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Report On

Emergency Beacons Testing of the
Jotron AS
Tron S-VDR CAPSULE and L-3 FFSVR

COMMERCIAL-IN-CONFIDENCE

Document 75900372 Report 03 Issue 2 November 2007

Product Service

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REPORT ON

Emergency Beacons Testing of the
Jotron AS
Tron S-VDR CAPSULE and L-3 FFSVR

Document 75900372 Report 03 Issue 2

November 2007

PREPARED FOR

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PREPARED BY

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Test Engineer

APPROVED BY

N Forsyth
Authorised Signatory

DATED

6th November 2007

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 S-VDR CAPSULE and L-3 FFSVR

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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 S-VDR CAPSULE and L-3 FFSVR 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 S-VDR CAPSULE
Serial Number(s)	00519 00169 (Modified sample to incorporate 50Ω output)
Number of Samples Tested	Two
Additional Model Variant(s)	L-3 FFSVR
Test Specification/Issue/Date	RTCM Paper 77-2002/SC110-STD
Incoming Release Date	Application Form 11th May 2007
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	PO0712031 21st March 2007
Start of Test	15th February 2007
Finish of Test	10th August 2007
Name of Engineer(s)	R Hampton M Hardy A C Castle J Sutherland C Hedley L Spencer I Tebby

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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 S-VDR CAPSULE

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	168 hours
Battery chemistry	Li-SOCl2
Battery cell size and number of cells	D-size, LSH20, 8 Cells
Battery manufacturer	Saft
Battery pack manufacturer and part number	Jotron - 82148
Oscillator type (e.g. OCXO, MCXO, TCXO)	TCXO
Oscillator manufacturer	C-MAC
Oscillator part name and number	E3279
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	121.5/406 Antenna - 81898R0631
Navigation device type (Internal, External or None)	Internal
Features in beacon that prevent degradation to 406 MHz signal or beacon lifetime resulting from a failure of navigation device or failure to acquire position data (Yes, No, or N/A)	*Covered by Cospas-Sarsat Accreditation
Features in beacon that ensures erroneous position data is not encoded into the beacon message (Yes, No or N/A)	Yes
Navigation device capable of supporting global coverage (Yes, No or N/A)	Yes
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	Navman
- Navigation device model name and part Number	
- 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.)	1 flash of strobe light indicates a pass
- 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	406MHz emitted 121.5 MHz emitted EEPROM check PLL 406 in lock
- 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	97%
-Duty Cycle of Homer Swept Tone	47%

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Characteristic	Specification
Beacon includes a strobe light (Yes or No)	Yes
- Strobe light intensity	0.75Cd
- Strobe light flash rate	1/2.88s
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.	*Covered by Cospas-Sarsat Accreditation
Beacon includes automatic activation mechanism (Yes or No)	Yes

1.2.4 Information Provided by the Cospas-Sarsat Accepted Test Facility

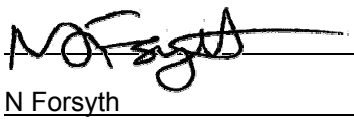
Name and Location of Beacon Test Facility: TUV Product Service Ltd, United Kingdom

Date of Submission for Testing: 11th May 2007

Applicable C/S Standards:

Document	Issue	Revision	Date
C/S T.001	3	7	Nov-05
C/S T.007	4	1	Oct-06

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

Signed: 

Name: N Forsyth

Position Held: Authorised Signatory

Date: 6th November 2007

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1.2.5 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

1.2.6 Manufacturer Details

Company Name	Same as above		
Address	N/A		
Contact Name	N/A	Telephone	N/A
Email	N/A	Facsimile	N/A

1.2.7 Declaration of Build Status

Hardware Version	
- PCB Revision	0637
- Battery Model	
Software Version	
Firmware Version	
Other (Specify)	

1.2.8 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: 11/05/07

Product Service

1.3 PRODUCT INFORMATION

1.3.1 Technical Description

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

Equipment Under Test, Sample Serial Number 00169

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1.3.2 Test Configuration

Tests requiring a conducted link to the EUT's transmitter we performed on test sample 75900372_02 which was modified, by the manufacturer, to provide two 50Ω output ports, one for 121 MHz measurements, the other for 406 MHz measurements.

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 LED on EUT.

1.3.5 Performance Criterion

EUT must successfully complete the aliveness test.

1.3.6 Additional Variants

Variants of the Tron S-VDR CAPSULE include the L-3 FFSVR. It is electrically identical to the Tron S-VDR CAPSULE except that the Final Recording Medium (FRM) is a L3-FRM.

Cospas-Sarsat Approval was granted for variants subject to the successful completion of the Spurious Emissions Test (T.007 Issue 4 - Rev 1 October 2006, Section A.3.2.2.4). Separate submissions were made to the Cospas-Sarsat Secretariat and approval granted under the same Type Approval Certificate (TAC) number. Copies of the Type Approval Certificates can be found at Annex B.

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1.4 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

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	Description can be found at Annex A, Customer Supplied information. Note: Modification only applied to unit with Serial Number 00169	Jotron AS	Week commencing 30th July 2007

1.6 ALTERNATIVE TEST SITE

Under our group UKAS Accreditation, TÜV Product Service Ltd conducted the following tests at Bearley, Stratford-upon-Avon Test Laboratory:

2.24 Peak Equivalent Radiated Power

Under our group UKAS Accreditation, 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

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SECTION 2

TEST DETAILS

Emergency Beacons Testing of the
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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:						
– Carrier Frequency	406.028±0.001	MHz		406.0279		
– Power Output	35 - 39	dBm		35.5		
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	✓			✓	
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	✓		✓		

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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)	
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	✓	✓			
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
Leakage & Immersion						
• 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	✓	✓	✓	✓	

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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* *Subject to waiver request being granted, see comment below
• Self-activation in fresh water	5	minutes	0		0	
• Self-activation in salt water (5% NaCl*)	5	minutes	0		0	*by mass
• Aliveness Test:						
– Carrier Frequency	406.028±0.001	MHz	406027820.3 406027821.2		406027800.2 406027800.5	Where two values are stated these are the minimum and maximum
• Frequency Stability:		MHz				
– short term stability	0.002	parts/ million in 100ms	5.84×10^{-11} 6.00×10^{-11}		1.30×10^{-10} 1.39×10^{-10}	
– medium term stability:						
– mean slope	0.001	parts/ million/ minute	-1.57×10^{-09} ** -1.28×10^{-09} **		3.45×10^{-10} 3.88×10^{-10}	** Waiver request: Although values exceed range of specification, they are within the limits laid out by Cospas-Sarsat in T.007 Issue 4 Rev 1 October 2006, see Annex A for Customer's official waiver request.
– residual frequency variation	0.003	parts/ million	1.15×10^{-09} 1.38×10^{-09}		2.93×10^{-10} 2.99×10^{-10}	
11. Cospas-Sarsat Type Approval (A12.0)						
Cospas-Sarsat Certificate	Provided (attach test report)	Y/N	Y			See Annex B

Product Service

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 within MU*
• Operational Life	Time to first Failure	Hours	201.0			
• Frequency:						
– Nominal Carrier	406.028±0.001	MHz	406.0276621 406.0276767			
– Short-term stability	0.002	parts/ million in 100ms	$1.552x10^{-10}$ $3.044x10^{-10}$			
• Medium-term stability:						Where two values are stated these are the minimum and maximum up to 168 hours
– Mean Slope	0.001	parts/ million/ minute	$-1.692x10^{-10}$ $1.998x10^{-10}$			
– Residual Variation	0.003	parts/ million	$1.064x10^{-10}$ $4.698x10^{-10}$			
• RF output power	35 - 39	dBm	34.82 36.34			
• Auxiliary radio-locating Peak envelope power	14 - 20	dBm	19.50 20.27*			* Measurement uncertainty is 1.2dB
13. Strobe Light Test (A13.2)						Section 2.14 Result: Pass
• Flash Rate	20 - 30	/min	21*	21*	21*	
• Effective intensity	0.75	Cd	1.00*	1.87*	1.94*	* As per customer supplied information
• Pulse Duration	10^{-6} to 10^{-2}	s	$39.4x10^{-6}$	$39.9x10^{-6}$	$38.9x10^{-6}$	
14. Self-test (A13.3)						Section 2.15 Result: Pass
• RF pulse duration	<444 or <525*	ms	520.4906	521.5855	520.4217	* 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	✓	✓	✓	✓	

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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)	
15. Automatic Release Mechanism Test						Section 2.16 Result: Pass* *subject to waiver being granted – see comments for Normal mounted orientation
• Normal mounted orientation	Release and float free before 4 meters; automatic activation	✓	✓*	✓*	✓ (+50°C) **	* As per customer supplied information
• Rolling 90° starboard		✓		✓*		
• Rolling 90° port		✓		✓*		** Extreme temperature utilised was +50°C, not +55°C – see Section 2.16 for details.
• 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*		* As per customer supplied information
• Reserve buoyancy	> 5	%		86.19		
• Float upright; Antenna base	> 4	cm		0.4*		* As per customer supplied information
17. Inadvertent Activation Test (A16.0)						Section 2.18 Result: Pass
• Activation/Release	EUT should not release from bracket or automatically activate	✓		✓*		* 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	121.5010939	121.5003269	121.4991623	Section 2.19
• Duty cycle	100	%	97.4	97.6	97.4	Section 2.20
• Modulation:						
– Frequency	700 Hz within the range of 300 - 1600 Hz	✓	✓	✓	✓	Section 2.21
– Range	> 700	Hz	1139.63	1089.6	1148.65	
– Minimum	> 300	Hz	325.93	366.42	326.1	
– Maximum	< 1600	Hz	1465.56	1456.02	1474.74	
– Direction	Upward	Upward / Downward	Upward*	Upward*	Upward*	* EUT capable of both directions. When EUT is coded with “US settings” the direction is Upward.
– Duty cycle	33 - 55	%	47.44	45.54	46.55	
– Sweep repetition rate	2 - 4	Hz	2.50	2.94	2.47	
– Factor	0.85 - 1.0	#	92.1	90.9	88.5	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		19.99		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 S-VDR CAPSULE, Serial Number 00169

2.1.3 Date of Test and Modification State

12th 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 and Self-test

2.1.6 Environmental Conditions

Ambient Temperature	22.5°C
Relative Humidity	34%
Atmospheric Pressure	977mbar

2.1.7 Test Results

Parameter	Value	Units
Carrier Frequency	406.0279	MHz
Power Output	35.5	dBm

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Beacon Test Report (Normal Message)

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 12-Feb-07 10:37:36 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–3
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 24°C

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

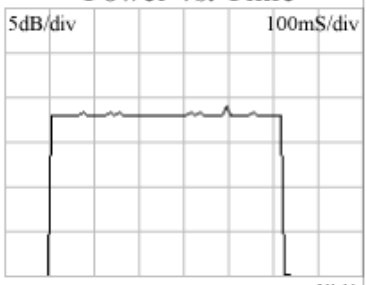
Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

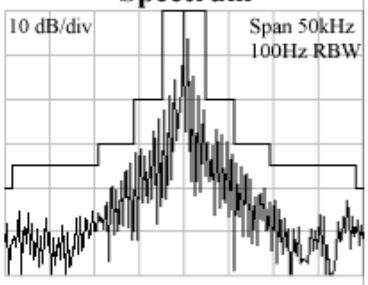
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (5 Watt): 35.5 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.1 +1.04 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 188 uS
Modulation Symmetry: 0.7%
Modulation Bit Rate: 398.1 bps
CW Preamble: 159.7 ms

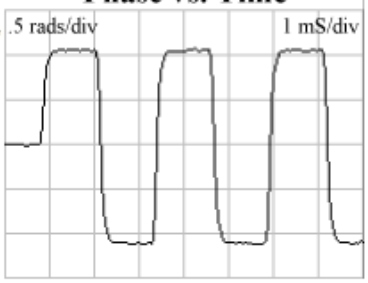
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

Beacon Test Report (Self-test Message)

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 12-Feb-07 10:36:47 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 24°C

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

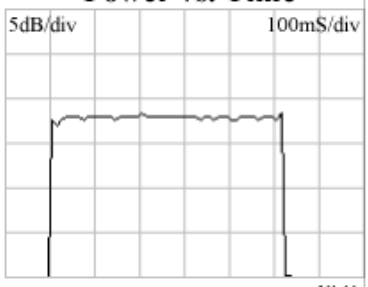
Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFED0901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

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

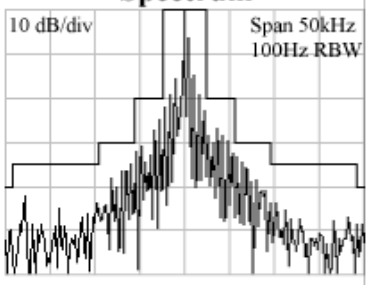
406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (5 Watt): 35.6 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.1 +1.04 radians
Modulation Rise Time: 198 uS
Modulation Fall Time: 209 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 398.5 bps
CW Preamble: 160.4 ms

Power vs. Time

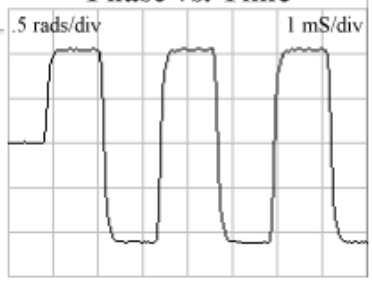


Spectrum

V1.11



Phase vs. Time



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Product Service

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 S-VDR CAPSULE, Serial Number 00169

2.2.3 Date of Test and Modification State

13th February 2007 - Modification State 0

2.2.4 Test Equipment Used

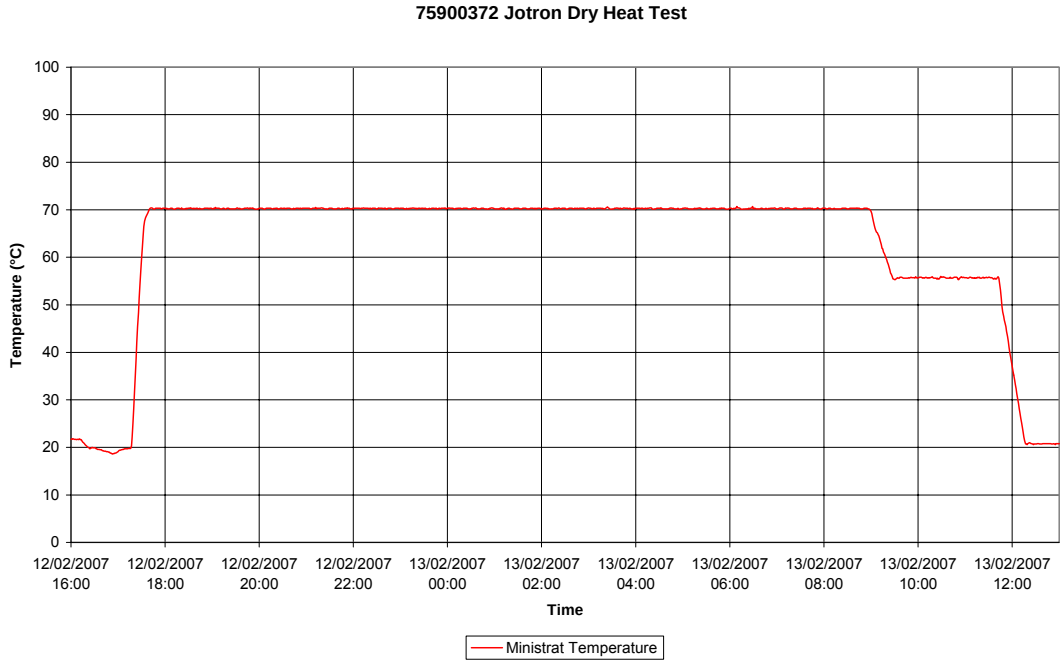
The major items of test equipment used for the above tests are identified in Section 3.1.

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.

2.2.6 Environmental Conditions

Dry Heat Cycle Temperature Plot



Product Service

2.2.7 Test Results

Summary of Aliveness test results

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

Product Service

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

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 10:47:08 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 20°C

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

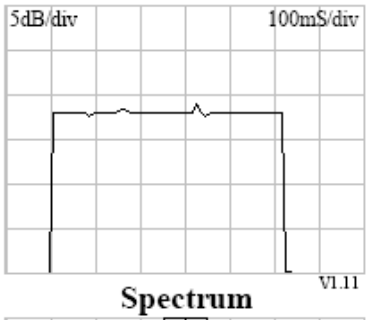
Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

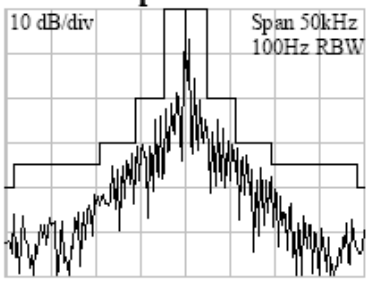
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0278 MHz
406 Power (5 Watt): 35.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.15 +1.08 radians
Modulation Rise Time: 78 uS
Modulation Fall Time: 165 uS
Modulation Symmetry: 0.7%
Modulation Bit Rate: 397.9 bps
CW Preamble: 159.2 ms

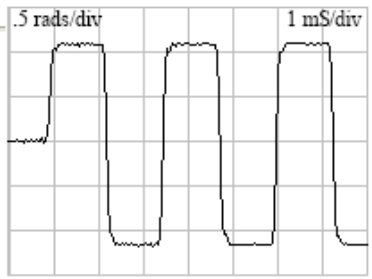
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

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

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 10:48:00 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 21°C

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

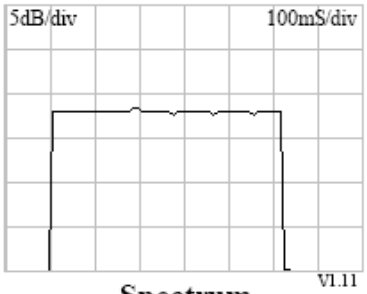
Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

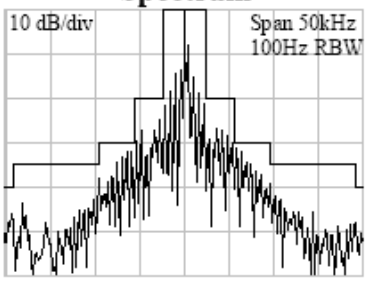
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0278 MHz
406 Power (5 Watt): 35.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.16 +1.08 radians
Modulation Rise Time: 78 uS
Modulation Fall Time: 105 uS
Modulation Symmetry: 1.5%
Modulation Bit Rate: 398.1 bps
CW Preamble: 159.3 ms

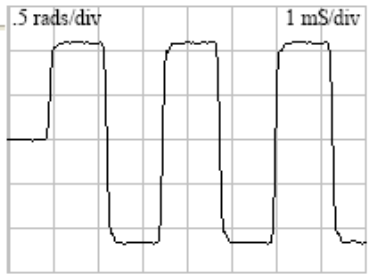
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

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

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 11:35:25 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–7
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 21°C

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

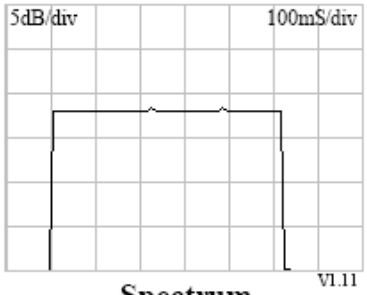
Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

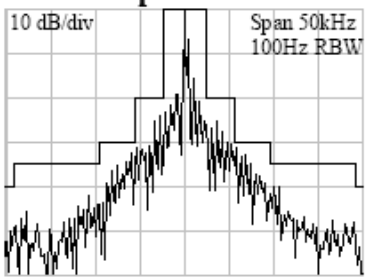
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0278 MHz
406 Power (5 Watt): 35.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.15 +1.09 radians
Modulation Rise Time: 78 uS
Modulation Fall Time: 92 uS
Modulation Symmetry: 1.1%
Modulation Bit Rate: 398.1 bps
CW Preamble: 159.6 ms

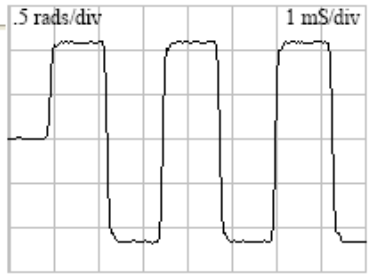
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

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

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 13-Feb-07 11:36:15 AM
Tester Model/Serial No./File Name: BT100S/1025/jotron–8
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 22°C

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

Notes: Add text comments here.

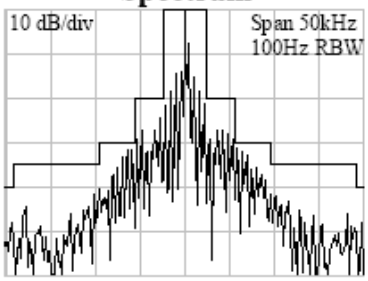
15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

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

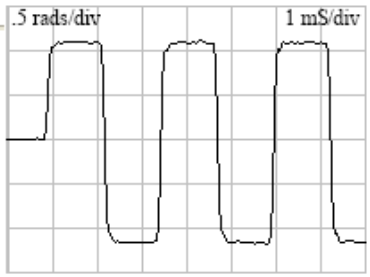
406 MHz Measurements
406 Frequency (INT REF): 406.0278 MHz
406 Power (5 Watt): 35.2 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.15 +1.09 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 105 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 397.9 bps
CW Preamble: 159.6 ms

Power vs. Time

Spectrum



Phase vs. Time



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 S-VDR CAPSULE, Serial Number 00169

2.3.3 Date of Test and Modification State

16th February 2007 - Modification State 0

2.3.4 Test Equipment Used

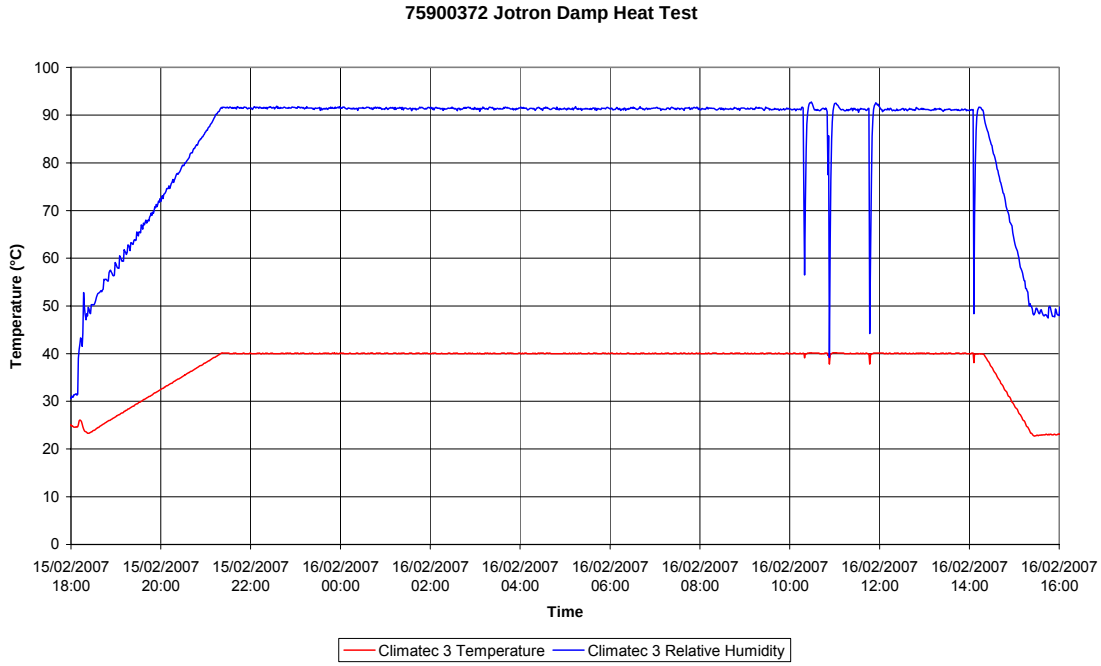
The major items of test equipment used for the above tests are identified in Section 3.1.

