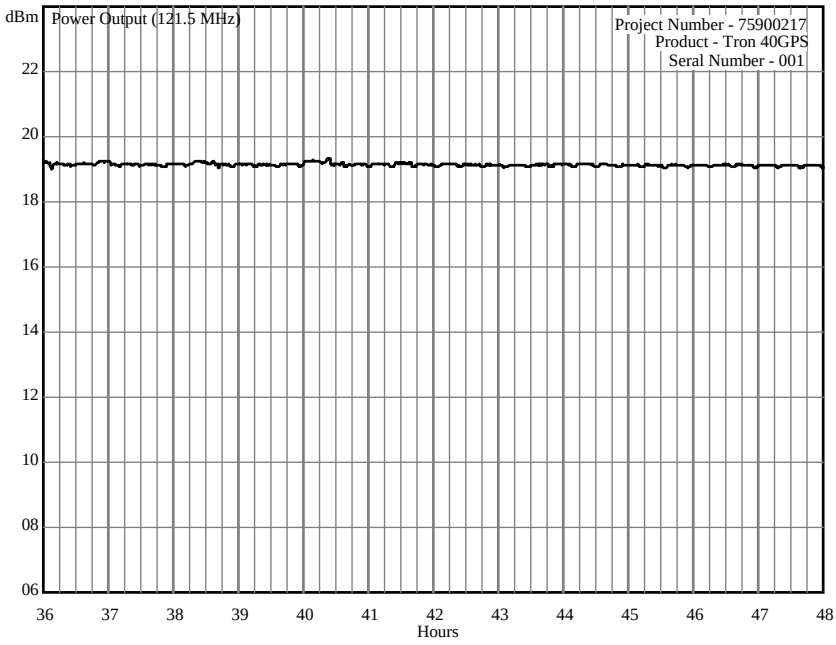
PEOP Graph 1



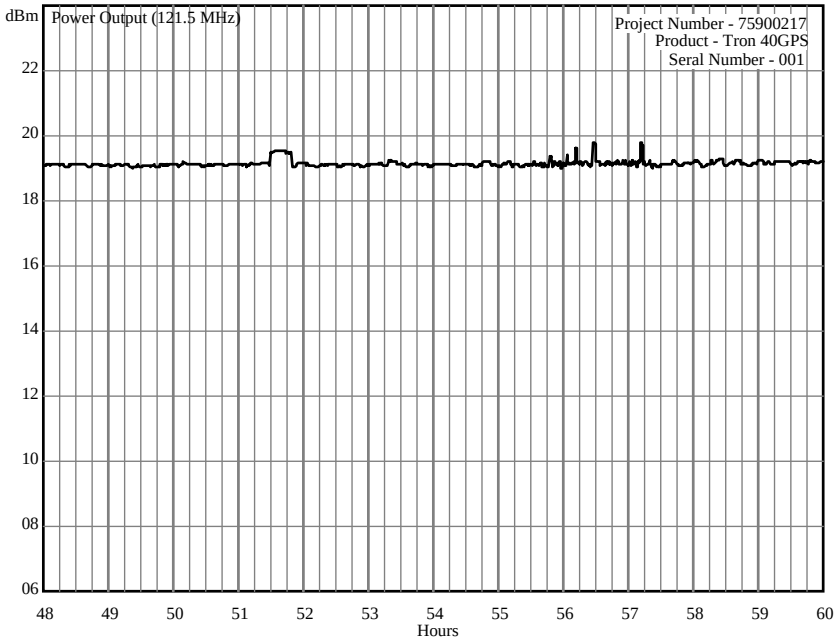
PEOP Graph 2



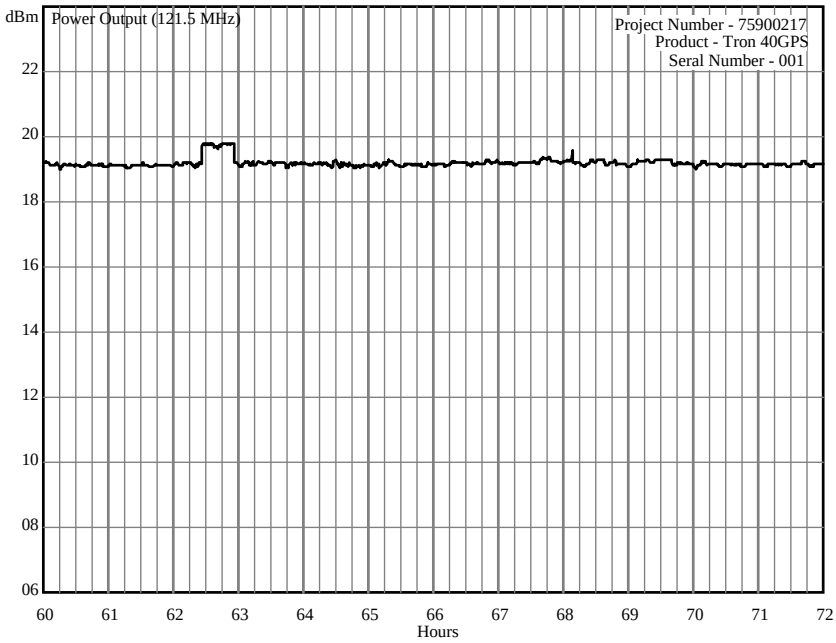
PEOP Graph 3



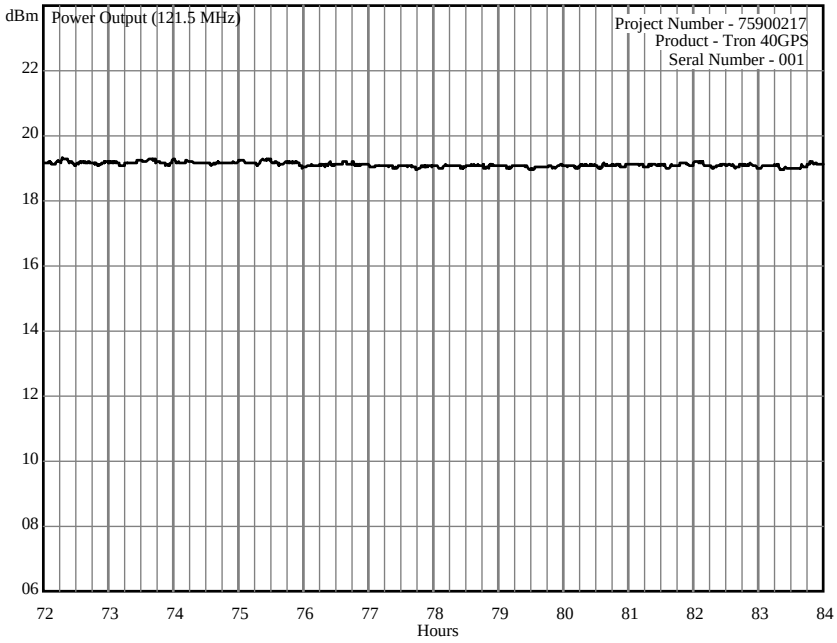
PEOP Graph 4



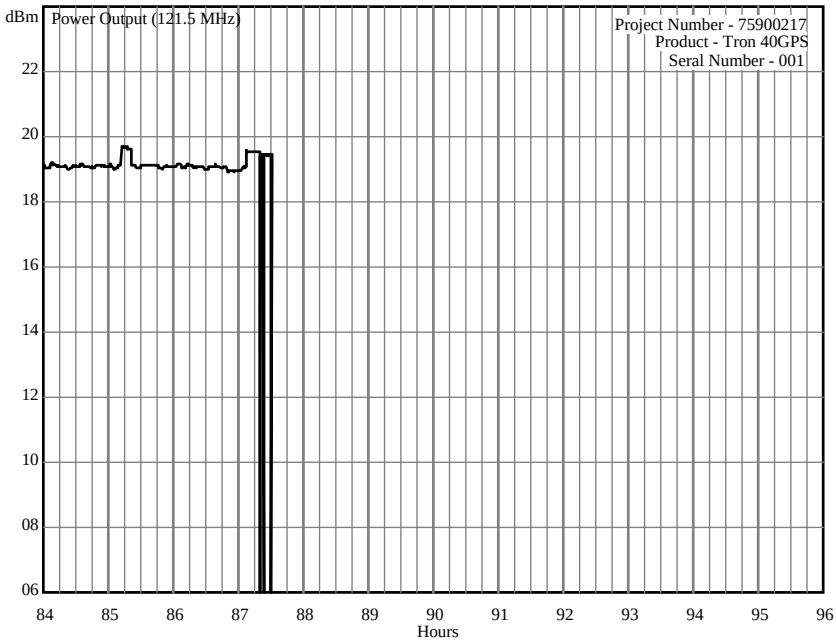
PEOP Graph 5



PEOP Graph 6



PEOP Graph 7



PEOP Graph 8

Product Service

2.14 STROBE LIGHT TEST

2.14.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A13.2

2.14.2 Test Results

Test completed as per customer supplied information, see Annex A.

Product Service

2.15 SELF-TEST

2.15.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A13.2

2.15.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.15.3 Date of Test and Modification State

Test at Ambient:	30 August 2007	- Modification State 6
Test at +55°C:	17 September 2007	- Modification State 7
Test at -20°C:	12 September 2007	- Modification State 7

2.15.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.15.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating and Self-test as per "Specification Reference", above.

2.15.6 Environmental Conditions

	30th August 2007
Ambient Temperature	22.0°C
Atmospheric Pressure	1017mbar

2.15.7 Test Procedure

EUT Stabilised for greater than 3 hours, EUT turned on and Aliveness Test performed. EUT main switch returned to the ready position for a minimum of 5 minutes. EUT turned on again and measurements performed.