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



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

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 16-Feb-07 11:46:23 AM
Tester Model/Serial No./File Name: BT100S/1025/josvdr–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 25°C

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

Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

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

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (5 Watt): 36.6 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.13 +1.07 radians
Modulation Rise Time: 165 uS
Modulation Fall Time: 188 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 398.3 bps
CW Preamble: 159.7 ms

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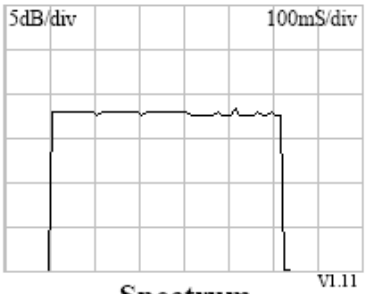
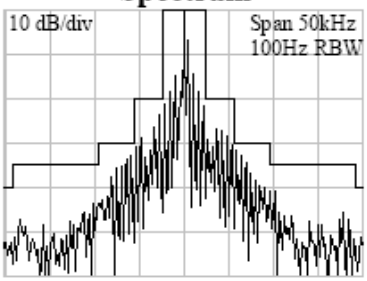
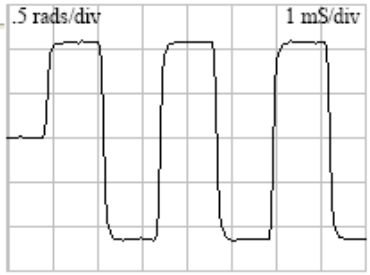
Power vs. Time



Spectrum



Phase vs. Time



Product Service

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

Beacon Test Report

203C4D8152FFBFF

Organization: TUV Product Service Ltd
Tested By: Emergency Beacons Dept.
Date: 16-Feb-07 11:47:14 AM
Tester Model/Serial No./File Name: BT100S/1025/josvdr--2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 26°C

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

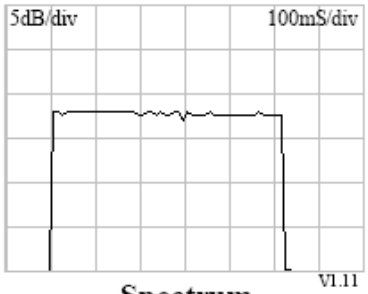
Notes: Add text comments here.

15 Hex ID: 203C4D8152FFBFF
Full Hex: FFFE2F901E26C0A97FDFFE74CF3783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2539689

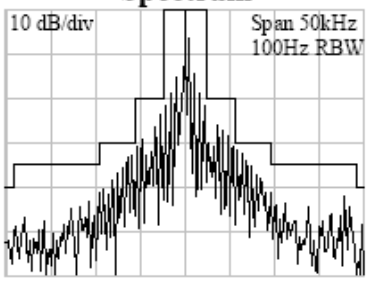
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (5 Watt): 36.7 dBm
Power Rise Time: : < 5 ms
Phase Deviation: -1.13 +1.08 radians
Modulation Rise Time: 177 uS
Modulation Fall Time: 188 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 397.9 bps
CW Preamble: 159.9 ms

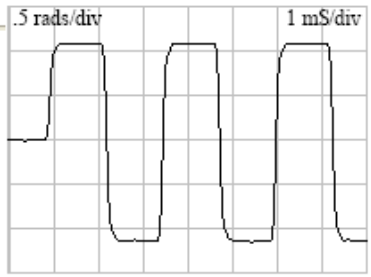
Power vs. Time



Spectrum



Phase vs. Time



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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 S-VDR CAPSULE, Serial Number 00519

2.4.3 Date of Test and Modification State

20th and 21st February 2007 - Modification State 0

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 as per “Specification Reference”, above.

Test Set-up

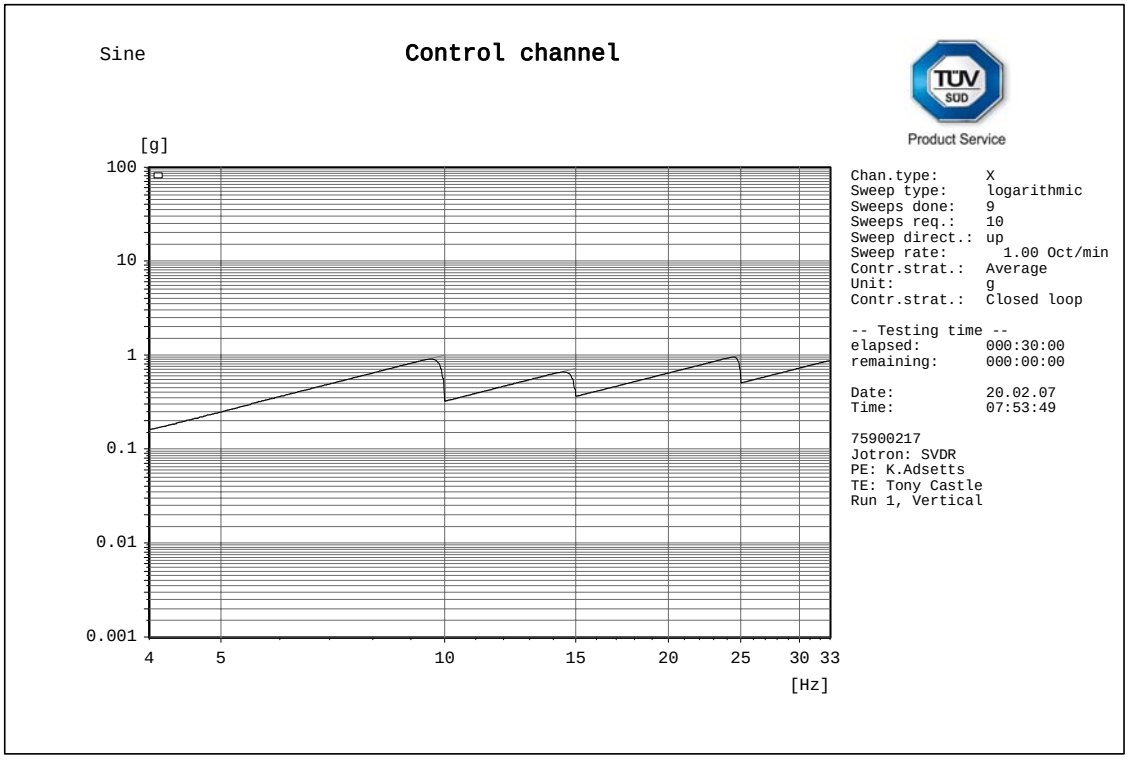
Product Service

2.4.6 Environmental Conditions

	20th February AM	20th February PM	21st February AM
Ambient Temperature	20.9°C	24.2°C	17.5°C
Relative Humidity	42%	37%	39%
Atmospheric Pressure	1000mbar	1001mbar	1000mbar

2.4.7 Test Results

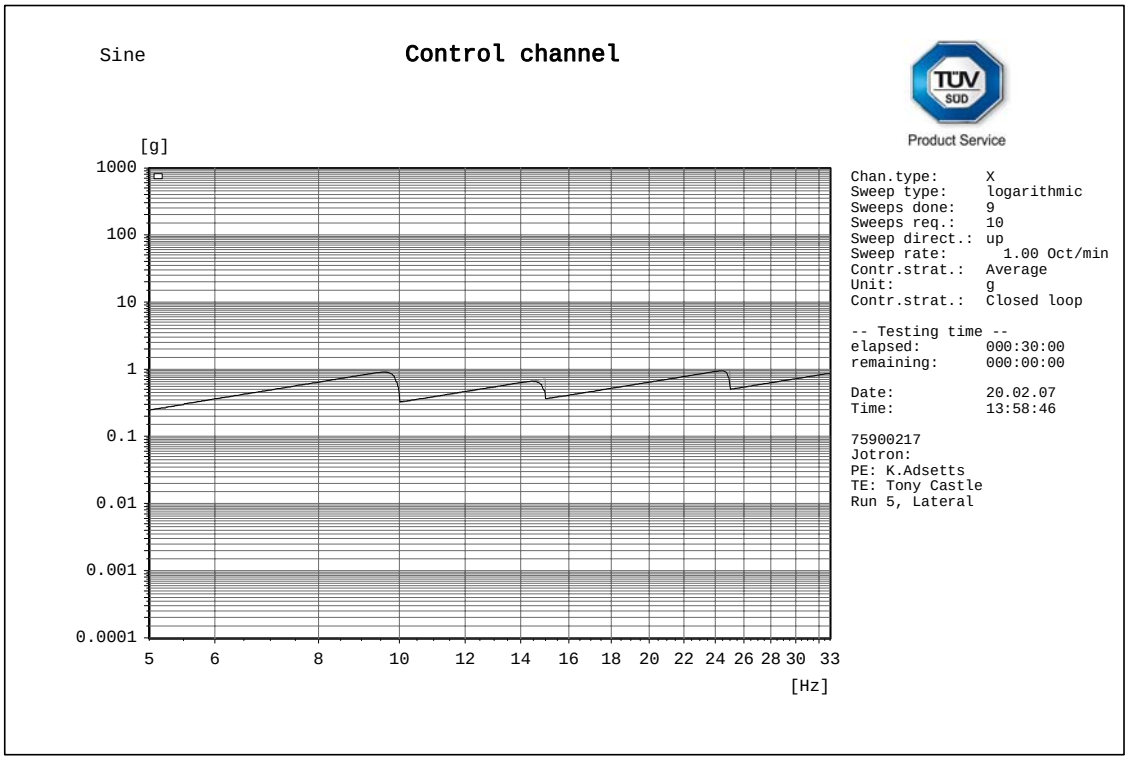
Vertical axis



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

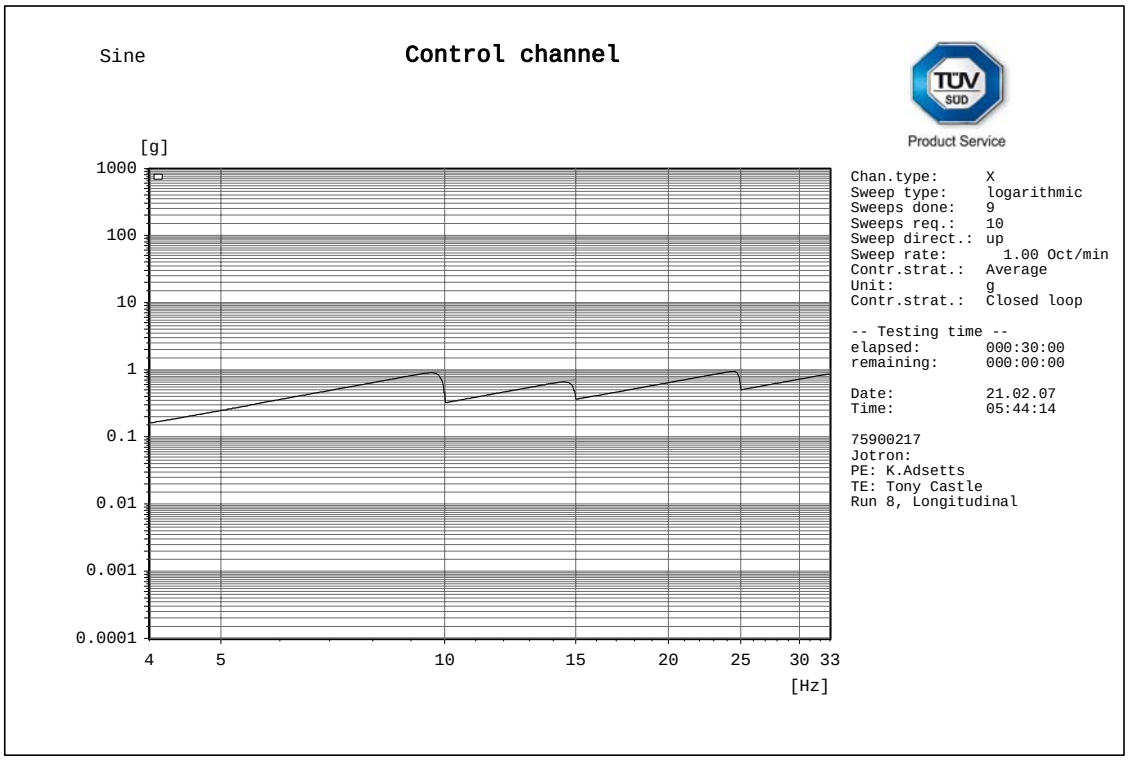
Product Service

Lateral axis



C:\VcpNT\Daten\m+p\Jotron\Swept Sine 30 Mins 004.rsn

Longitudinal axis



C:\VcpNT\Daten\m+p\Jotron\Swept Sine 30 Mins 005.rsn

Product Service

Mechanical Inspection

Test Engineer (A.C.Castle) reported: “Post this test no signs of mechanical degradation could be witnessed. K.Adsetts reports the EUT to be functioning as normal.”

Summary of Aliveness test results

Stage	Pass / Fail
Post-run 1	Pass
Post-run 2	Pass
Post-run 3	Pass

Product Service

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

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 2:50:56 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr vib–14
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 25°C

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

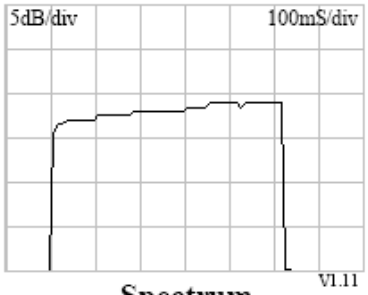
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

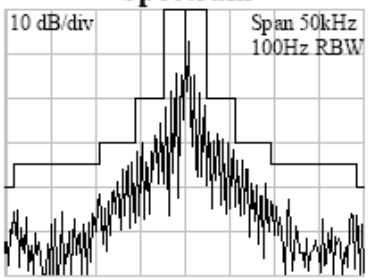
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 68%
Power Rise Time: > 5 ms
Phase Deviation: -1.12 +1.1 radians
Modulation Rise Time: 198 uS
Modulation Fall Time: 220 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 398.3 bps

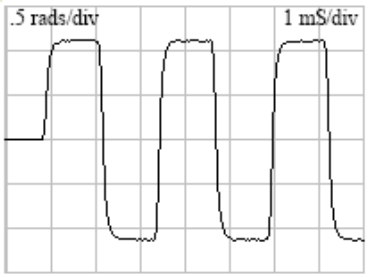
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, Post-run 2)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 8:22:20 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr sweep vib—20
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 25°C

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

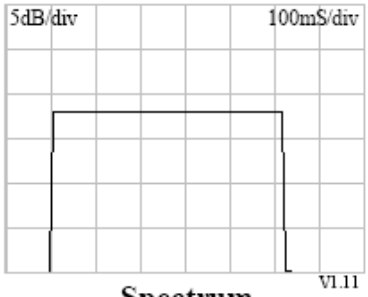
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

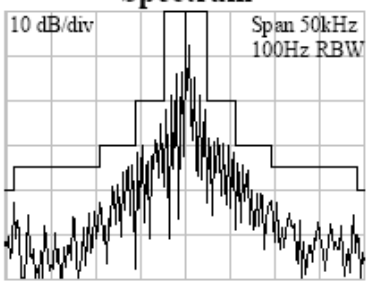
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 88%
Power Rise Time: < 5 ms
Phase Deviation: -1.11 +1.11 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps
CW Preamble: 159.9 ms

Power vs. Time



Spectrum



Phase vs. Time

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Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 2/21/07 8:52:07 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr back front sweep–24
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

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

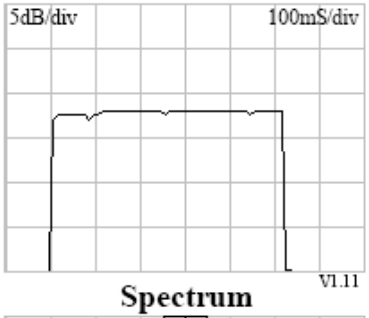
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

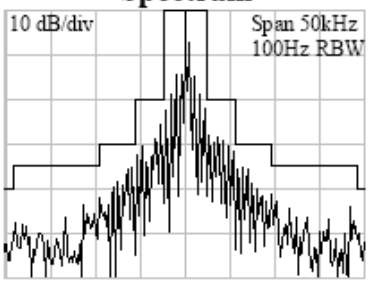
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 87%
Power Rise Time: > 5 ms
Phase Deviation: -1.1 +1.09 radians
Modulation Rise Time: 198 uS
Modulation Fall Time: 220 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 398.3 bps

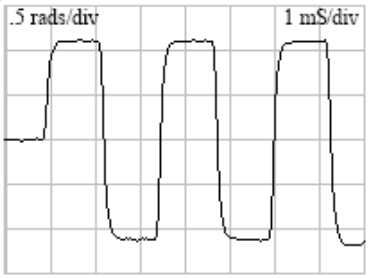
Power vs. Time



Spectrum



Phase vs. Time



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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 S-VDR CAPSULE, Serial Number 00519

2.5.3 Date of Test and Modification State

20th February 2007 - Modification State 0

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

Test Set-up

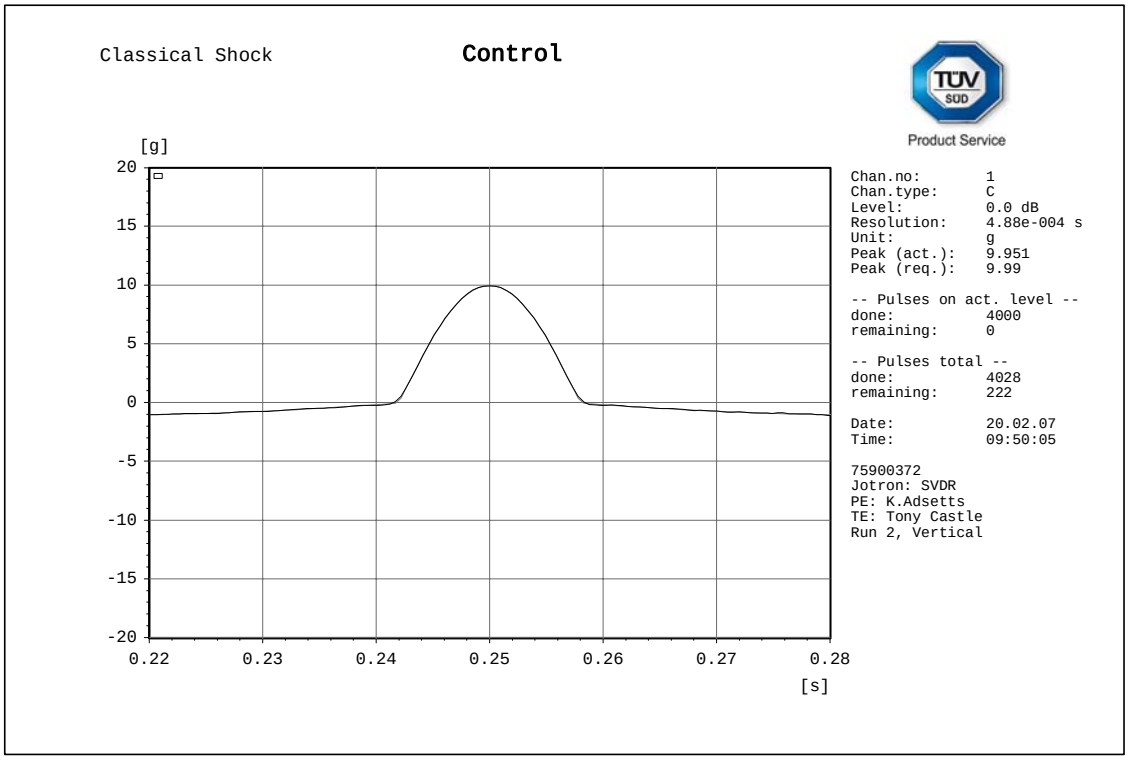
Product Service

2.5.6 Environmental Conditions

Ambient Temperature	20.9°C
Relative Humidity	42%
Atmospheric Pressure	1000mbar

2.5.7 Test Results

Vertical axis, 4000 Bumps



C:\VcpNT\Daten\m+p\Jotron\Bump 10g 16ms 001.rcs

Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/21/05 4:12:33 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr–17
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 23°C

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

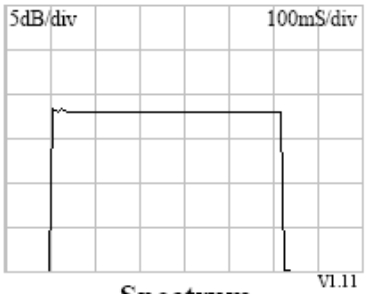
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

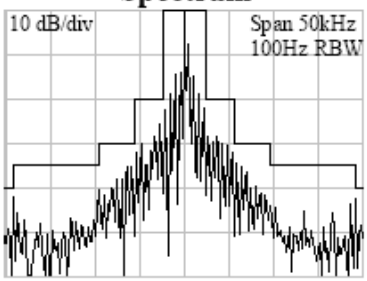
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 88%
Power Rise Time: < 5 ms
Phase Deviation: -1.12 +1.11 radians
Modulation Rise Time: 209 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 398.3 bps
CW Preamble: 160.3 ms

Power vs. Time



Spectrum



Phase vs. Time

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Product Service

2.6 SALT FOG TEST

2.6.1 Specification Reference

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

2.6.2 Equipment Under Test

Tron S-VDR CAPSULE, Serial Number 00519

2.6.3 Date of Test and Modification State

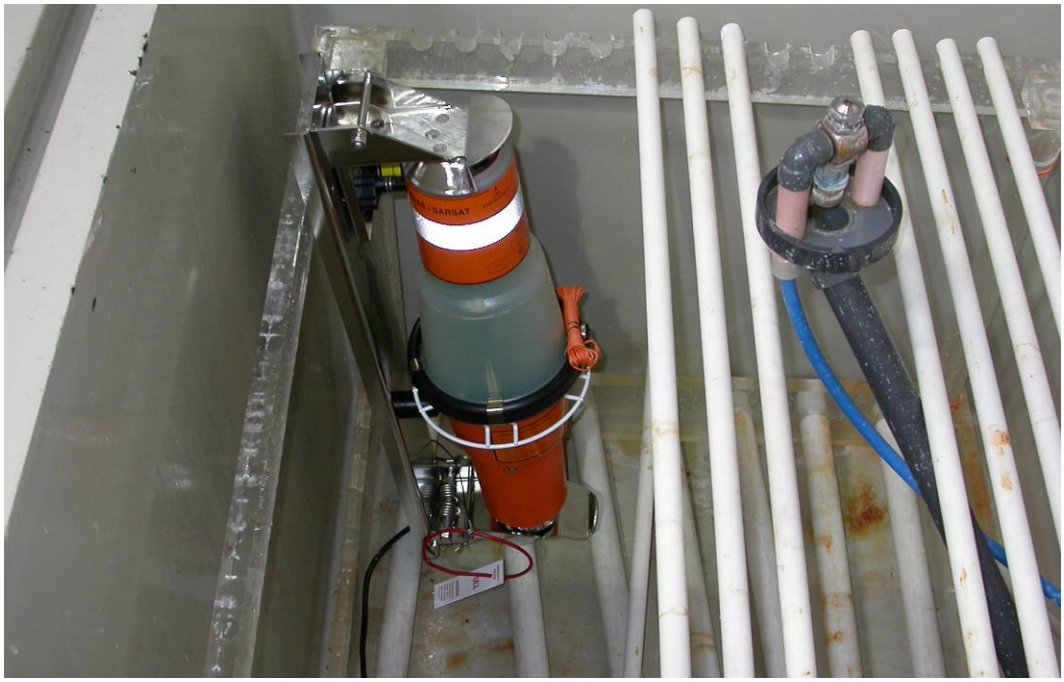
12th to 16th March 2007- Modification State 0

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

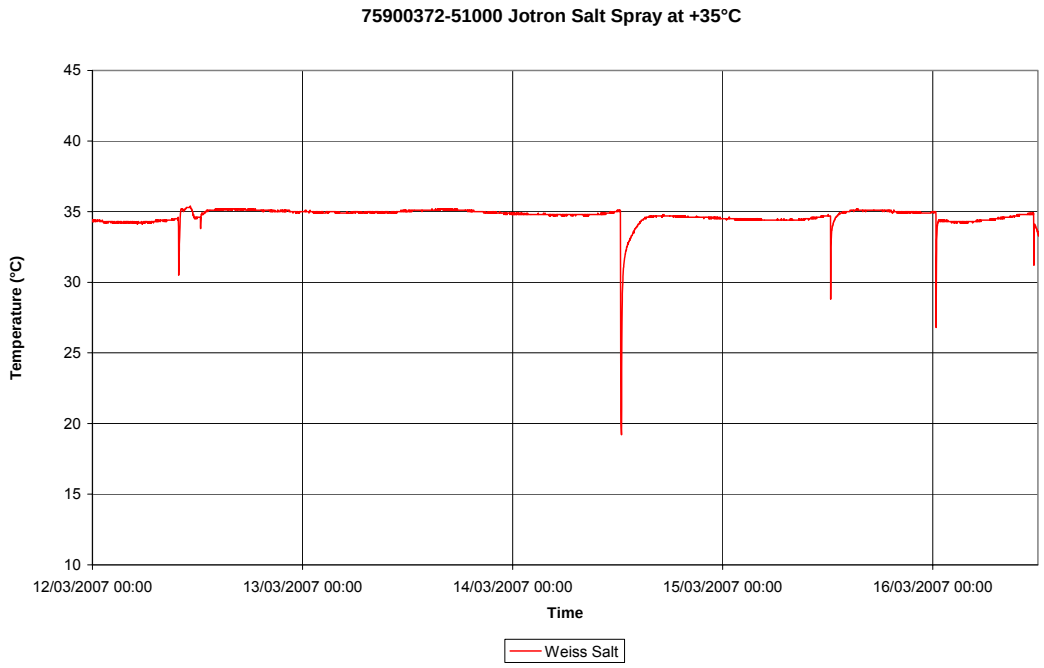


Test Set-up

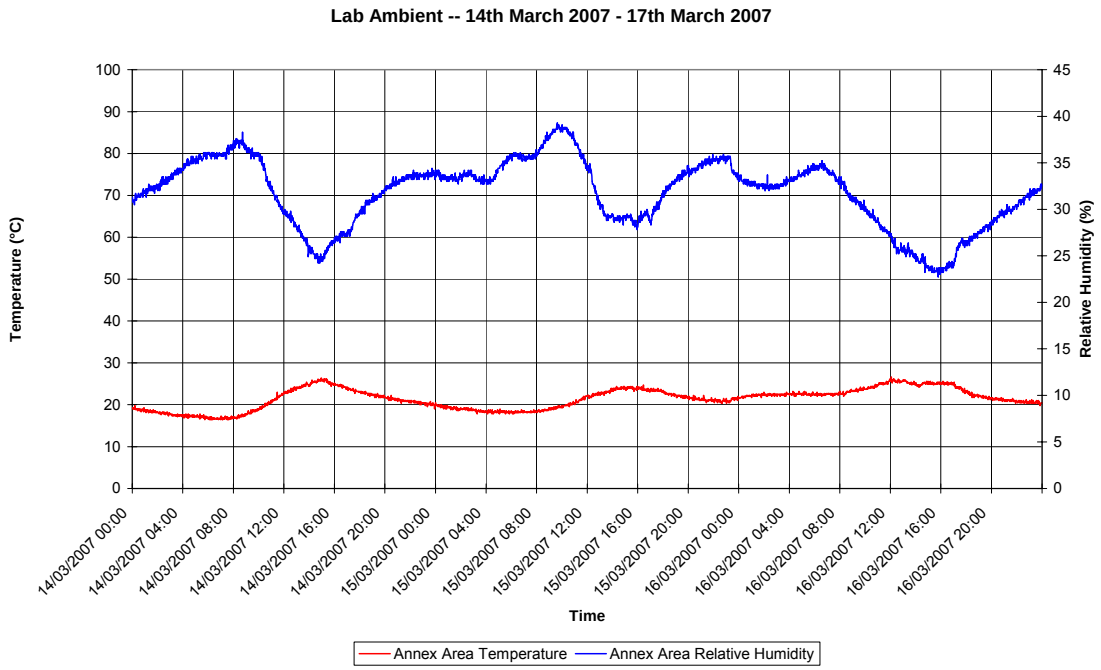
Product Service

2.6.6 Environmental Conditions

Salt Spray Temperature Plot



Ambient Storage Temperature Plot



Product Service

2.6.7 Test Results

Beacon Test Report (Aliveness Test, Pre-test)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 3/12/07 8:25:52 AM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr presalt—74
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 23°C

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

Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 87%
Power Rise Time: > 5 ms
Phase Deviation: -1.12 +1.1 radians
Modulation Rise Time: 209 uS
Modulation Fall Time: 209 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps

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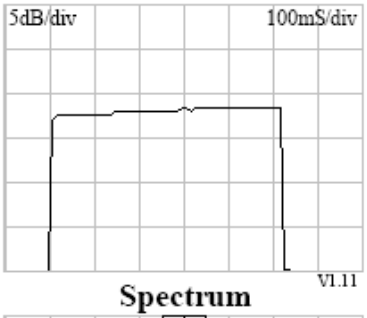
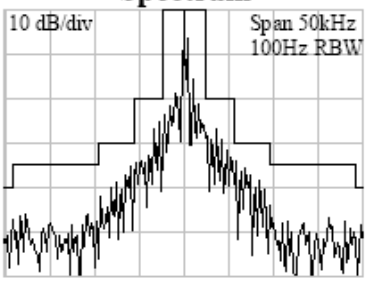
Power vs. Time



Spectrum



Phase vs. Time

Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 3/16/07 4:01:45 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr post salt–79
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 24°C

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

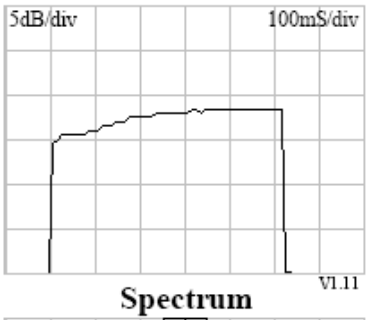
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

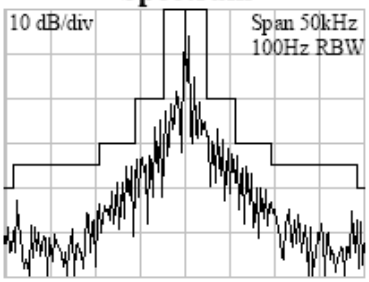
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 65%
Power Rise Time: > 5 ms
Phase Deviation: -1.13 +1.11 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps

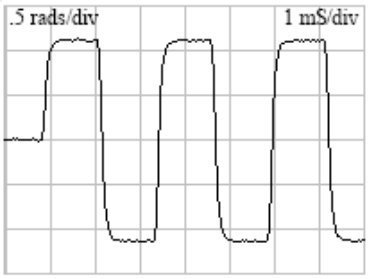
Power vs. Time



Spectrum



Phase vs. Time



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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 S-VDR CAPSULE, Serial Number 00519

2.7.3 Date of Test and Modification State

10th May 2007 - Modification State 0

2.7.4 Test Equipment Used

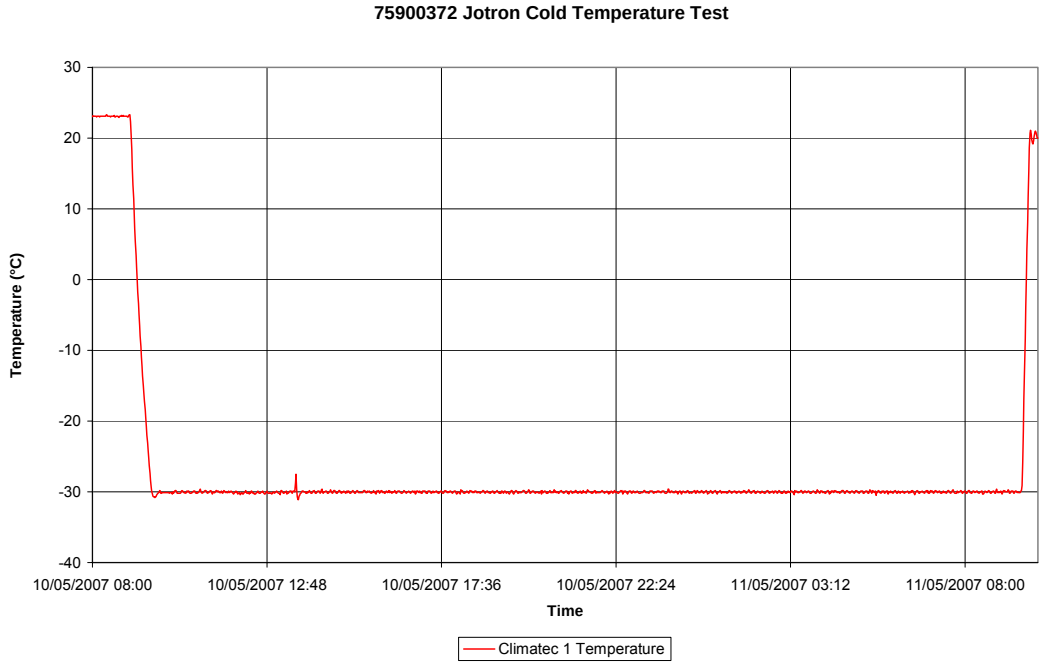
The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Test Set-up and Operating Modes

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

2.7.6 Environmental Conditions

Preconditioning Temperature Plot



Product Service

2.7.7 Test Results

The test piece was located into test chamber and the chamber was set to -30°C, the chamber was dwelled for a minimum of 2 hours.

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 Kevin Adsetts tested the EUT and reported it as satisfactory.

Product Service

Beacon Test Report (Aliveness Test, Pre-test)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 5/9/07 3:24:58 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr pre drop—90
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 30°C

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

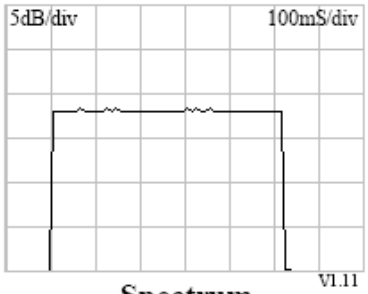
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

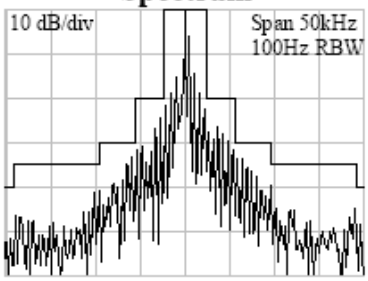
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * *****.**
Longitude: * *****.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 88%
Power Rise Time: < 5 ms
Phase Deviation: -1.12 +1.11 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 209 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps
CW Preamble: 160.1 ms

Power vs. Time



Spectrum



Phase vs. Time

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Product Service

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 5/10/07 1:38:00 PM
Tester Model/Serial No./File Name: BT100S/2383/jotron svdr post drop——91
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 24°C

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

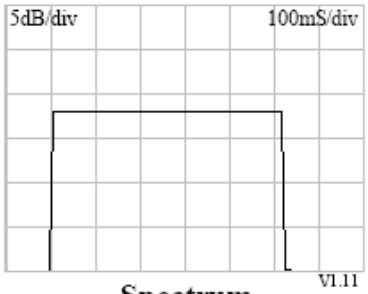
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

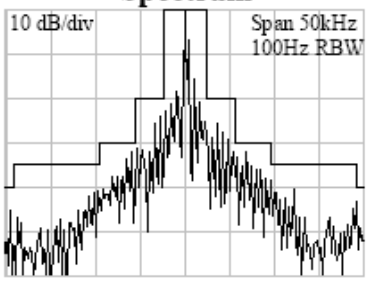
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 88%
Power Rise Time: < 5 ms
Phase Deviation: -0.98 +0.98 radians
Modulation Rise Time: 142 uS
Modulation Fall Time: 165 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps
CW Preamble: 160.4 ms

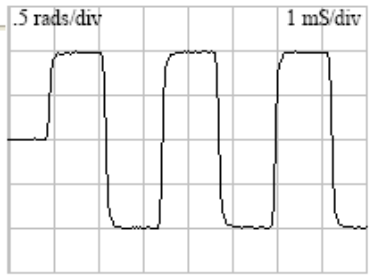
Power vs. Time



Spectrum



Phase vs. Time



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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 S-VDR CAPSULE, Serial Number 00519

2.8.3 Date of Test and Modification State

26th June 2007 - Modification State 0

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

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:09:44 PM
Tester Model/Serial No./File Name: BT100S/2383/SVDRpre–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 19°C

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

Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 63%
Power Rise Time: > 5 ms
Phase Deviation: -1.12 +1.1 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 209 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps

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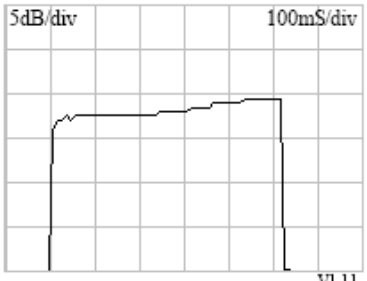
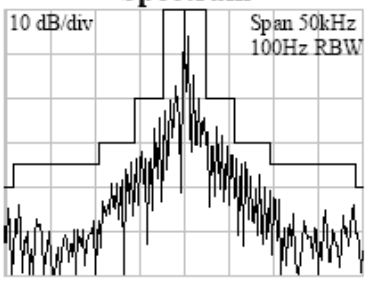
Power vs. Time



Spectrum



Phase vs. Time

Product Service

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

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:19:54 PM
Tester Model/Serial No./File Name: BT100S/2383/SVDRpost–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 19°C

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

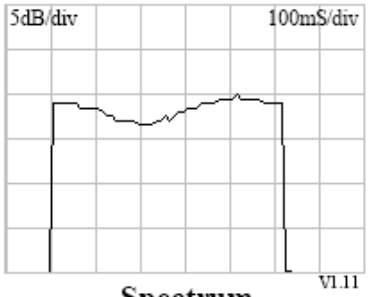
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFE2F901E26C2077FDFFFCA677783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

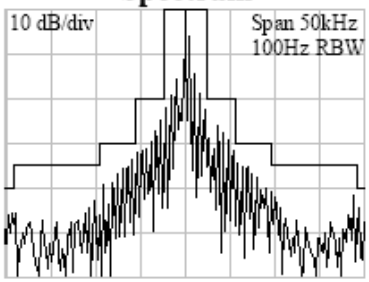
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 59%
Power Rise Time: < 5 ms
Phase Deviation: -1.12 +1.11 radians
Modulation Rise Time: 177 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 1.1%
Modulation Bit Rate: 398.3 bps
CW Preamble: 159.3 ms

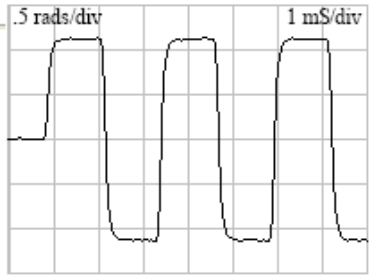
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

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

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:25:24 PM
Tester Model/Serial No./File Name: BT100S/2383/SVDRinvertedPre–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 24°C

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

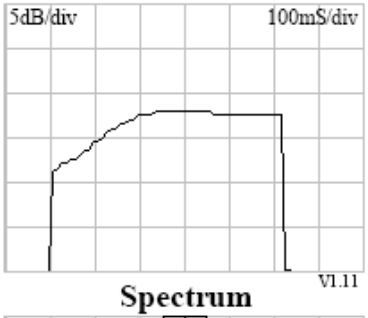
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

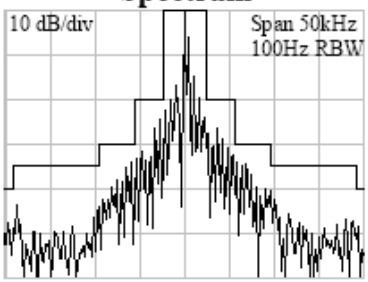
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 70%
Power Rise Time: > 5 ms
Phase Deviation: -1.12 +1.11 radians
Modulation Rise Time: 198 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps

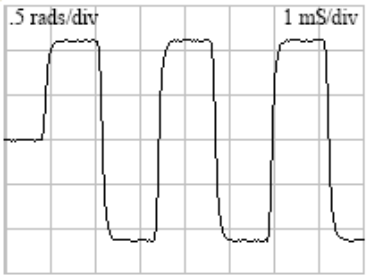
Power vs. Time



Spectrum



Phase vs. Time



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Product Service

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

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:32:11 PM
Tester Model/Serial No./File Name: BT100S/2383/SVDRinvertedPost–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 25°C

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

Notes: Add text comments here.

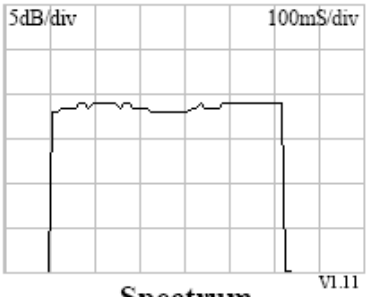
15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFE2F901E26C2077FDFFFCA677783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

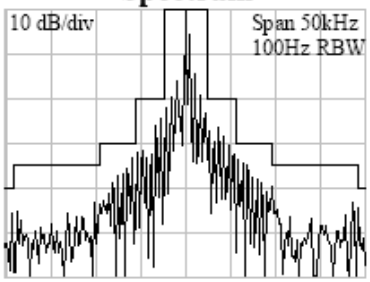
406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 61%
Power Rise Time: < 5 ms
Phase Deviation: -1.11 +1.11 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 188 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps
CW Preamble: 160.1 ms

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.

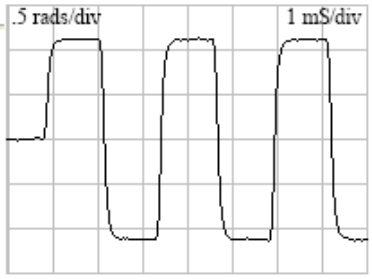
Power vs. Time



Spectrum



Phase vs. Time



Product Service

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

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:43:05 PM
Tester Model/Serial No./File Name: BT100S/2383/SVDRhorizPre–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 23°C

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

Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFE2F901E26C2077FDFFFCA677783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 61%
Power Rise Time: < 5 ms
Phase Deviation: -1.11 +1.12 radians
Modulation Rise Time: 198 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 0.7%
Modulation Bit Rate: 398.1 bps
CW Preamble: 159.7 ms

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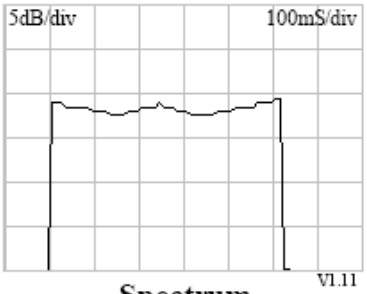
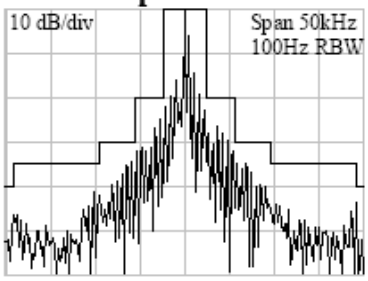
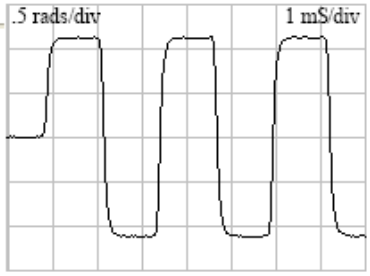
Power vs. Time



Spectrum



Phase vs. Time



Product Service

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

Beacon Test Report

203C4D840EFFBFF

Organization: TUV Product Service
Tested By: BT100A S/N: 2383
Date: 6/26/07 2:47:00 PM
Tester Model/Serial No./File Name: BT100S/2383/SVDRhorizPost–1
Tester Cal Due Date: Sep 6, 2008
Tester Temperature: 27°C

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

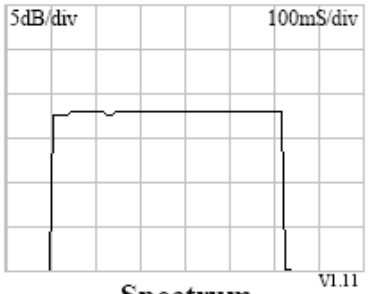
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFE2F901E26C2077FDFFFCA677783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

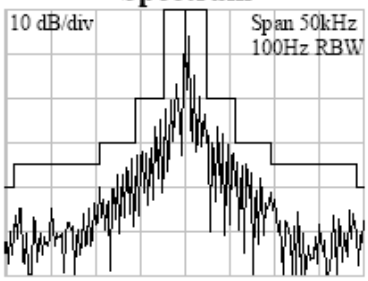
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * **°**.**

406 MHz Measurements
406 Frequency (INT REF): 406.0279 MHz
406 Power (INT ANT): 85%
Power Rise Time: < 5 ms
Phase Deviation: -1.11 +1.11 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 198 uS
Modulation Symmetry: 1.1%
Modulation Bit Rate: 398.1 bps
CW Preamble: 159.4 ms

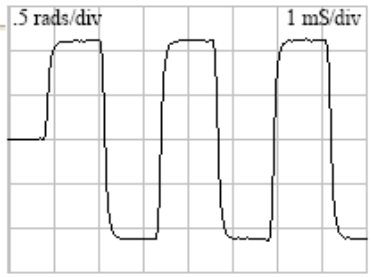
Power vs. Time



Spectrum



Phase vs. Time



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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 S-VDR CAPSULE, Serial Number 00519

2.9.3 Date of Test and Modification State

5th to 7th September 2007 - Modification State 0

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*

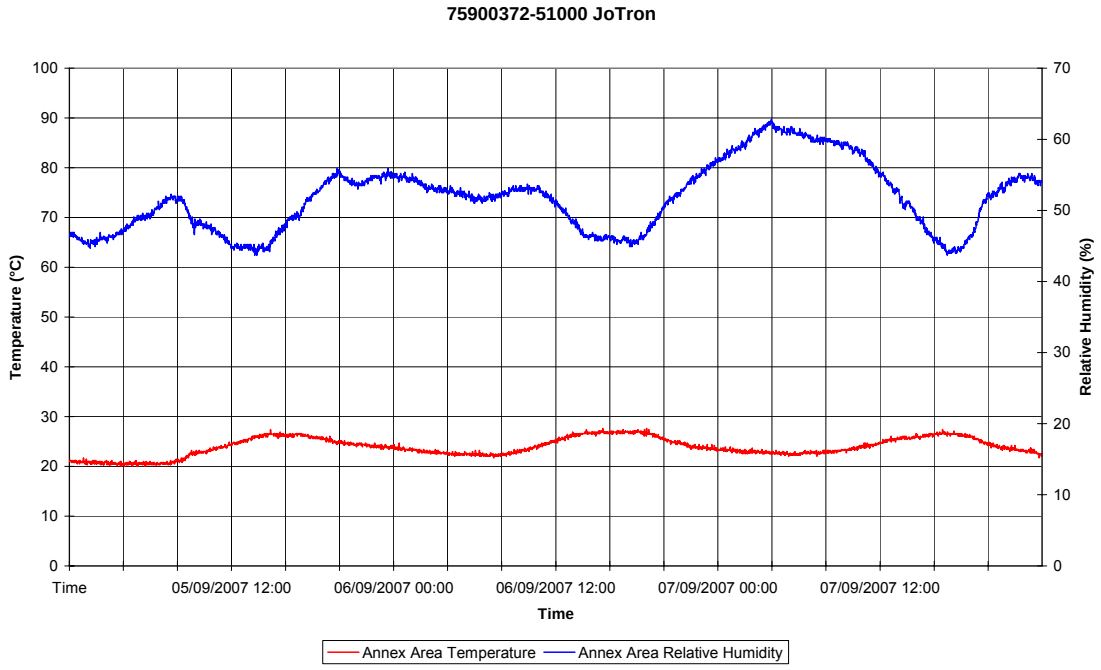
*Note: EUT activated (entered Operating mode automatically) on contact with water.