2.15.8 Test Results

Summary of Aliveness test/Self-test results

Stage	Pass / Fail
Ambient Aliveness Test	Pass
Ambient Self-test	Pass
High Temperature (+55°C) Aliveness Test	Pass
High Temperature (+55°C) Self-test	Pass
Low Temperature (-20°C) Aliveness Test	Pass
Low Temperature (-20°C) Self-test	Pass

Product Service

Self-test Results

Parameter	Units	Test Results		
		T_{min} (-20°C)	T_{amb}	T_{max} (+55°C)
Pulse duration	ms	520.2609	520.2706	520.2208
Frame sync pattern	9 binary bits	0 1101 0000	0 1101 0000	0 1101 0000
Number of bursts	number	1	1	1
15 Hex ID	15 hexadecimal bits	992D4 0018C 001E9	992D4 0018C 001E9	992D4 0018C 001E9

Product Service

2.16 AUTOMATIC RELEASE MECHANISM AND AUTOMATIC ACTIVATION TESTS

2.16.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A14.0

2.16.2 Test Results

Test completed as per customer supplied information, see Annex A for information.

Product Service

2.17 STABILITY AND BUOYANCY TEST

2.17.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A15.0

2.17.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 002

2.17.3 Date of Test and Modification State

16 February 2007- Modification State 1

2.17.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.17.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Idle*

*Note: EUT activated (entered Operating mode automatically) on contact with water.

Test Set-up

Product Service

2.17.6 Environmental Conditions

Ambient Temperature	22.2°C
Relative Humidity	31%
Atmospheric Pressure	1004mbar
Water Temperature	11.2°C

2.17.7 Test Procedure

Stability

The EUT was submerged just below the surface of the aforementioned tank of fresh water with the antenna in a horizontal position (parallel with the water's surface). The EUT was released and allowed to float freely. The time for the EUT to pass through the vertical position was checked to be less than 2 seconds.

Buoyancy

The EUT was strapped with cable ties to create a central fixing point at the base of the unit. A large tank was filled with domestic tap water and a 20Kg mass with a pulley attachment was submerged therein.

Completely submerging the EUT into the tank the unit was held under the surface with a rope tied to the fixing point, running through the pulley and attached to a force gauge held by the Test Engineer. The pulley converted the buoyant (upwards) force to an equal force at an angle coaxial with the force gauge.

Antenna Height

Completed by customer declaration.

2.17.8 Test Results

Stability

EUT passed through the upright position in less than 1 second.

Uprightness

The EUT was immersed in calm fresh water as shown in the following photograph and floated upright.

Product Service

EUT Immersed In Fresh Water

Antenna Height

Test passed as per customer supplied information, see Annex A for information.

Reserve Buoyancy

EUT mass = 1.994 Kg
EUT weight = 19.56 N

Buoyant forces measured were 10.3, 8.3, 8.5, 10.3 and 10.9 N
Mean = 9.66N

Reserve buoyancy = $\frac{\text{Buoyant Force}}{\text{Weight}} = \frac{9.66}{19.56}$

Reserve buoyancy = 0.494

2.18 INADVERTENT ACTIVATION TEST

2.18.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A16.0

2.18.2 Test Results

Test completed as per customer supplied information, see Annex A for information.

Product Service

2.19 CARRIER FREQUENCY TEST

2.19.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.1

2.19.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.19.3 Date of Test and Modification State

Test at +55°C: 14 September 2007 - Modification State 7
Test at -20°C: 13 September 2007 - Modification State 7

2.19.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.19.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.19.6 Test Procedure

The EUT was connected to the automated test rack and the following results were obtained.

2.19.7 Test Results

Parameter	Units	Test Results	
		T_{min} (-20°C)	T_{max} (+55°C)
Carrier Frequency	MHz	121.4997666	121.4997202

Product Service

2.20 MODULATION CHARACTERISTICS (TRANSMITTER DUTY CYCLE)

2.20.1 Specification Reference

RTCM Paper 77-2002/SC110-STD, Clause A17.2

2.20.2 Equipment Under Test

Tron 40GPS MkII, Serial Number 001

2.20.3 Date of Test and Modification State

Test at +55°C:	14 September 2007	- Modification State 7
Test at -20°C:	12 September 2007	- Modification State 7

2.20.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.20.5 Test Set-up and Operating Modes

The test was performed with the EUT in the following mode(s): Operating

2.20.6 Test Procedure

Using an oscilloscope the 121MHz transmission was observed, the transmission duration and interruption duration were observed. the interruption duration was checked to be less than 2 seconds and the Transmitter Duty Cycle was calculated using the following formula:

$$\text{Transmitter Duty Cycle} = \frac{\text{Transmission Duration}}{\text{Transmission Duration} + \text{Transmission Interruption Duration}}$$

2.20.7 Test Results

Parameter	Units	Test Results	
		T_{min} (-20°C)	T_{max} (+55°C)
121.5 MHz transmission duration	seconds	50.981	46.953
121.5 MHz transmission interruption duration	seconds	1.073	1.064
Transmitter Duty Cycle	%	97.9	97.8