Test Set-up

Product Service

2.9.6 Environmental Conditions

Ambient Conditions Plot



2.9.7 Test Results

5th September 2007

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

- The test item operated correctly.
- Dry weight = 3.560 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 19.6°C). The unit activated the moment it was immersed. The unit was prevented from floating to the surface with the use of two 10kg masses as seen in Test Setup, above.

7th September 2007

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

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): 3.565 kg
- An Aliveness Test was conducted (see Beacon Test Report, below).

Product Service

Detailed inspection of the EUT (involving partial dismantling) was conducted and, as no moisture was found inside, the additional 5g of water was attributed to water contained within the tether and outer portion of seals and switches.

Beacon Test Report (Aliveness Test, Post-test)

Beacon Test Report

203C4D840EFFBFF

Organization:
Tested By:
Date: 10-Sep-07 3:31:08 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-PostImm–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 25°C

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

Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

406 MHz Measurements
406 Frequency (INT REF): 406.0281 MHz
406 Power (INT ANT): 85%
Power Rise Time: < 5 ms
Phase Deviation: -1.12 +1.1 radians
Modulation Rise Time: 188 uS
Modulation Fall Time: 209 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps
CW Preamble: 160.2 ms

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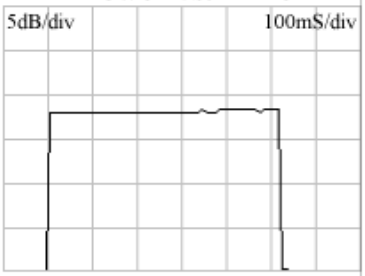
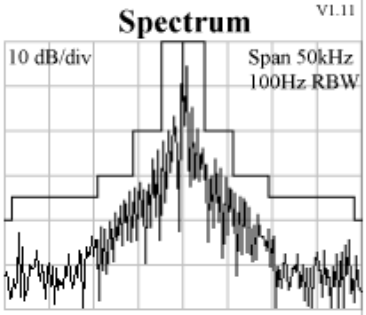
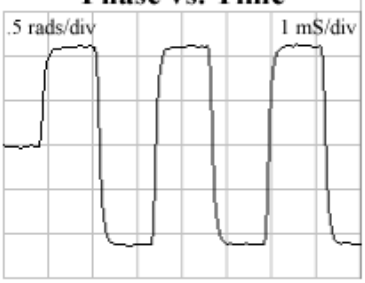
Power vs. Time



Spectrum



Phase vs. Time



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 S-VDR CAPSULE, Serial Number 00169

2.10.3 Date of Test and Modification State

406 MHz Test at +55°C:	21st June 2007	- Modification State 0
121 MHz Test at +55°C:	22nd June 2007	- Modification State 0
406 MHz Test at -20°C:	11th July 2007	- Modification State 0
121 MHz Test at -20°C:	11th July 2007	- Modification State 0
406 MHz Test at Ambient:	12th July 2007	- Modification State 0
121 MHz Test at Ambient:	7th August 2007	- Modification State 1

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

2.10.6 Environmental Conditions

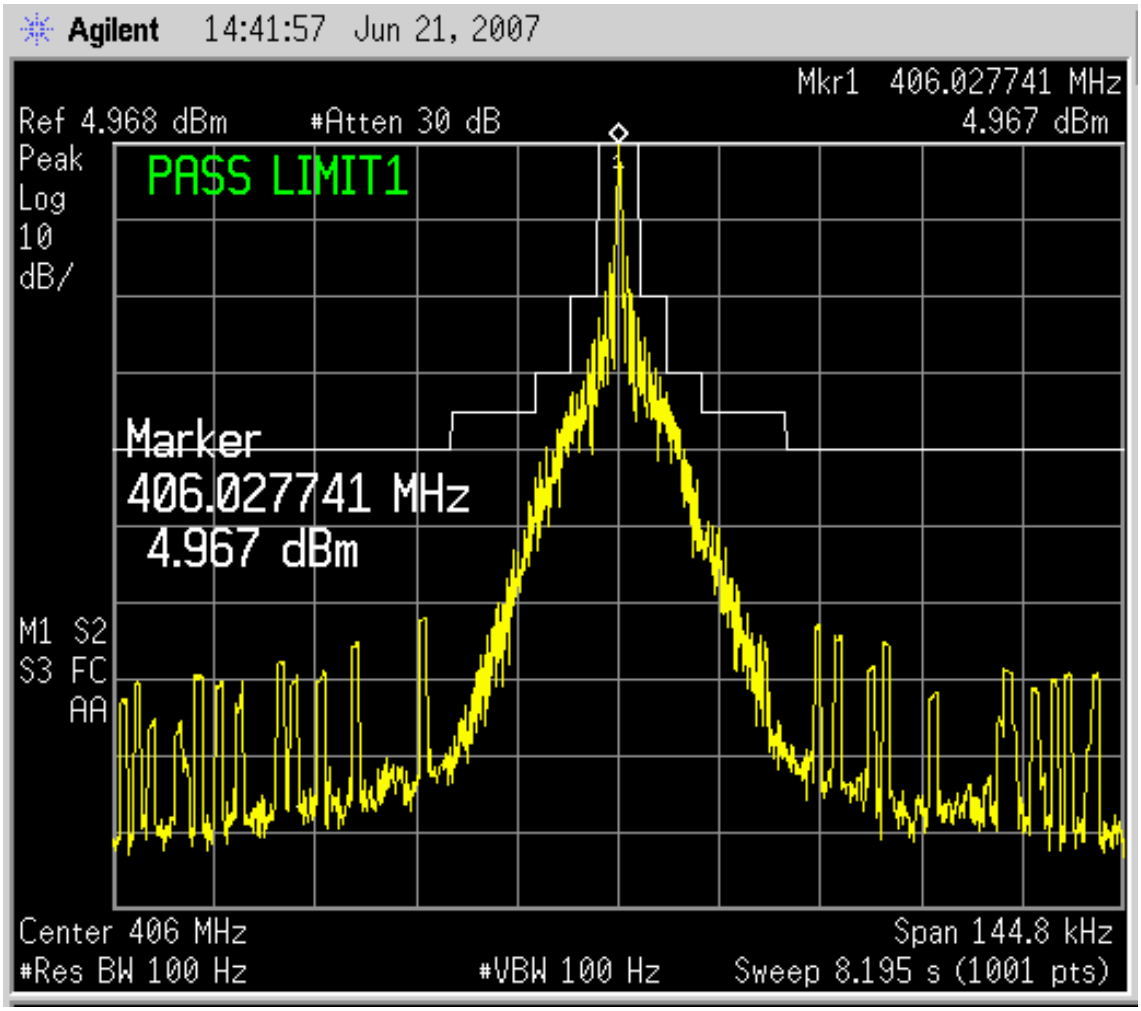
	21st June 2007	22nd June 2007	11th July 2007
Ambient Temperature	23.8°C	23.4°C	24.2°C
Atmospheric Pressure	1004mbar	999mbar	1008mbar

	12th July 2007	7th August 2007
Ambient Temperature	24.4°C	23.7°C
Atmospheric Pressure	1009mbar	1011mbar

Product Service

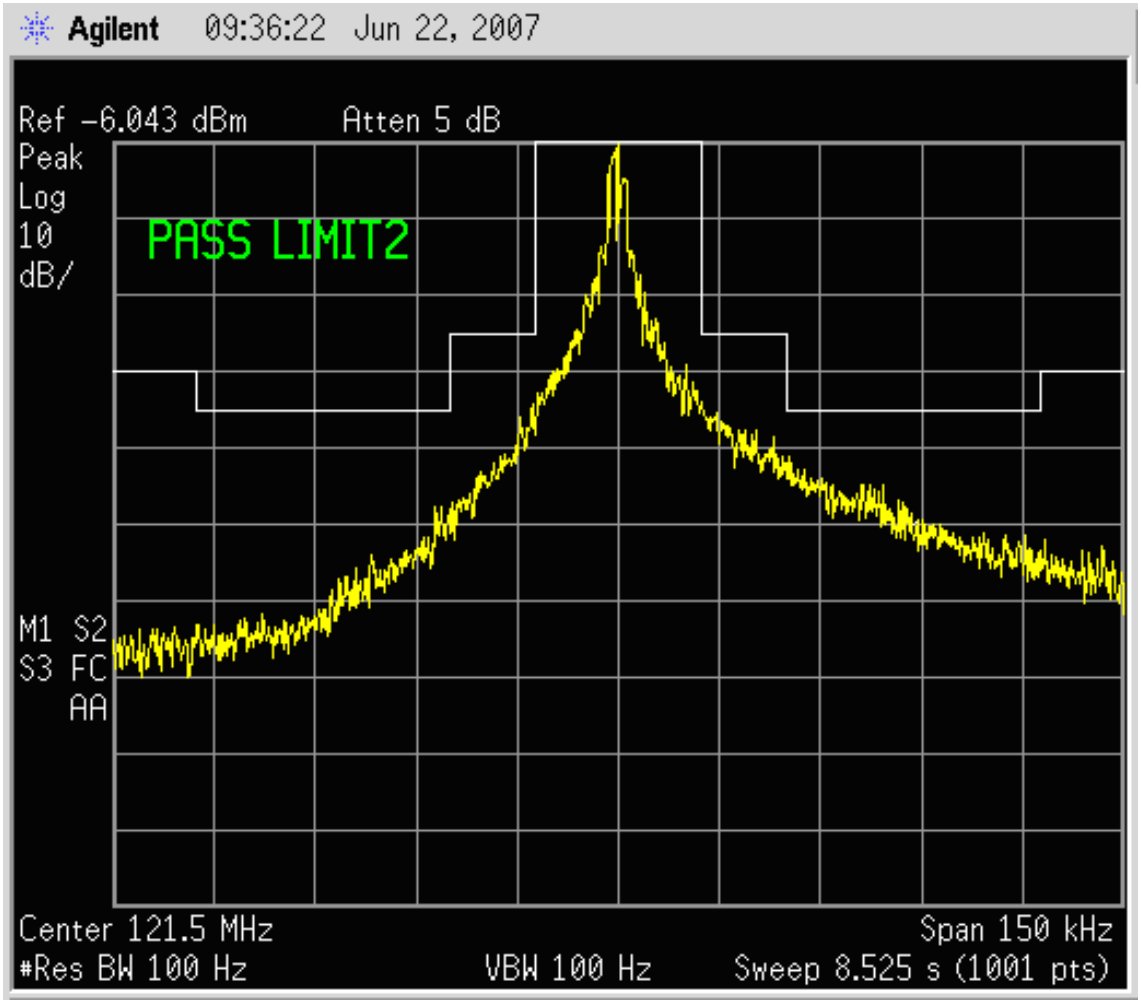
2.10.7 Test Results

406 MHz Test at +55°C



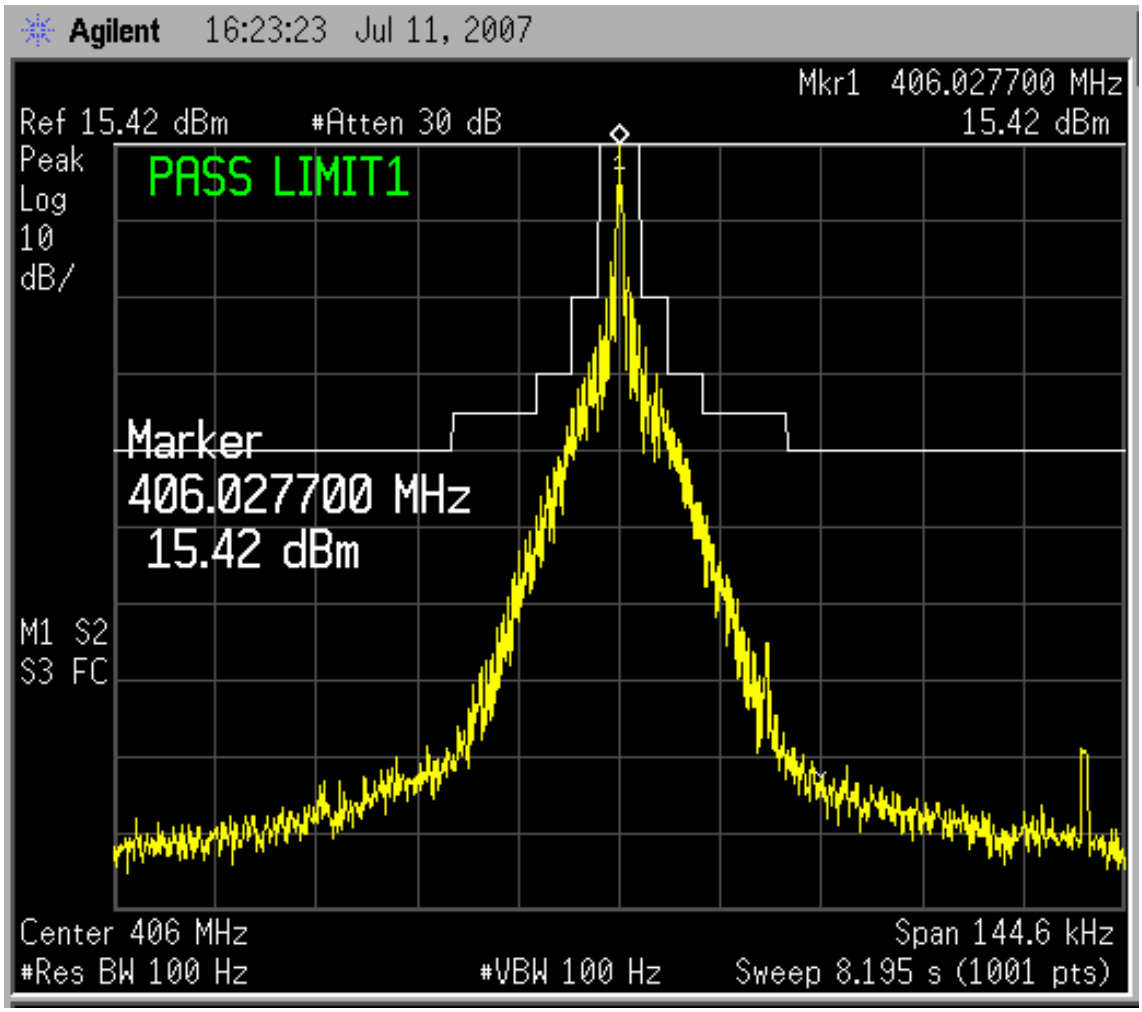
Product Service

121 MHz Test at +55°C



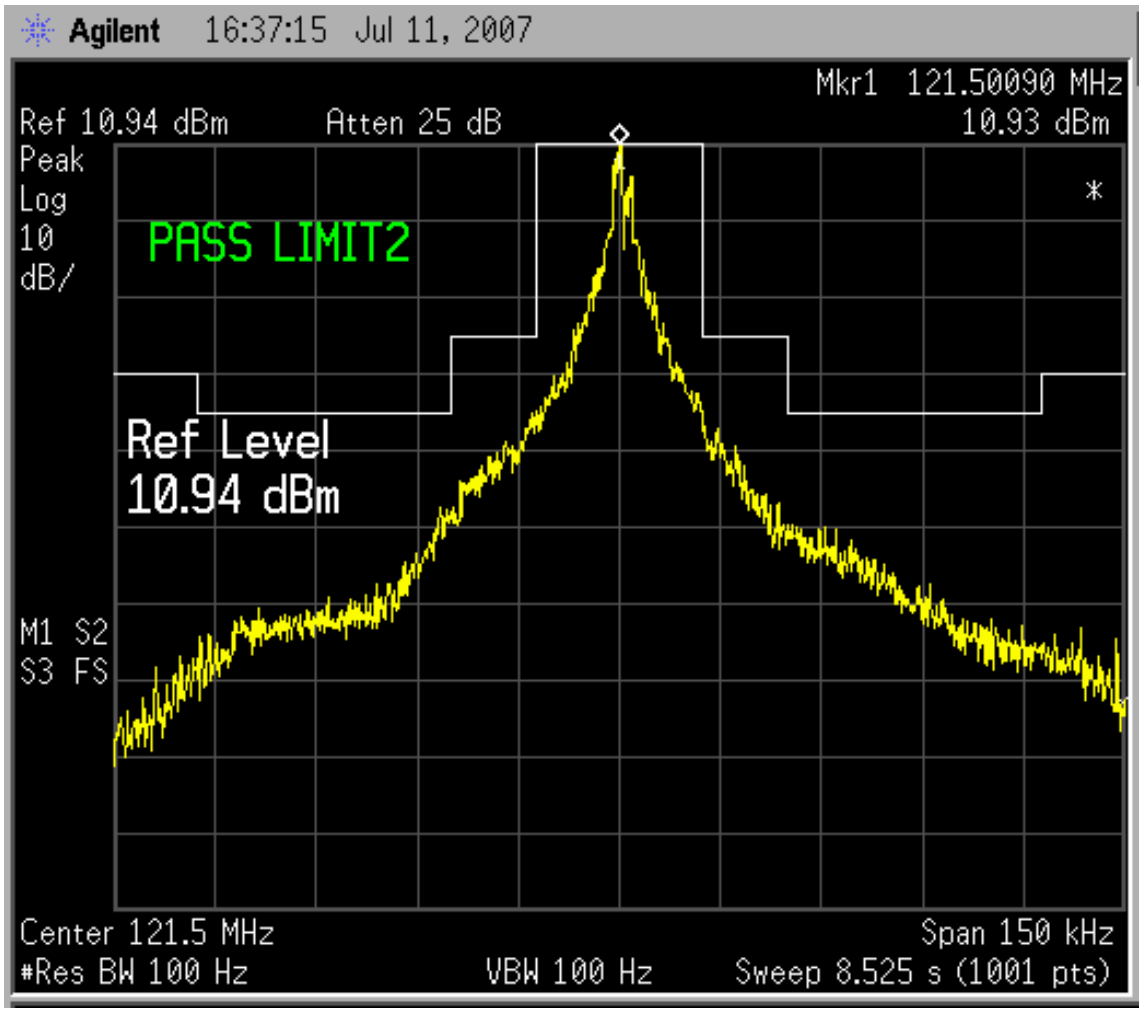
Product Service

406 MHz Test at -20°C



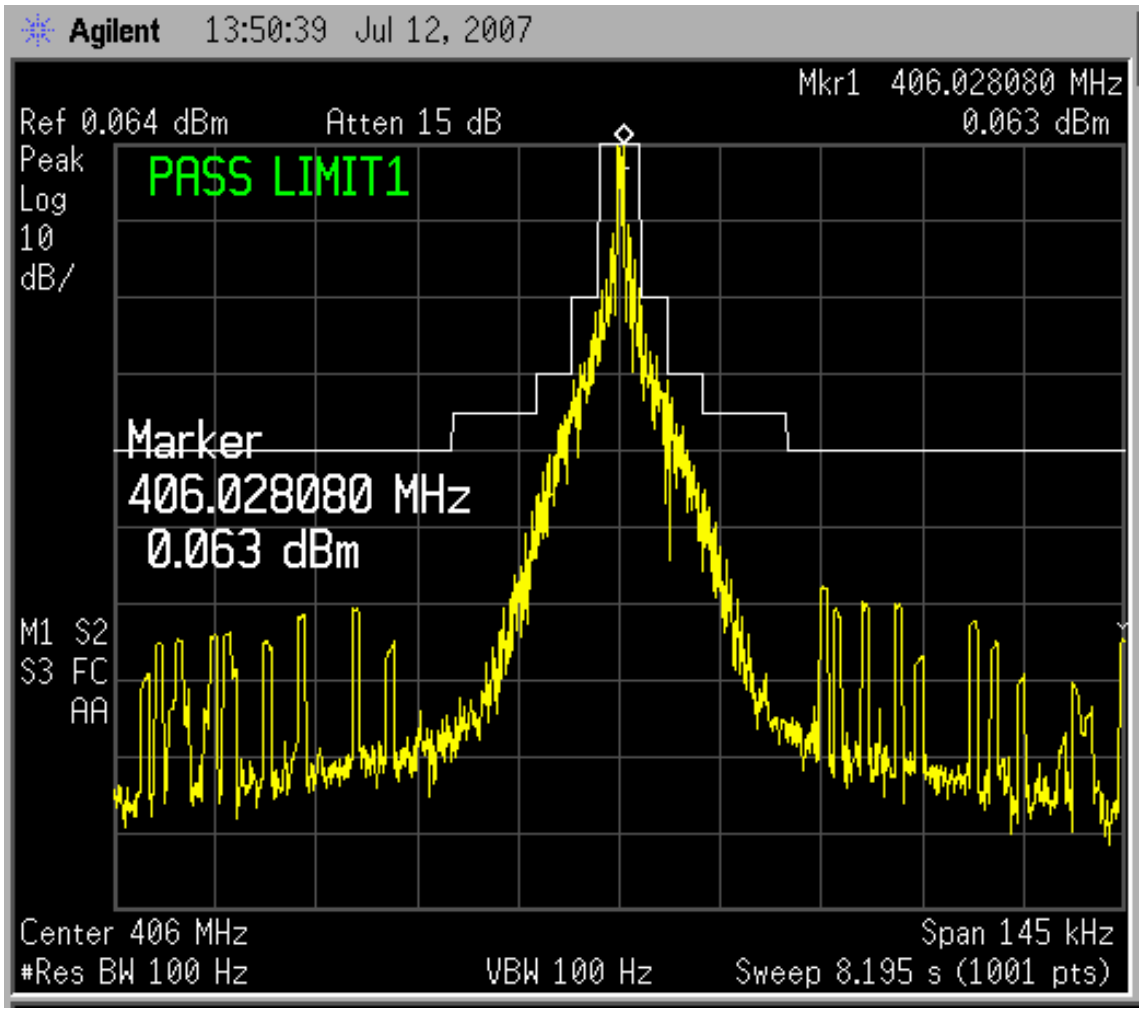
Product Service

121 MHz Test at -20°C



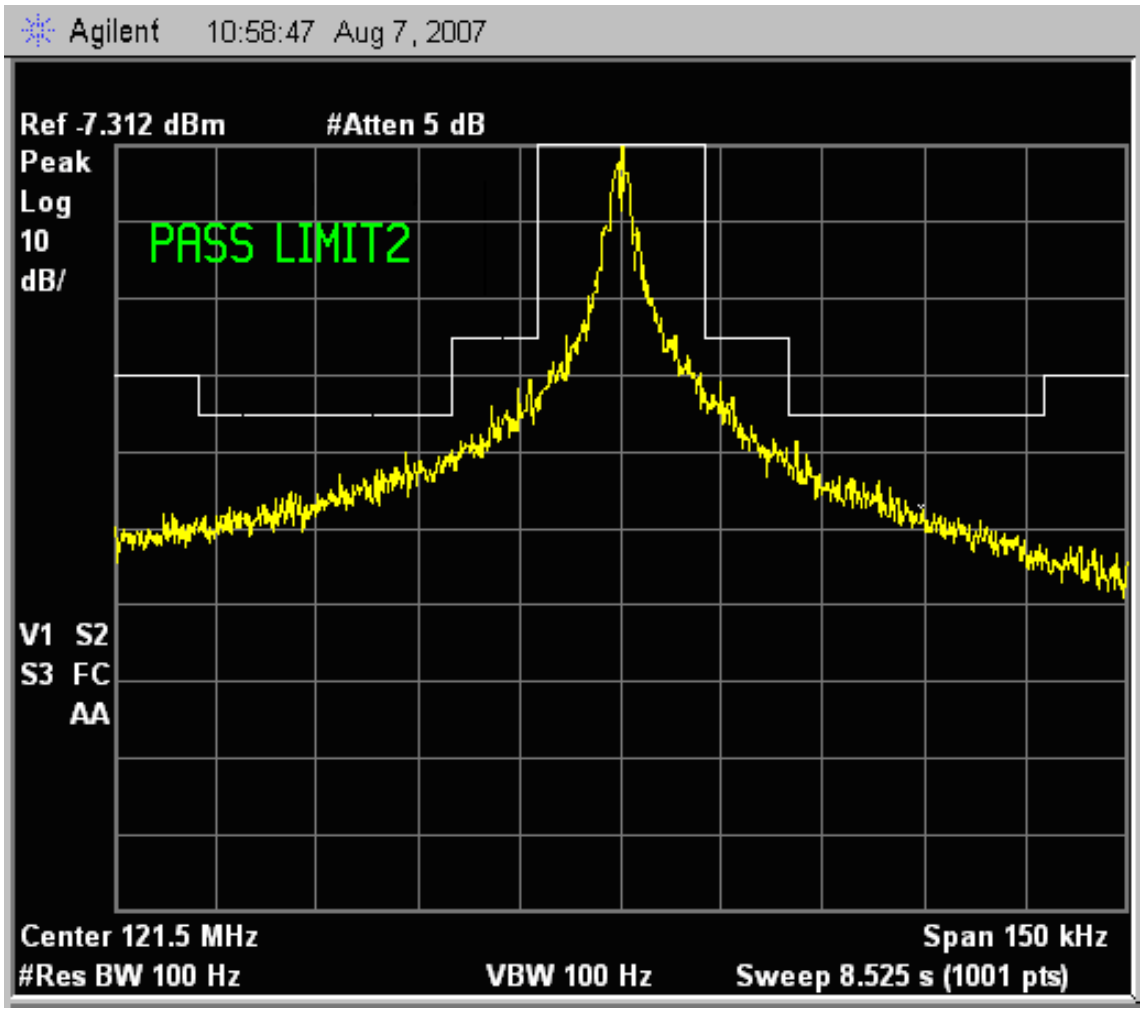
Product Service

406 MHz Test at Ambient



Product Service

121 MHz Test at Ambient



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 S-VDR CAPSULE, Serial Number 00516

2.11.3 Date of Test and Modification State

11th September 2007 - Modification State 0

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.

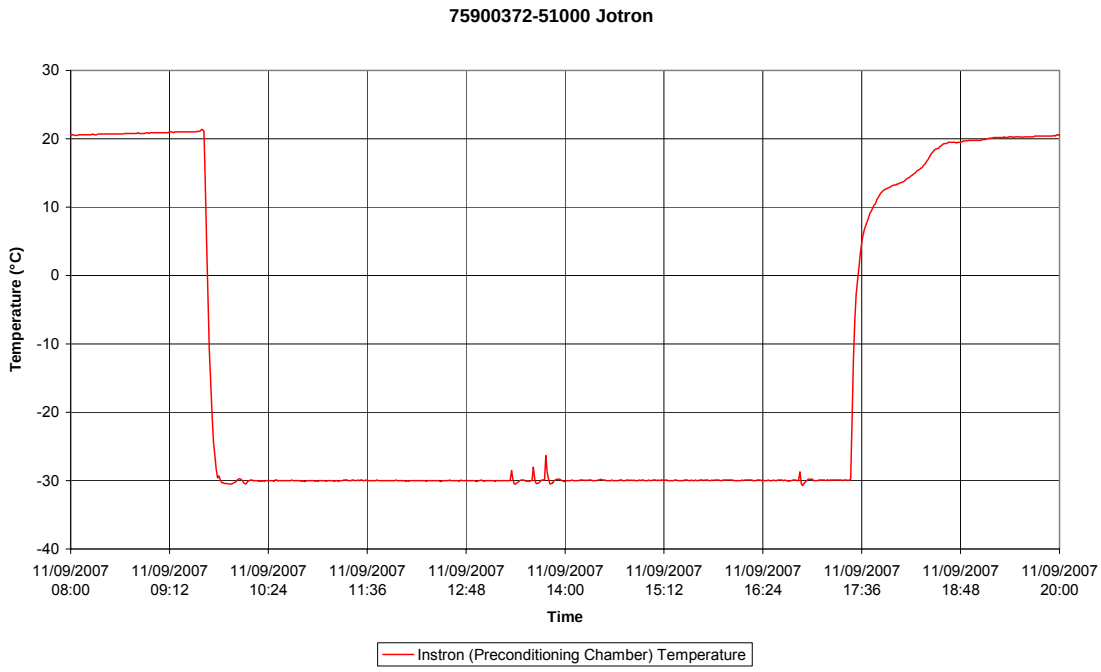
Test Set-up – Preconditioning

Product Service

Test Set-up – During Test

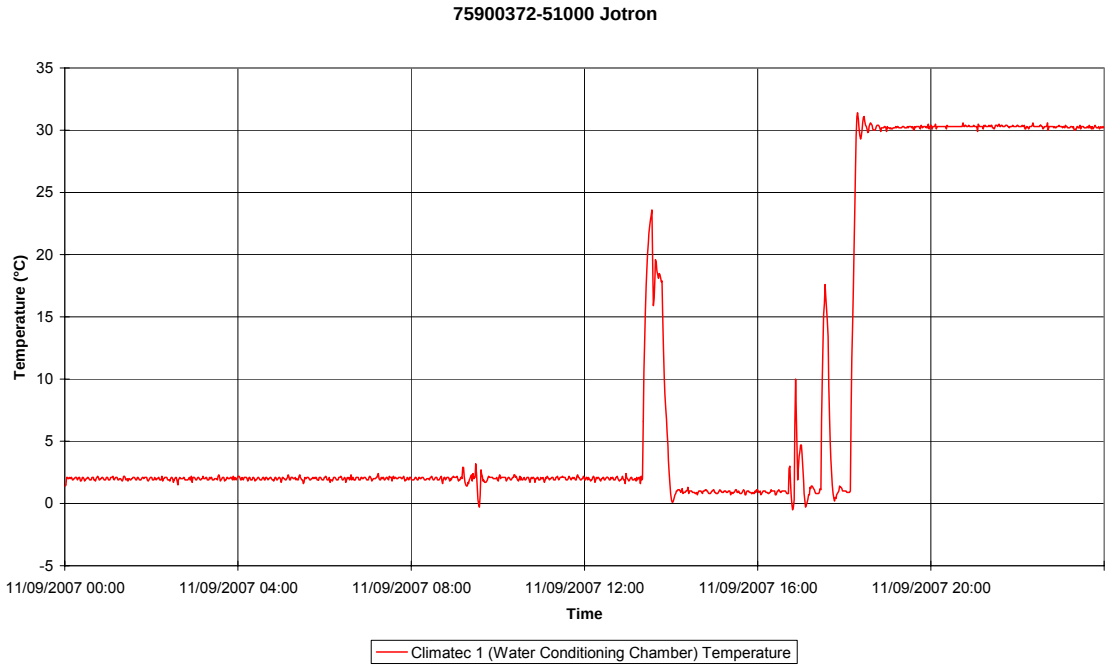
2.11.6 Environmental Conditions

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 at least 3 hours.

EUT removed from chamber and totally immersed in fresh water at 2.3°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 -30°C.

EUT removed from chamber after stabilisation of at lest 3 hours and totally immersed in salt water at 1.5°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

203C4D840EFFBFF

Organization:
Tested By:
Date: 11-Sep-07 1:36:25 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Cold-Fresh-SVDR–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 24°C

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

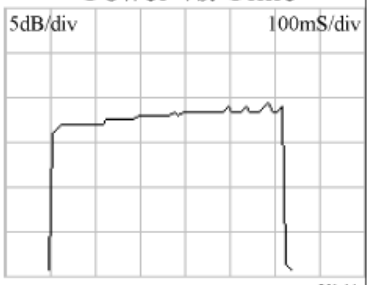
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

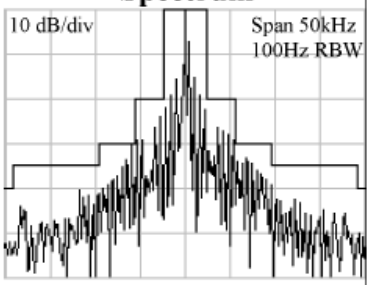
406 MHz Measurements
406 Frequency (INT REF): 406.0281 MHz
406 Power (INT ANT): 37%
Power Rise Time: > 5 ms
Phase Deviation: -0.98 +0.96 radians
Modulation Rise Time: 165 uS
Modulation Fall Time: 153 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps

Power vs. Time

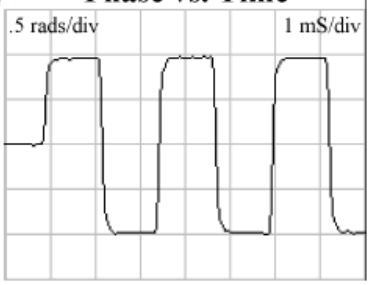


Spectrum

V1.11



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, In Salt Water)

Beacon Test Report

203C4D840EFFBFF

Organization:
Tested By:
Date: 11-Sep-07 5:28:58 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Cold-Salt-SVDR–2
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 30°C

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

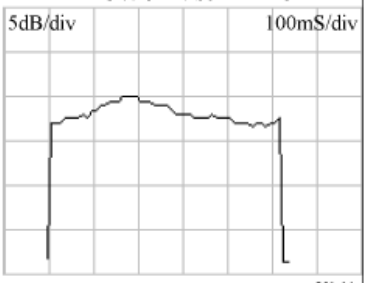
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFE2F901E26C2077FDFFFCA677783E0F66C
Burst Mode: Normal Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

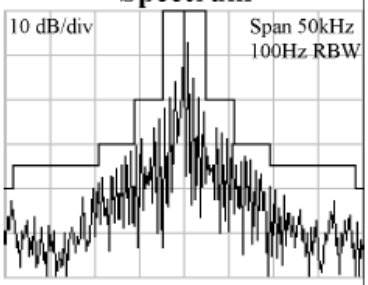
Position Source: Internal GPS
Auxiliary Radio: 121.5 MHz
Bits 107-110: Default
Latitude: * **°**.**
Longitude: * ***°**.**

406 MHz Measurements
406 Frequency (EXT REF): 406.027853 MHz
406 Power (INT ANT): 39%
Power Rise Time: > 5 ms
Phase Deviation: -0.98 +0.96 radians
Modulation Rise Time: 177 uS
Modulation Fall Time: 153 uS
Modulation Symmetry: 0.7%
Modulation Bit Rate: 398.1 bps

Power vs. Time



Spectrum



Phase vs. Time

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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 S-VDR CAPSULE, Serial Number 00516

2.12.3 Date of Test and Modification State

12th and 13th September 2007 - Modification State 0

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

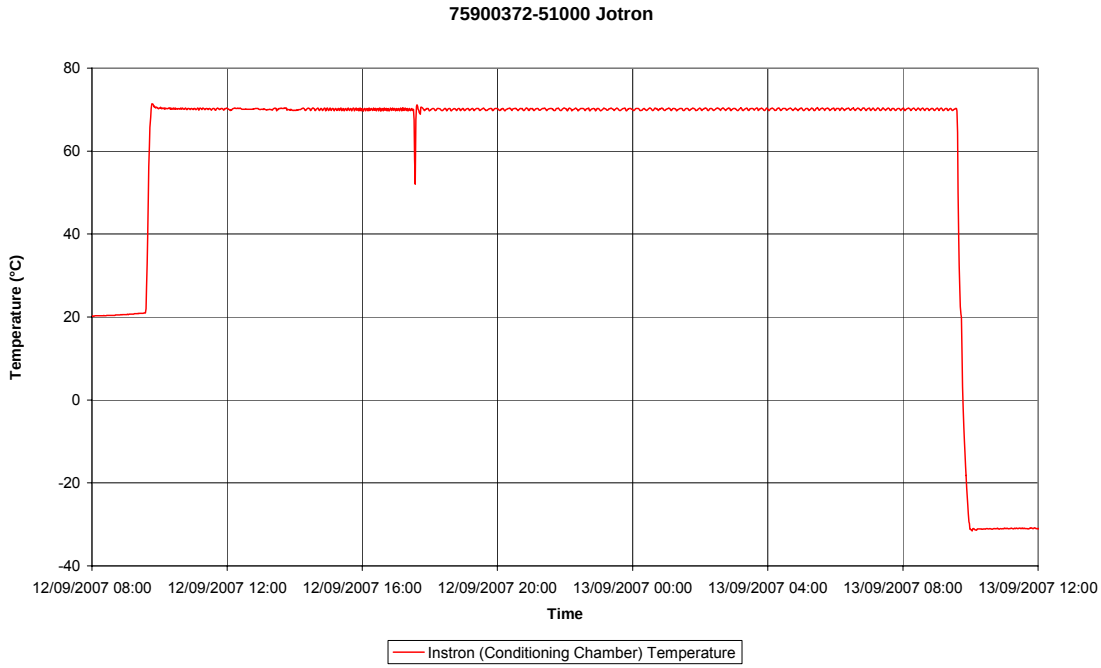
The test was performed with the EUT in the following mode(s): Idle ("Ready Condition")*

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

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

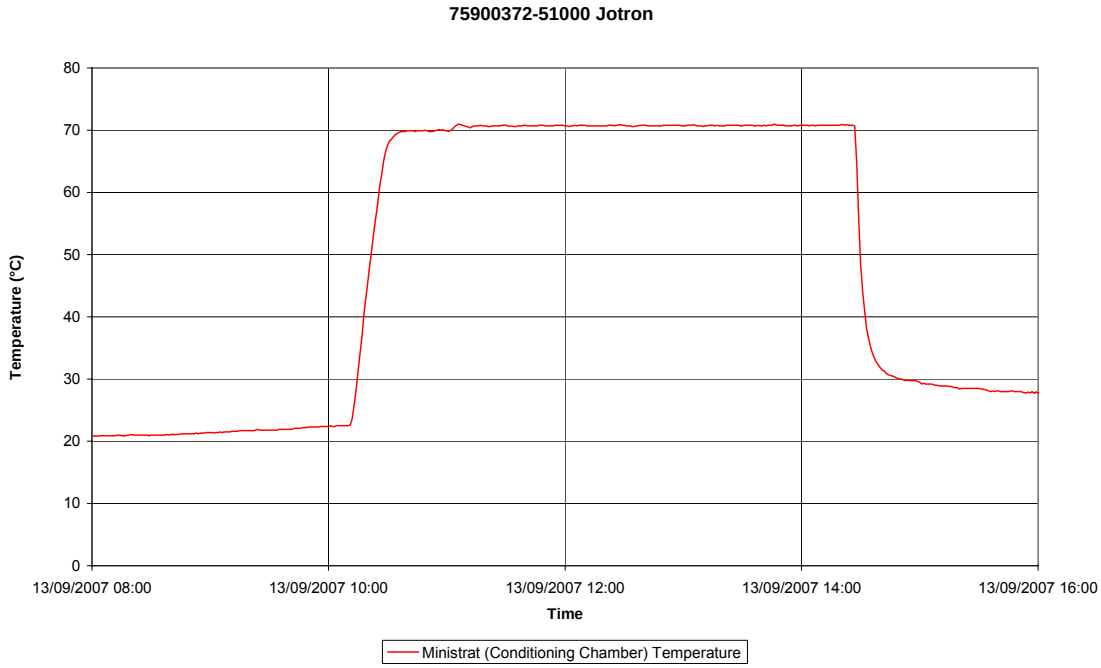
2.12.6 Environmental Conditions

Preconditioning Temperature Plot 1

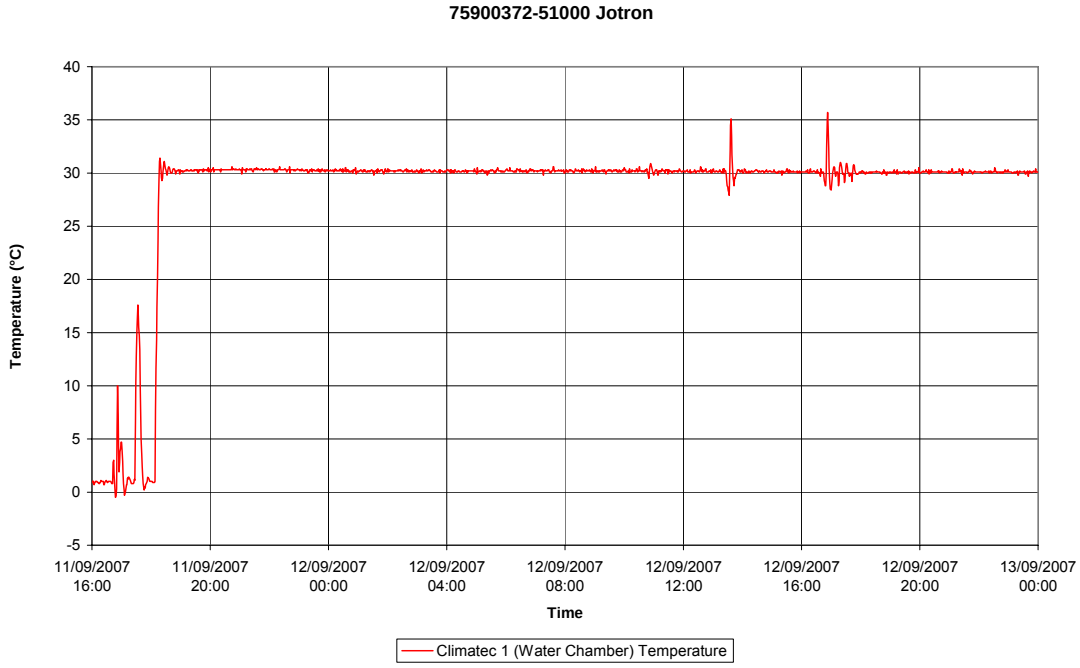


Product Service

Preconditioning Temperature Plot 2



Water Conditioning Temperature Plot 1



Product Service

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 at least 3 hours.

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 at least 3 hours 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

203C4D840EFFBFF

Organization:
Tested By:
Date: 12-Sep-07 5:31:54 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Hot-Fresh–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 31°C

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

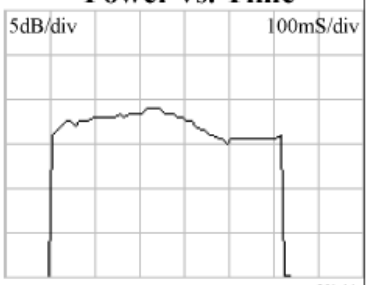
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA677783E0F66C
Burst Mode: Self Test Mode (Long)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

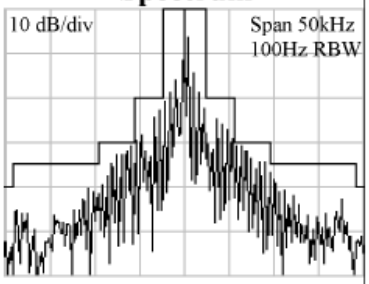
406 MHz Measurements
406 Frequency (INT REF): 406.0281 MHz
406 Power (INT ANT): 63%
Power Rise Time: > 5 ms
Phase Deviation: -1.18 +1.16 radians
Modulation Rise Time: 66 uS
Modulation Fall Time: 78 uS
Modulation Symmetry: 0%
Modulation Bit Rate: 398.3 bps

Power vs. Time

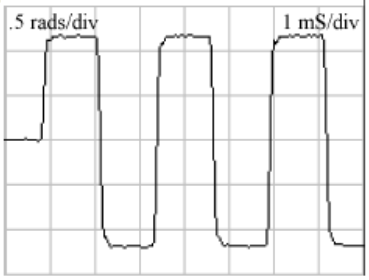


Spectrum

V1.11



Phase vs. Time



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Product Service

Beacon Test Report (Aliveness Test, In Salt Water)

Beacon Test Report

203C4D840EFFBFF

Organization:
Tested By:
Date: 13-Sep-07 2:27:34 PM
Tester Model/Serial No./File Name: BT100S/1025/00372-Hot-Salt3–1
Tester Cal Due Date: Nov 10, 2006
Tester Temperature: 33°C

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

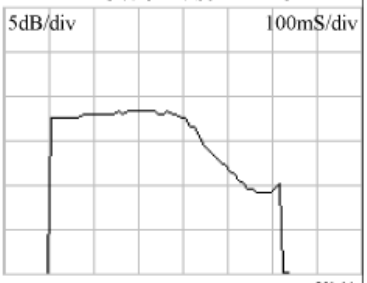
Notes: Add text comments here.

15 Hex ID: 203C4D840EFFBFF
Full Hex: FFFED0901E26C2077FDFFFCA6777
Burst Mode: Self Test Mode (Short)
Protocol: Standard Test Protocol
Country 257: Norway
Bits 41 - 64: 2540039

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

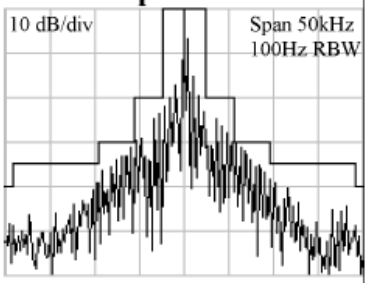
406 MHz Measurements
406 Frequency (INT REF): 406.0281 MHz
406 Power (INT ANT): 81%
Power Rise Time: < 5 ms
Phase Deviation: -1.19 +1.15 radians
Modulation Rise Time: 66 uS
Modulation Fall Time: 78 uS
Modulation Symmetry: 0.3%
Modulation Bit Rate: 398.3 bps
CW Preamble: 160.4 ms

Power vs. Time

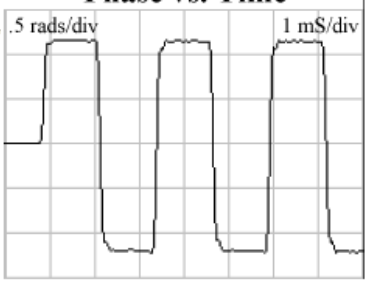


V1.11

Spectrum



Phase vs. Time



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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 S-VDR CAPSULE, Serial Number 00169

2.13.3 Date of Test and Modification State

19th to 28th August 2007 - Modification State 1

2.13.4 Test Equipment Used

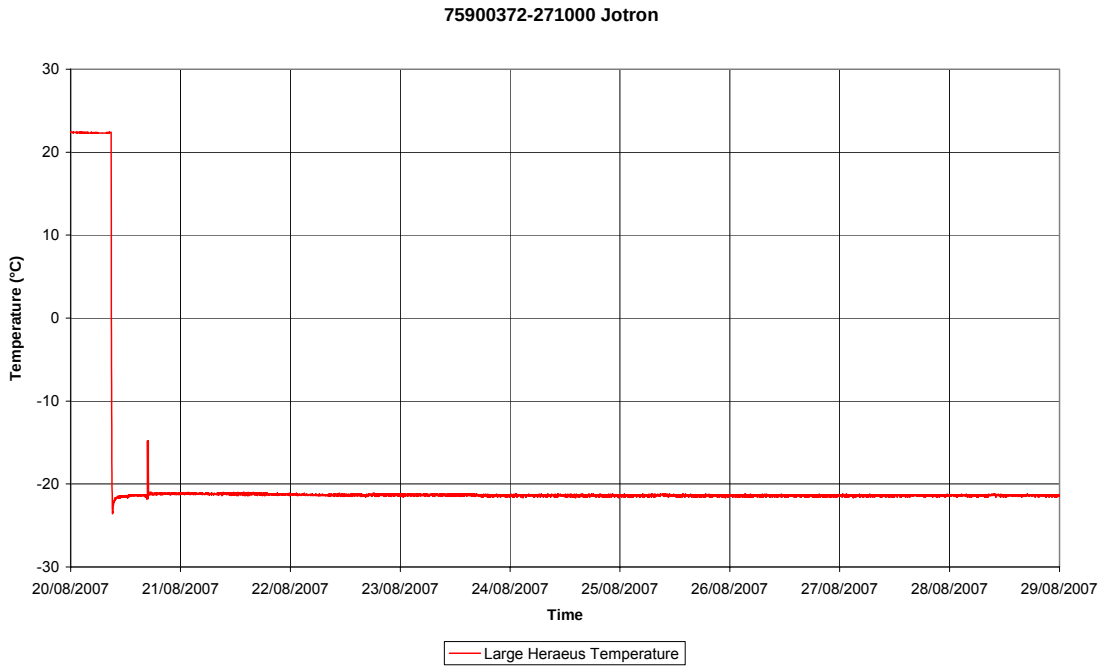
The major items of test equipment used for the above tests are identified in Section 3.1.

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	:	19.9 seconds	(19920 ms)
Operating Current	:	30 minutes	(1799920 ms)

Assumptions / Supplied Data

Battery Replacement Interval	: 5 years
Battery Capacity	: 52 Ah
Battery Self Drain	: 3.00 % per year
Self-test Interval	: 52 tests per year

Test Results

Mode Current	=	Accumulated Charge	/	Time	
Standby Current	=	13419472 pC	/	1799920 ms	= 7.46 nA
Self-test Current	=	1500252 uC	/	19920 ms	= 75.31 mA
Operating Current	=	221112934 uC	/	1799920 ms	= 122.85 mA

Battery Preconditioning / Discharge Time Calculations

Battery Self Drain = Capacity - [(100% - Self Drain/Year%)$^{\text{Replacement Interval}}$ x Capacity]
= 52- ((1- 0.0300)^{5} x 52) = 7.3458 Ah

Standby Drain = Hours per year x Battery Replacement Interval x Standby Current
= 365 x 24 x 5 x 7.46 x 10^{-9} = 0.0003 Ah

Self-test Drain = Self-tests per battery x Self-test Current x Self-test duration (in hours)
= 52 x 5 x 75.31 x 10^{-3} x (19.9 / 3600) = 0.1084 Ah

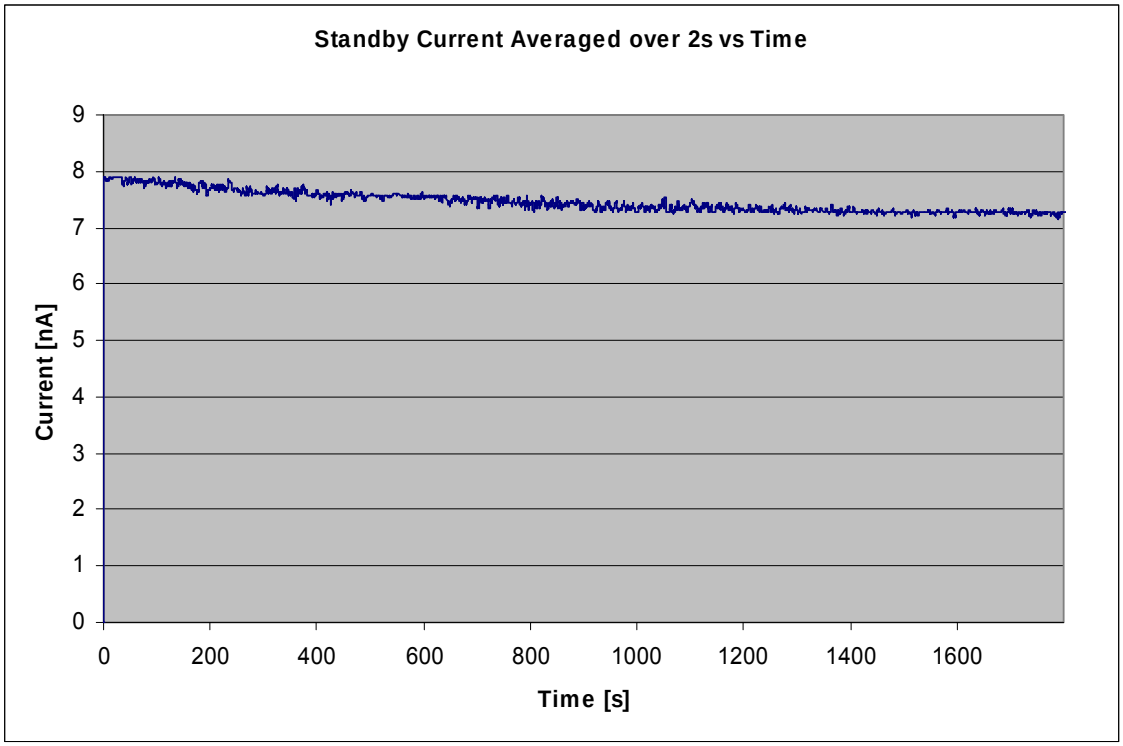
Total Drain = Self Drain + Standby Drain + Self-test Drain
= 7.3458 + 0.0003 + 0.1084 = 7.4545 Ah

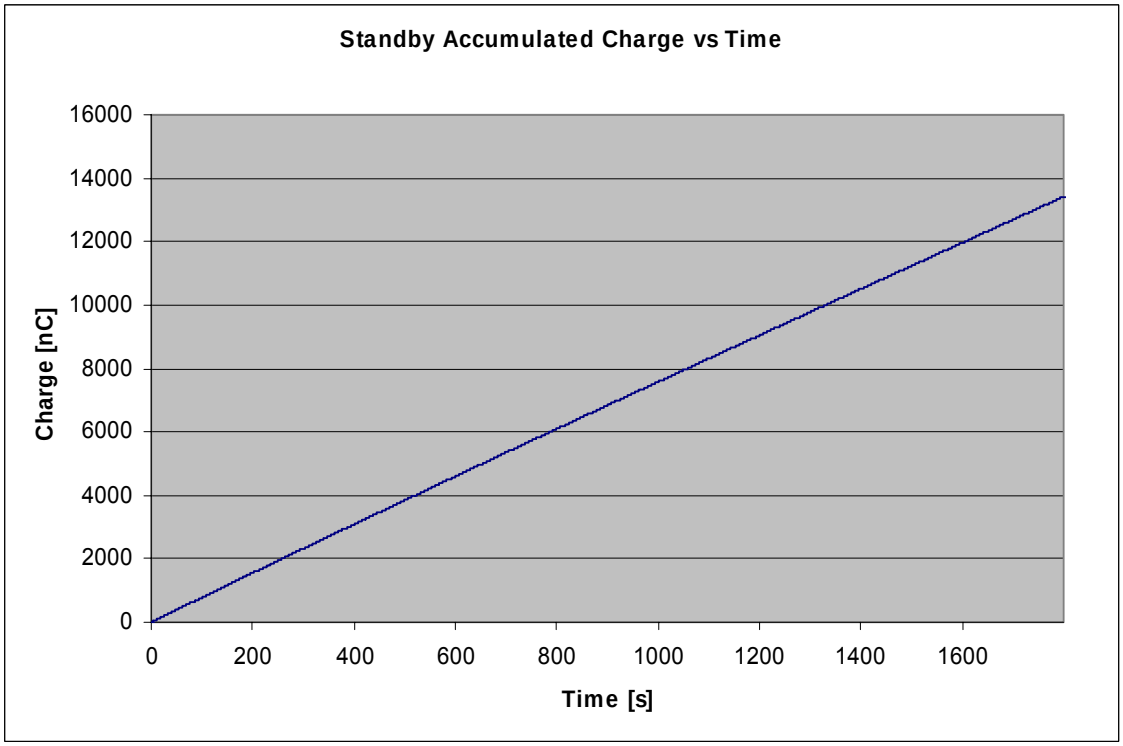
Battery Preconditioning / Discharge Time = Worst Case drain / Operational Current
= 7.4545 / (122.85 x 10^{-3})
= 60.68 hours

The battery was discharged prior to the test by operating the beacon for 61 hours 16 minutes (over tested by using the Cospas-Sarsat final result which includes a 'worst case' factor).

Product Service

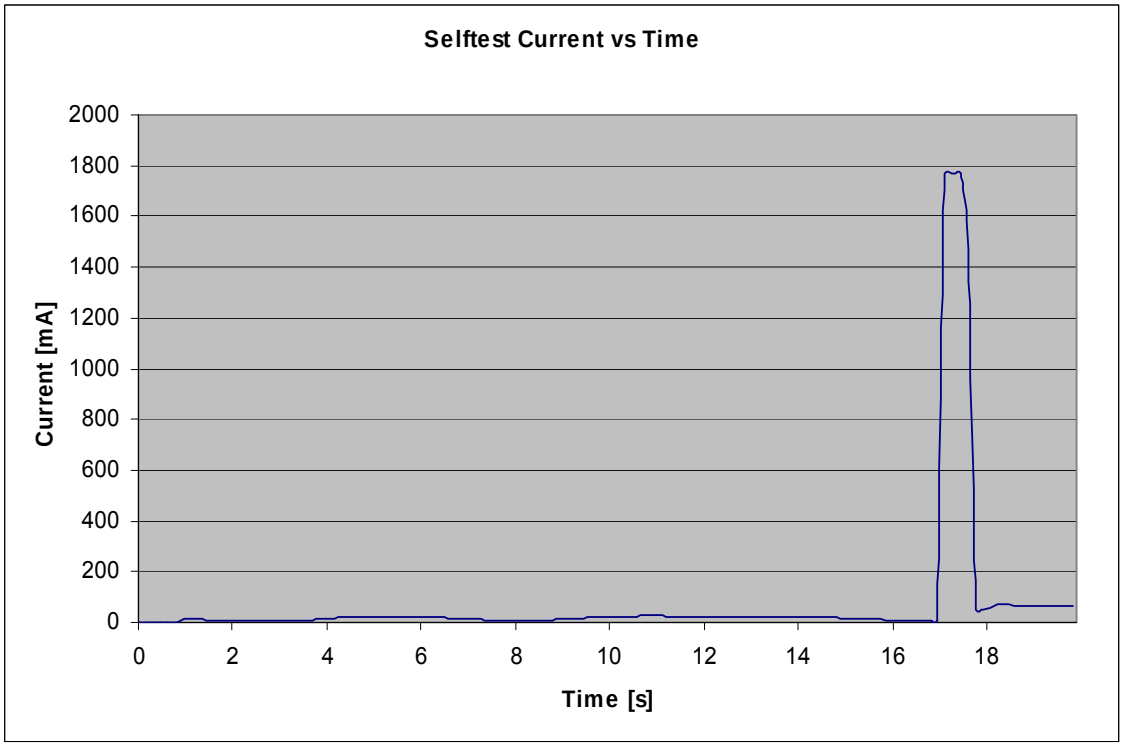
Battery Current Measurement Results (continued) - Standby Mode

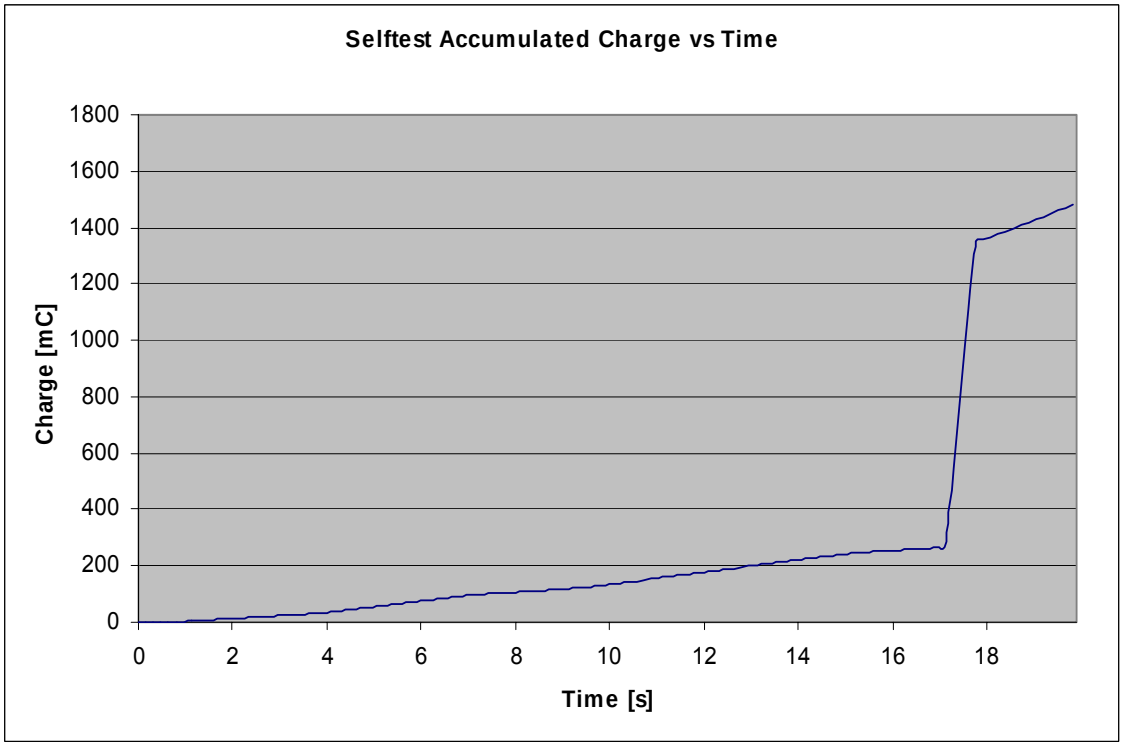




Product Service

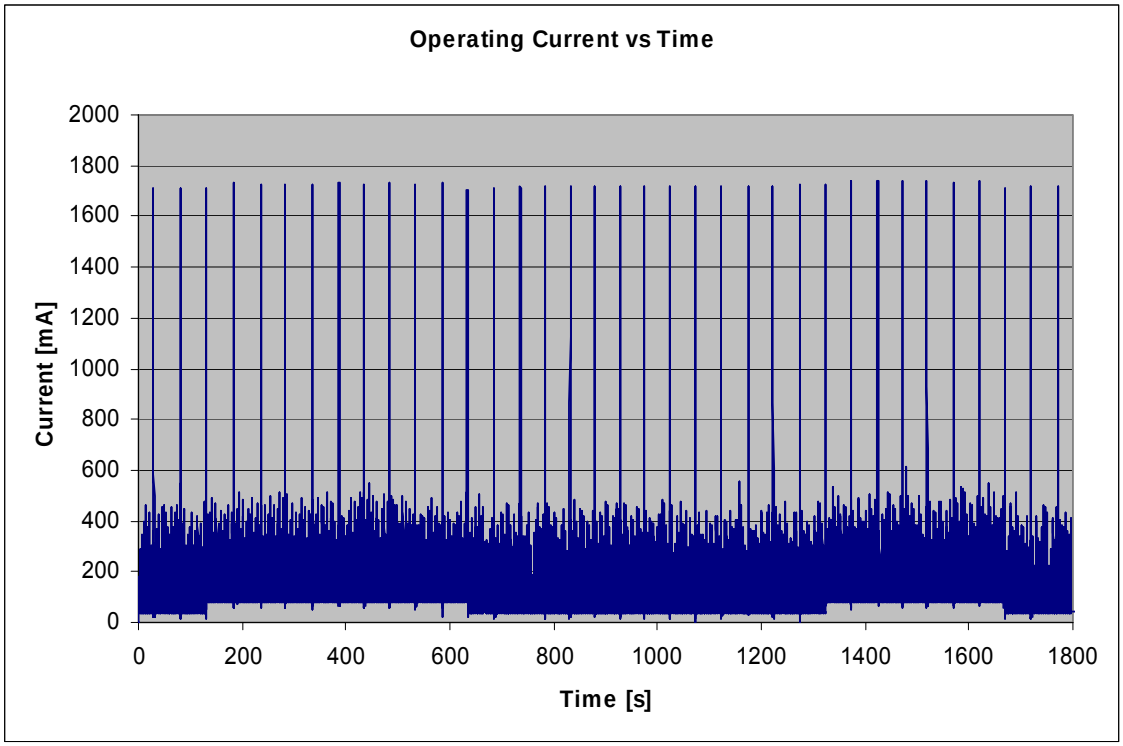
Battery Current Measurement Results (continued) - Self-test Mode

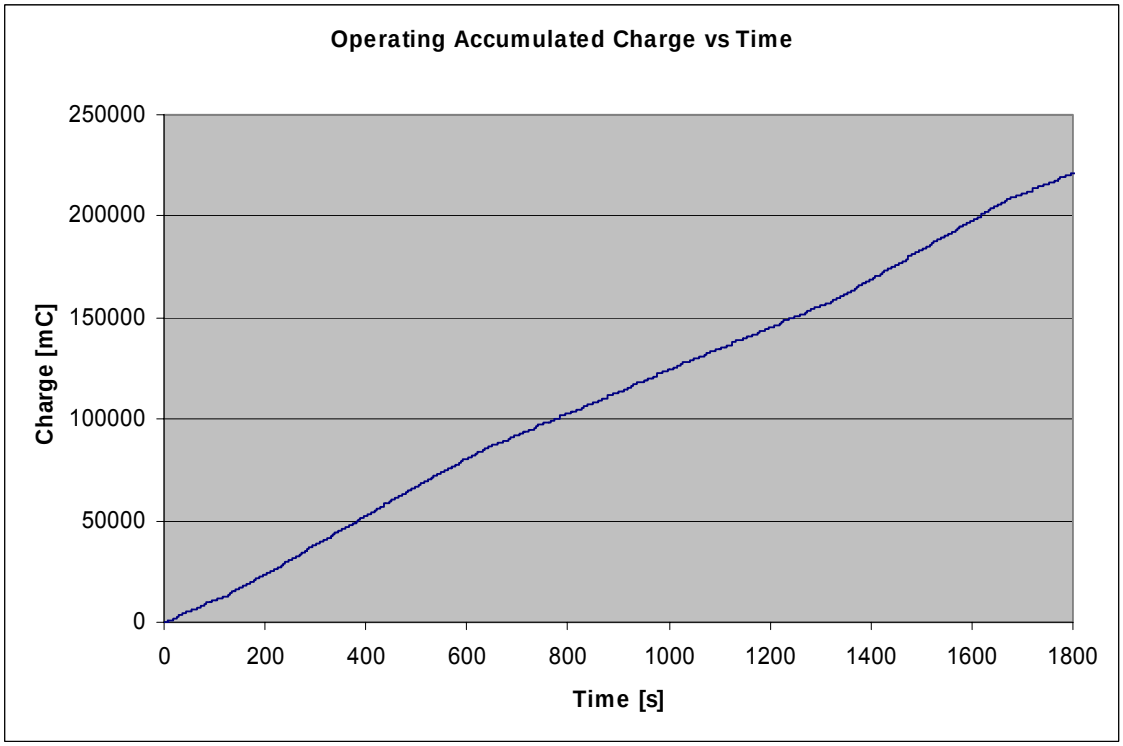




Product Service

Battery Current Measurement Results (continued) - Operational Mode



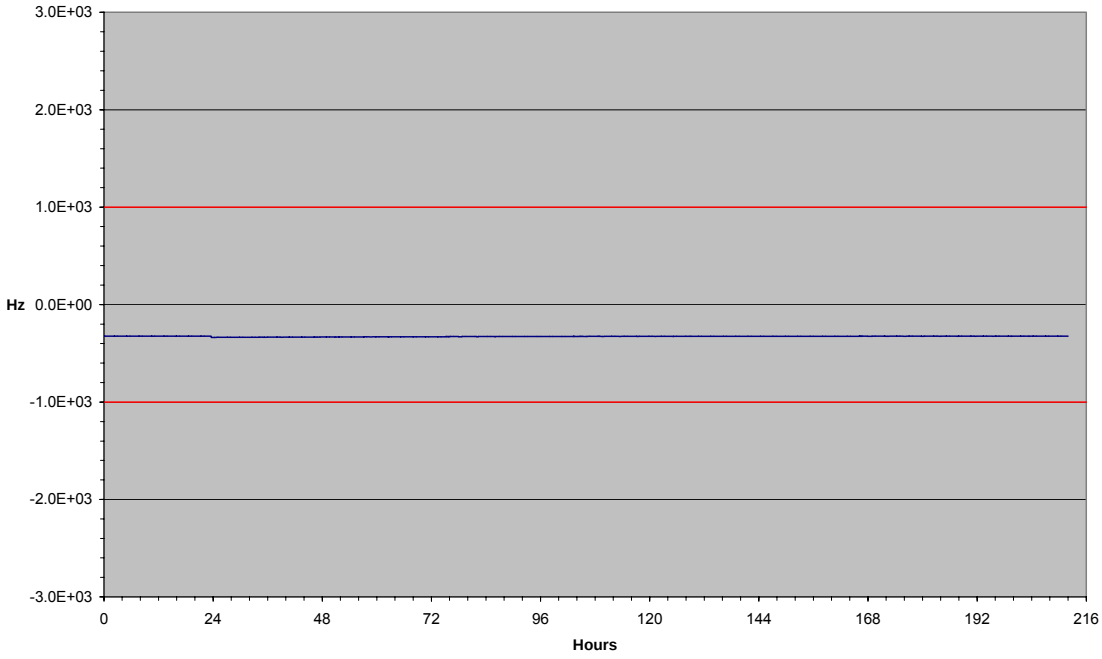


Product Service

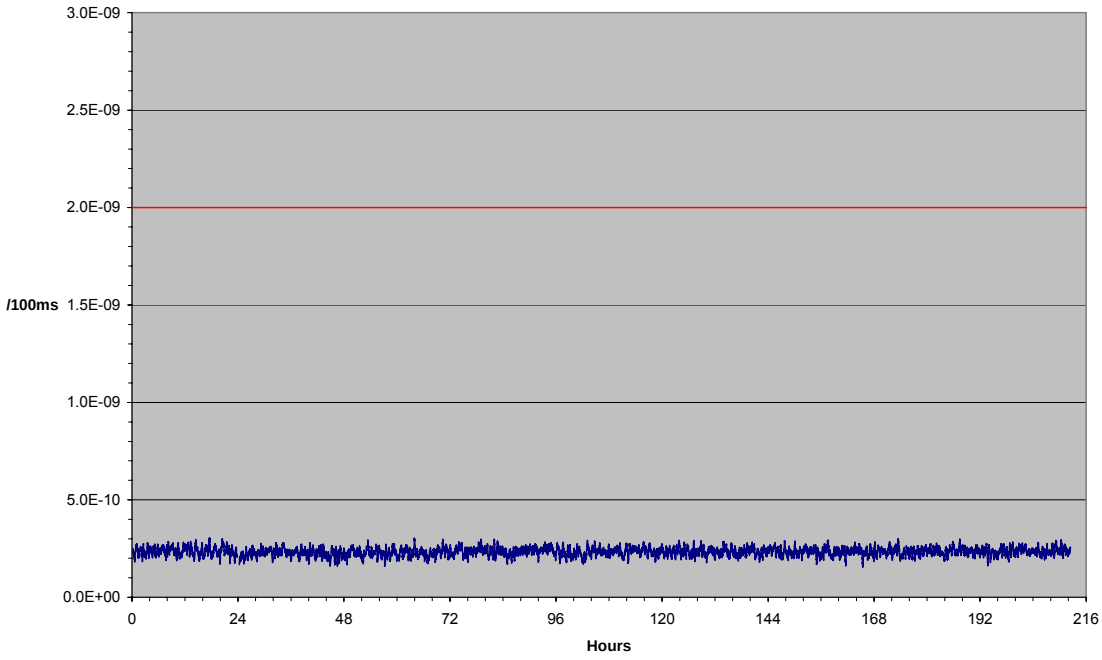
2.13.8 Test Results

406 MHz Test Results

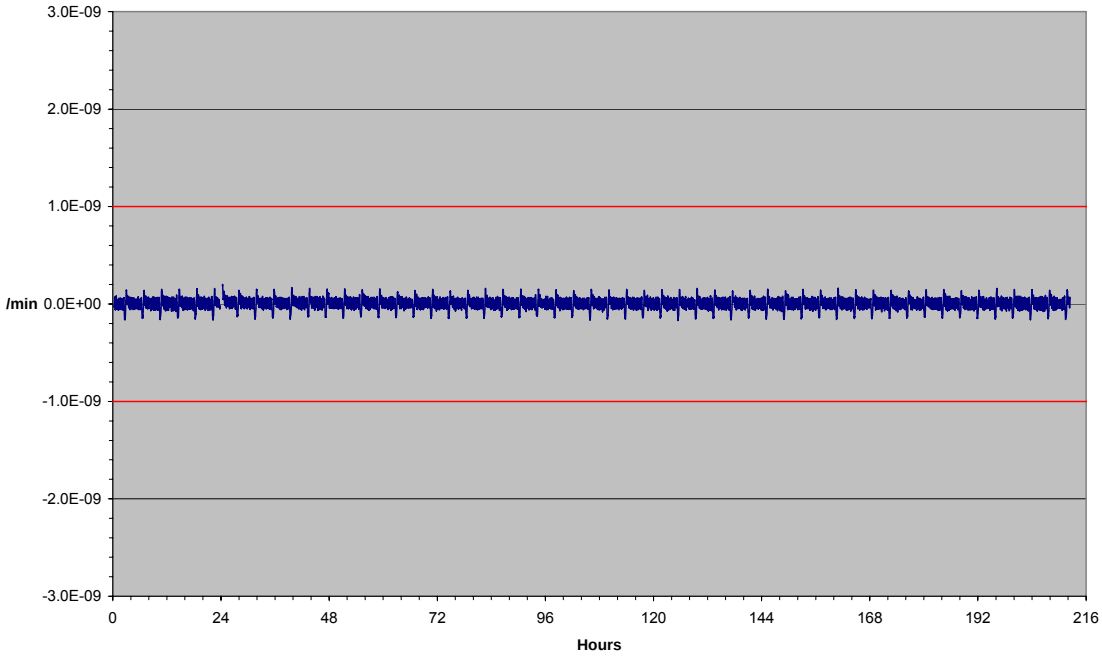
Note: During the test a power failure occurred after approximately 24 hours which resulted in a gap in the results of approximately 20 minutes. To offset this, and for confidence, the test ran for total of 212hours. However, final results were only taken across the first 168 hours (7 days).



Nominal Frequency Offset

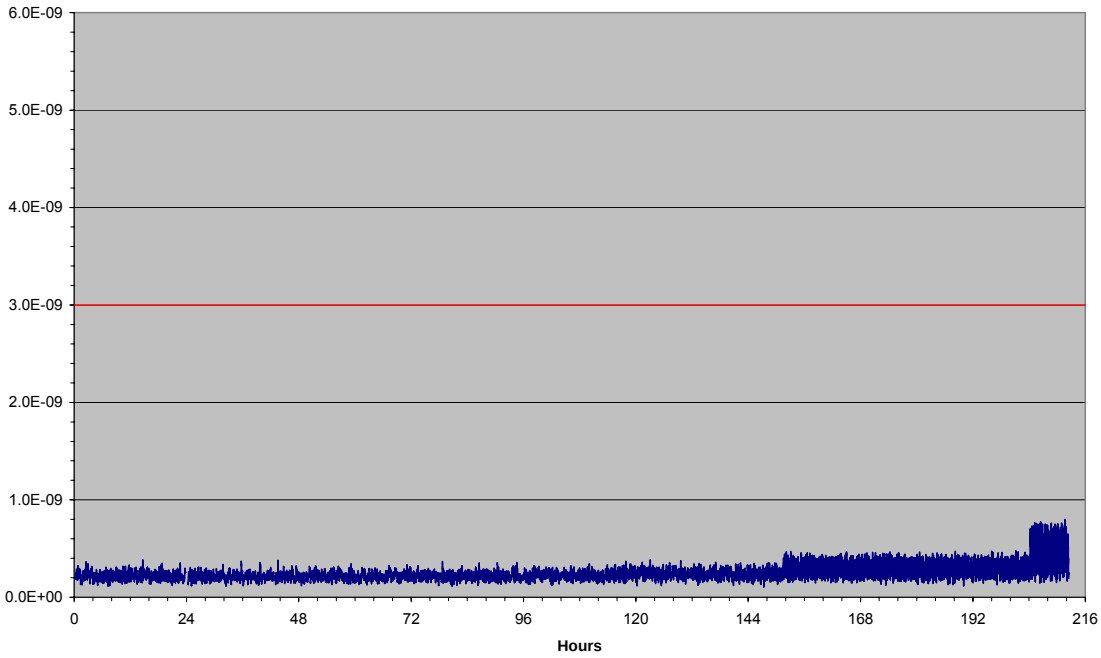


Short Term Stability

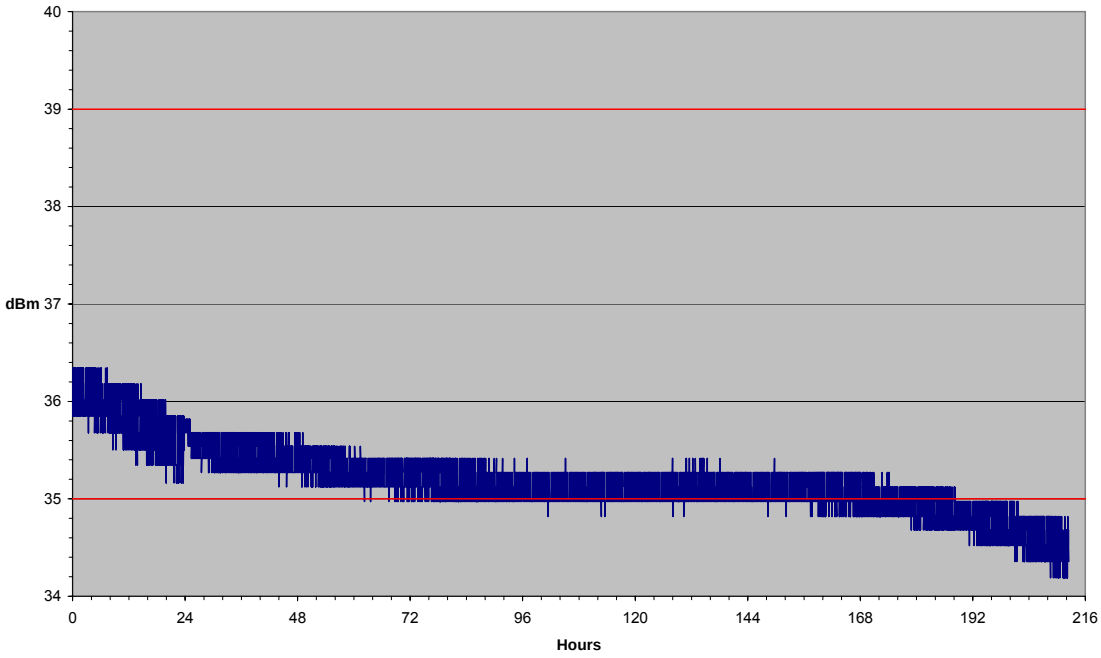


Medium Term Stability – Slope

Product Service



Medium Term Stability – Residual Frequency Variation



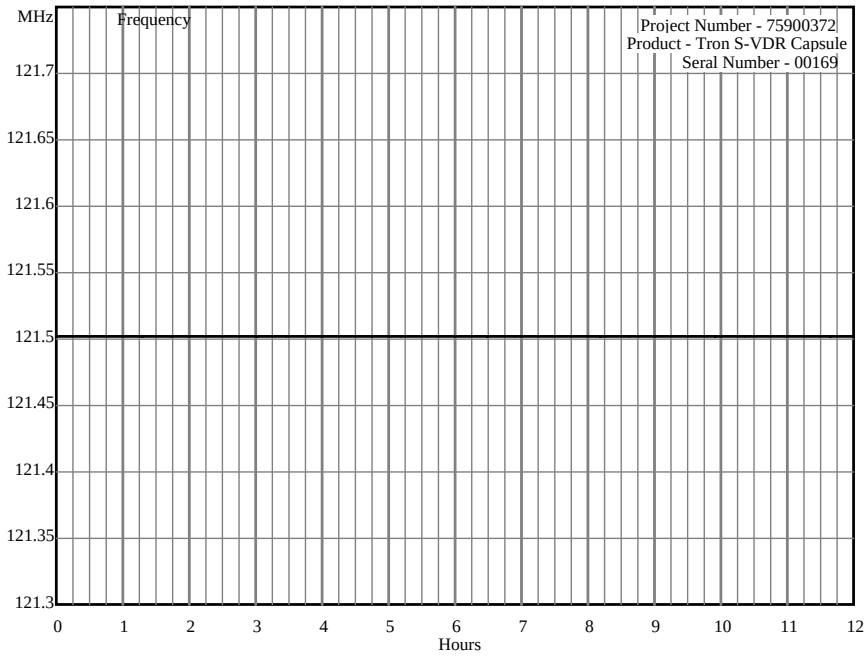
Output Power

Note: Measurement Uncertainty for Output Power results is 0.5dB; therefore, Time to First Failure (outside of MU), $t_{FF(MU)}$, is 201hours and 2 minutes.

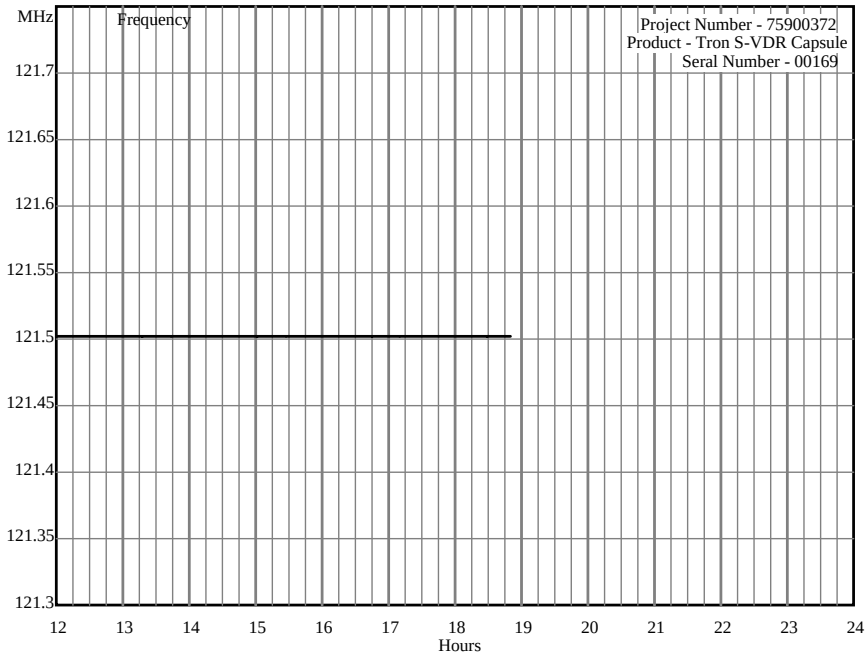
Product Service

121 MHz Test Results – Frequency

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



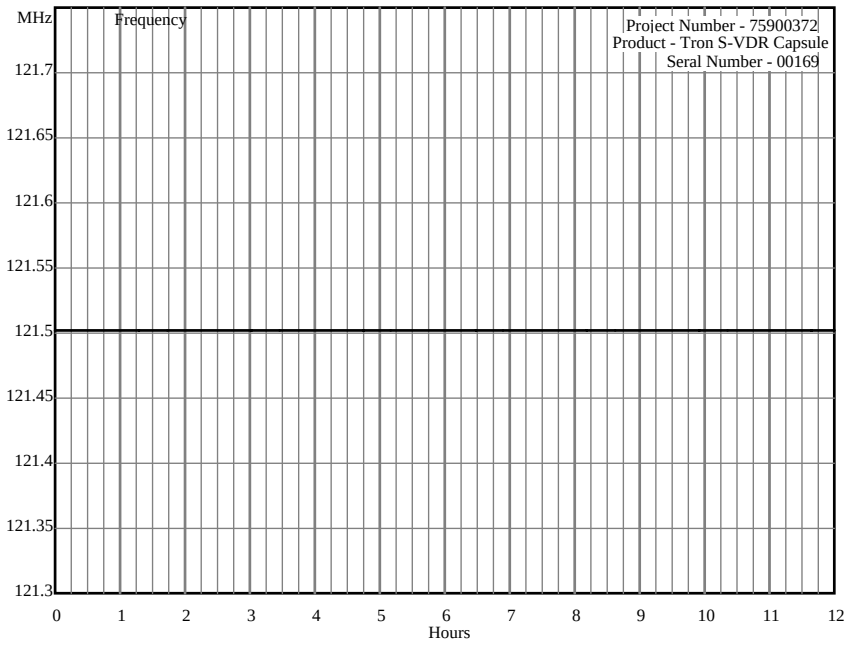
Frequency Graph 1



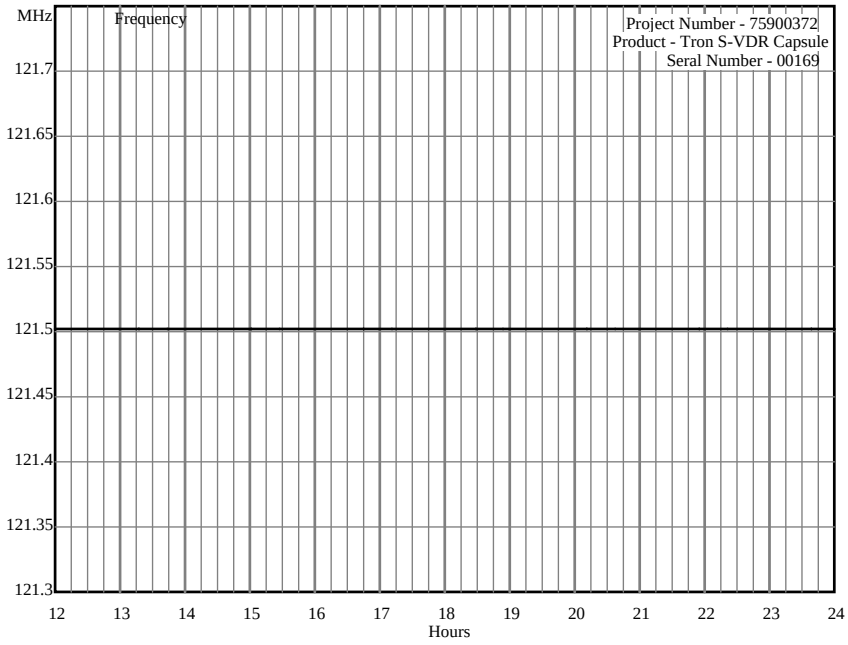
Frequency Graph 2

Note: Power interruption caused cessation of logging software. Restart thereof effectively zeros the counter. All time values henceforth are approximately 19hours slow.

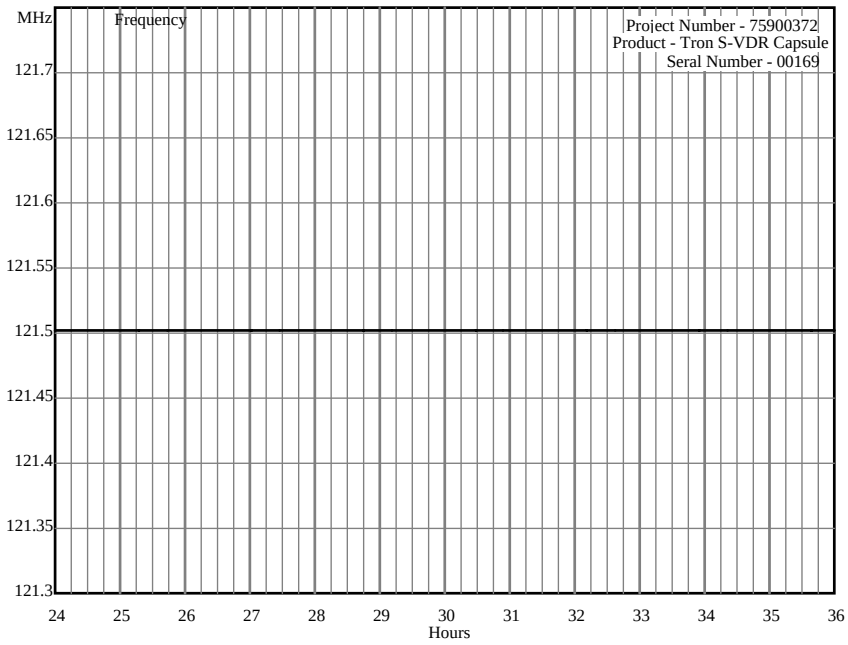
Product Service



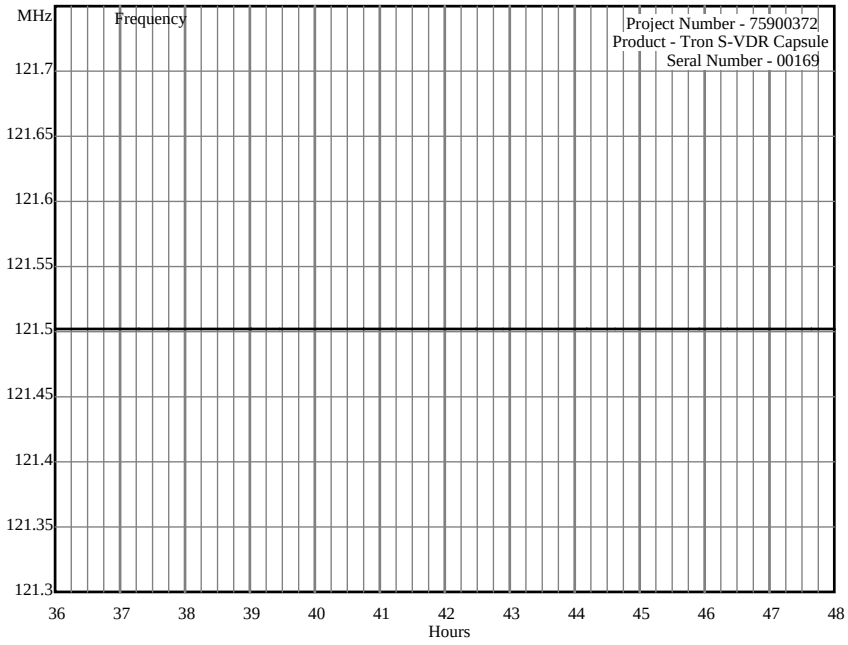
Frequency Graph 3



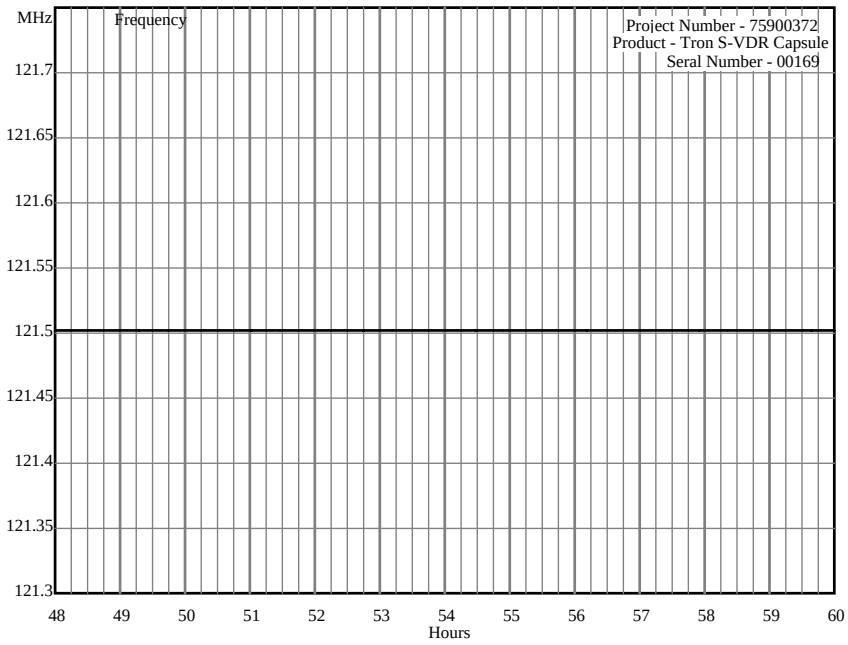
Frequency Graph 4



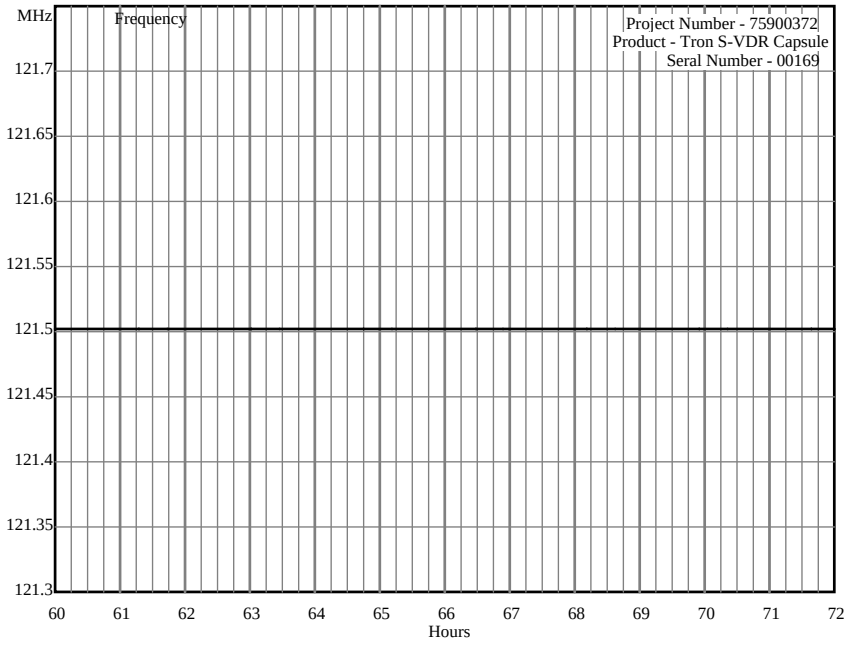
Frequency Graph 5



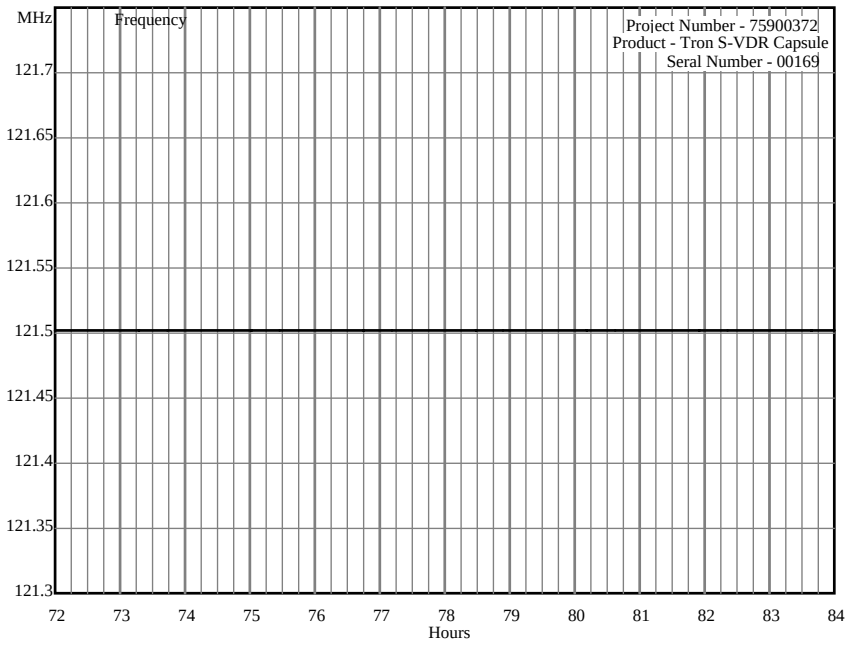
Frequency Graph 6



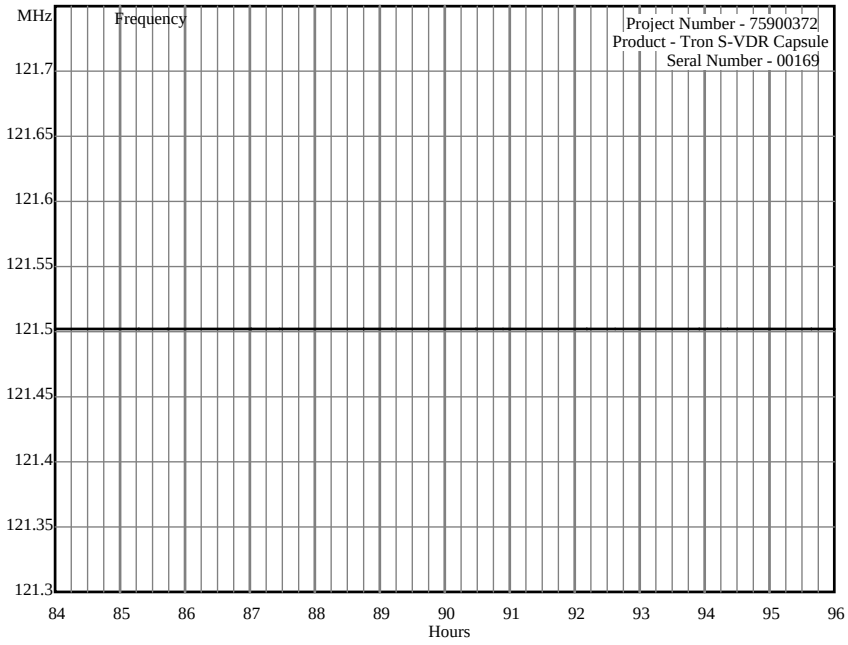
Frequency Graph 7



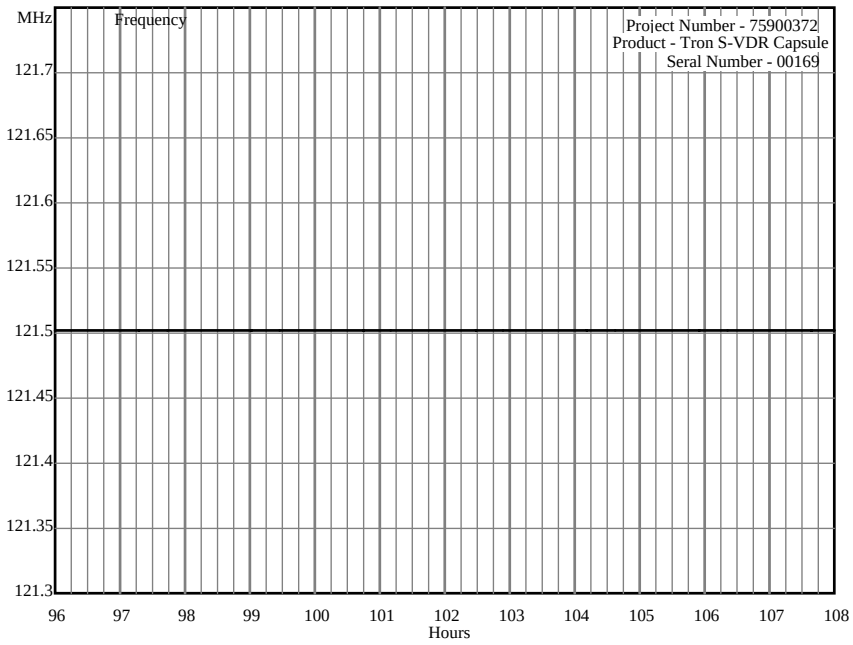
Frequency Graph 8



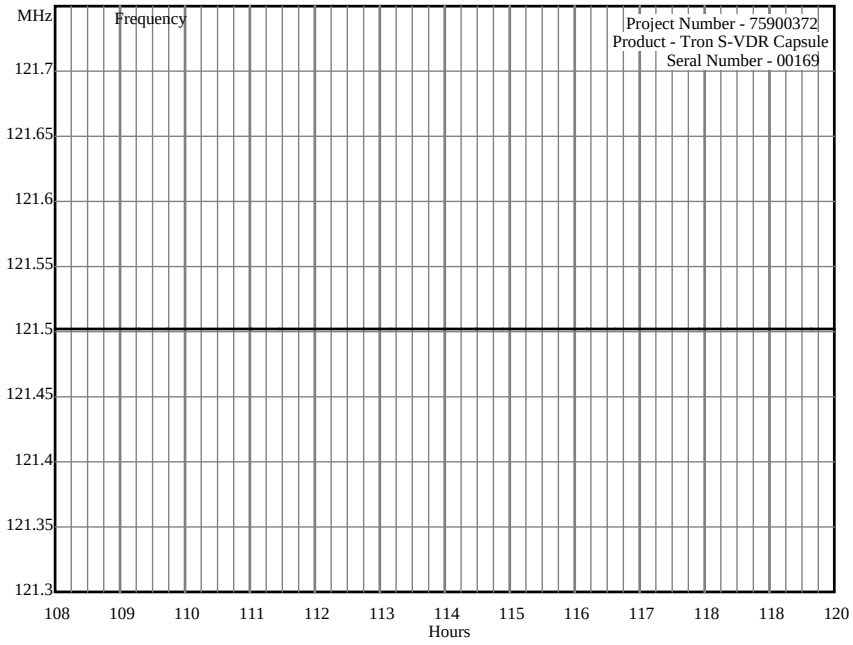
Frequency Graph 9



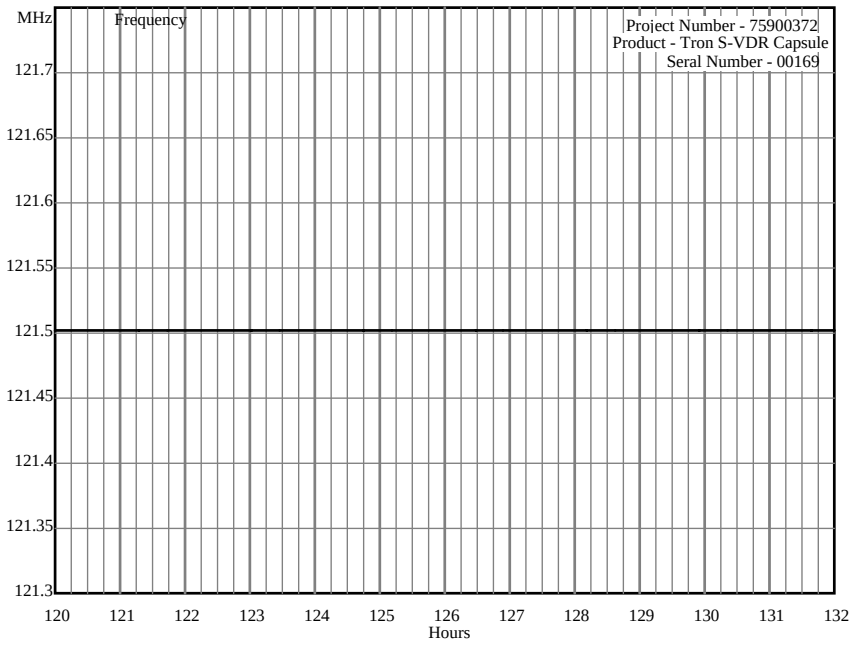
Frequency Graph 10



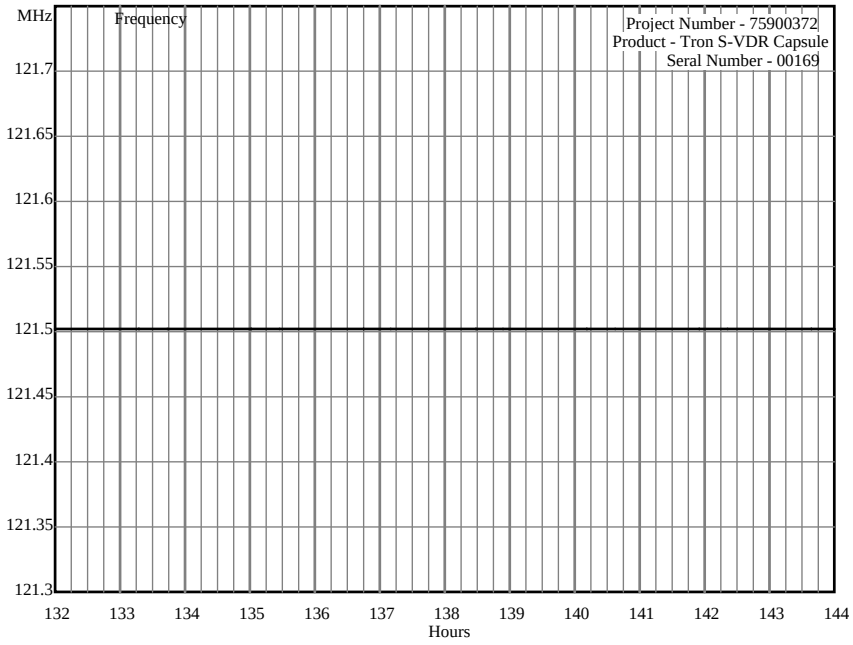
Frequency Graph 11



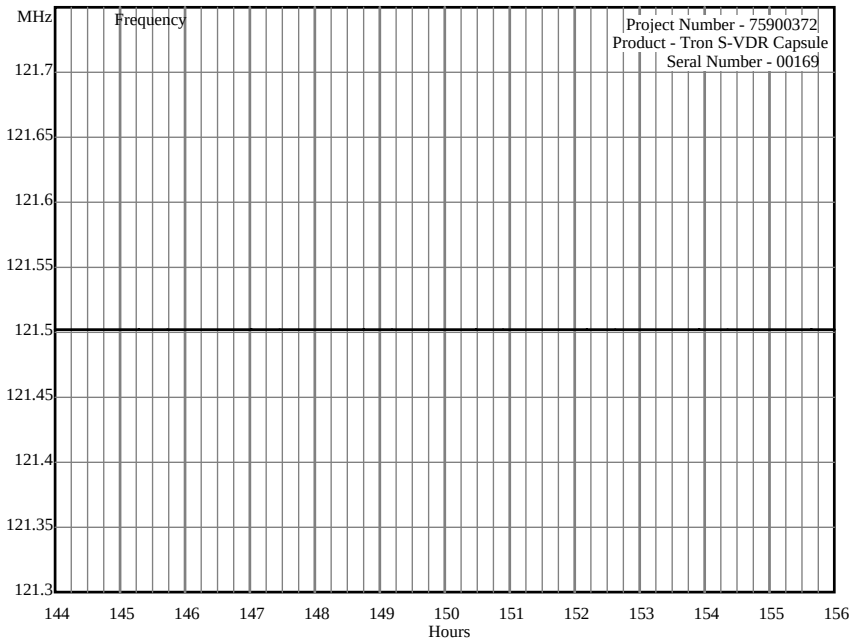
Frequency Graph 12



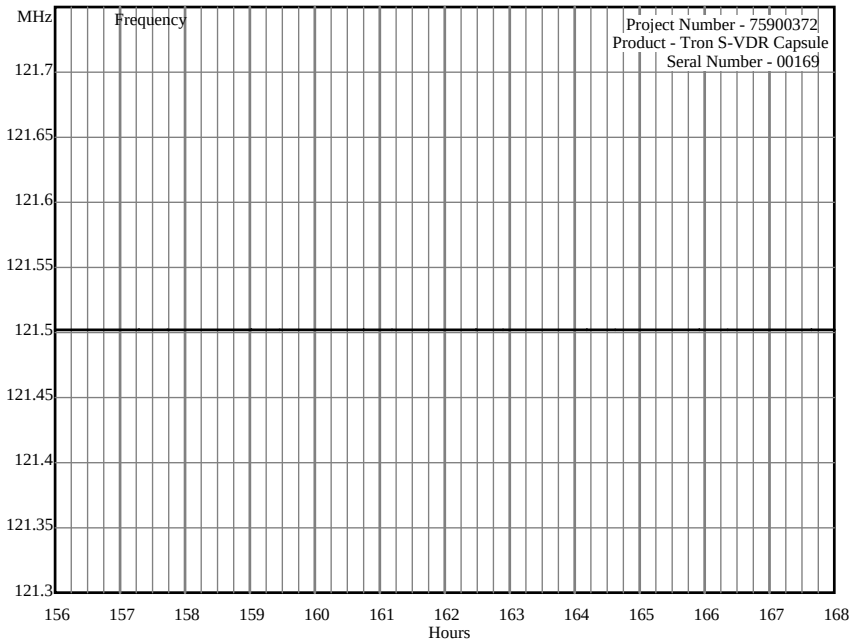
Frequency Graph 13



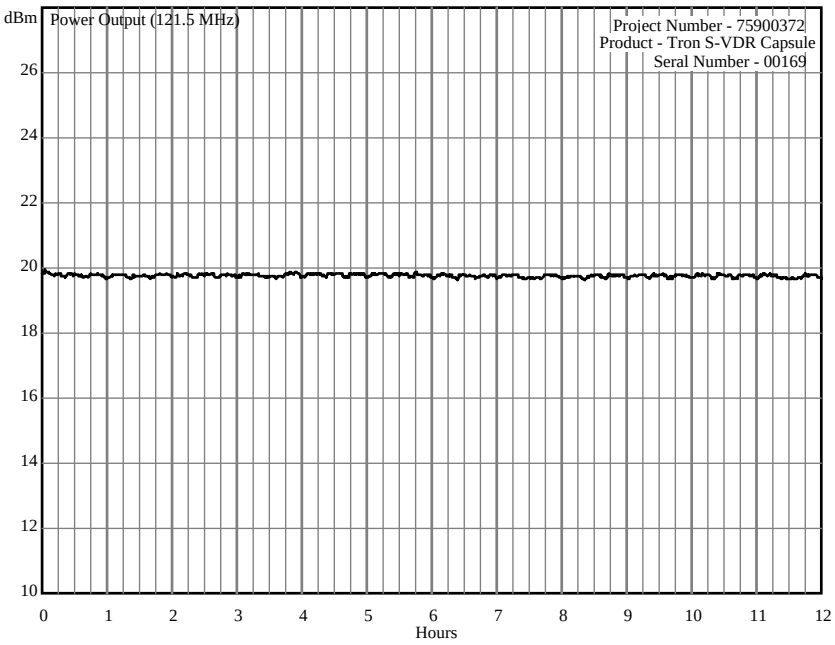
Frequency Graph 14



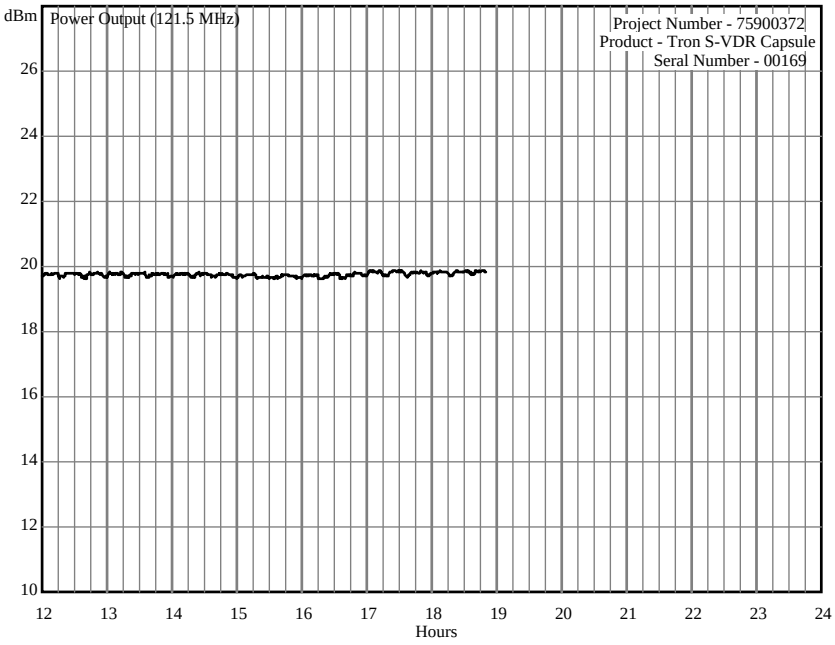
Frequency Graph 15



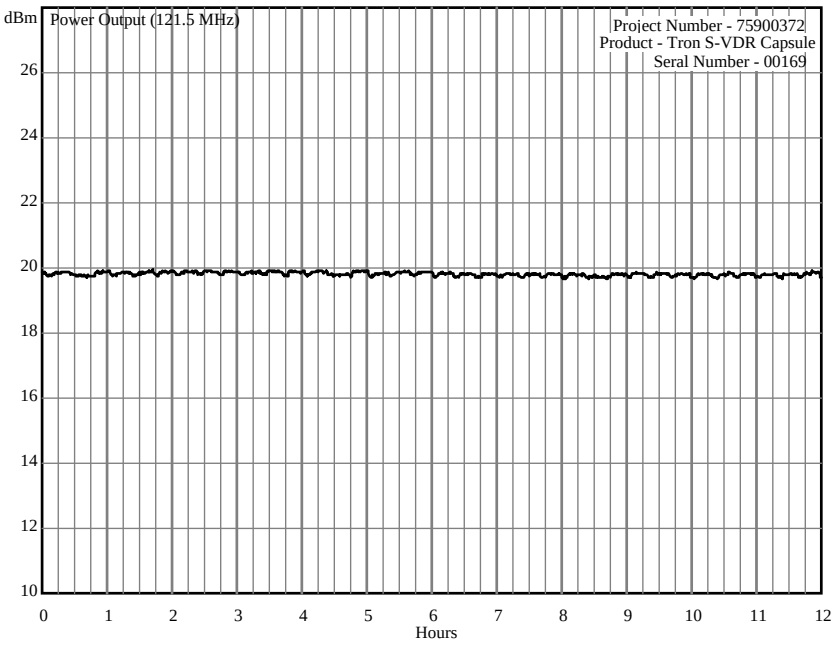
Frequency Graph 16



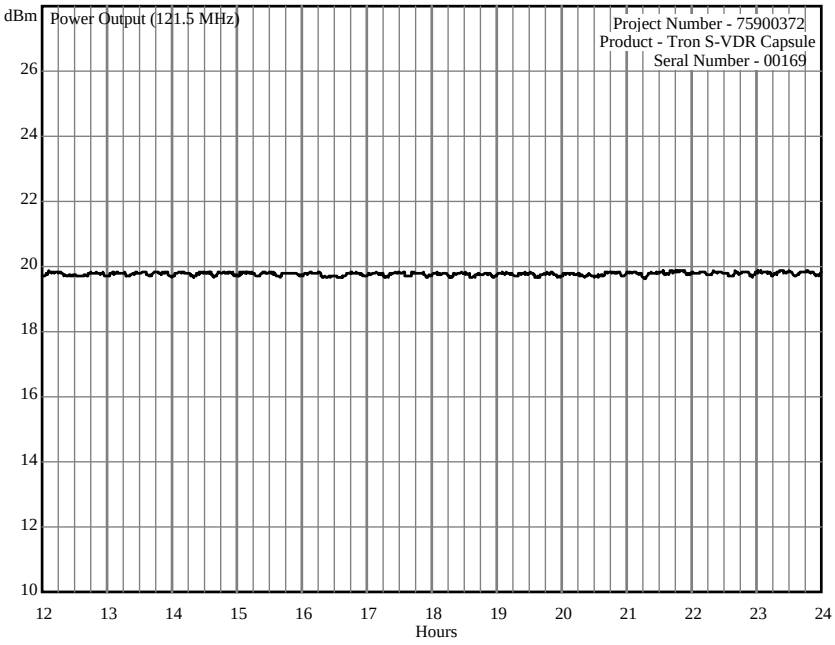
Power Graph 1



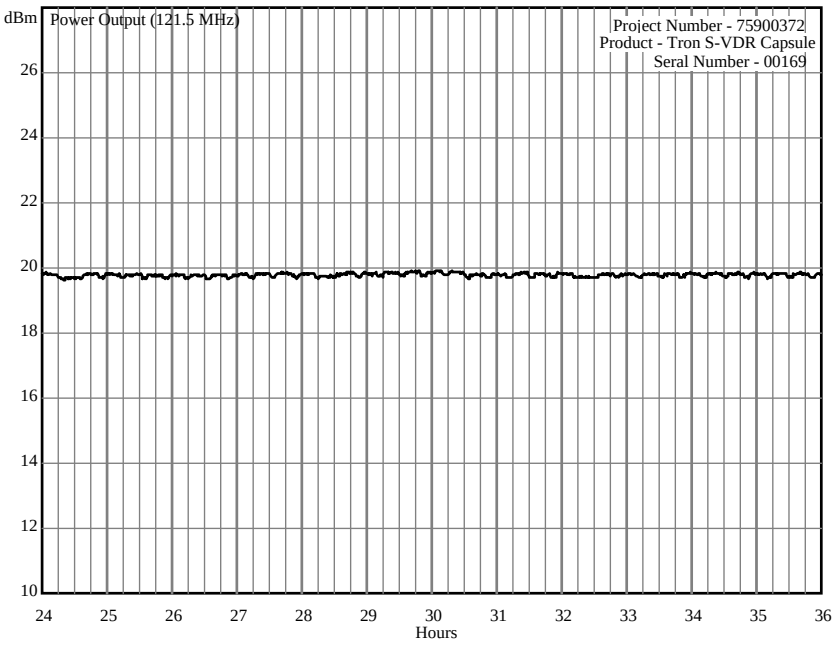
Power Graph 2



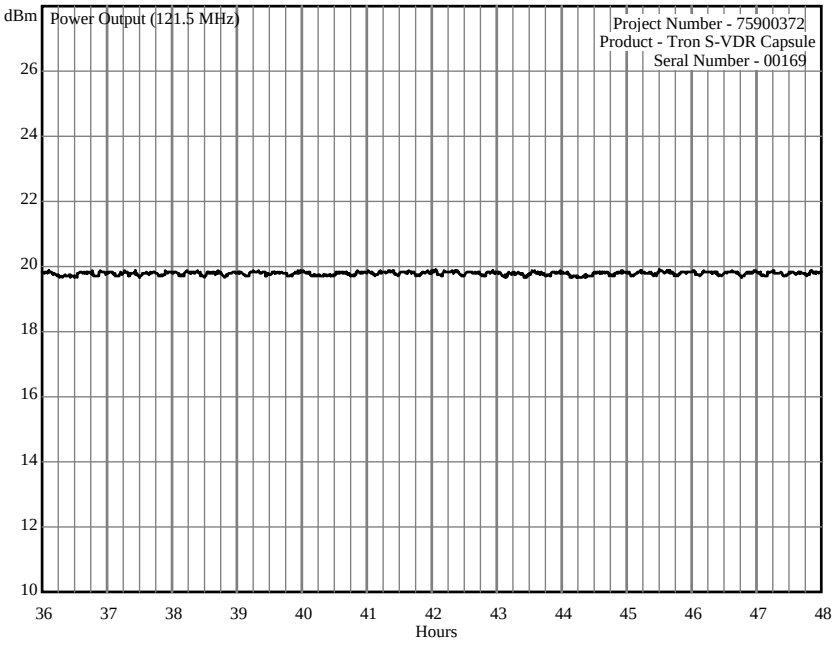
Power Graph 3



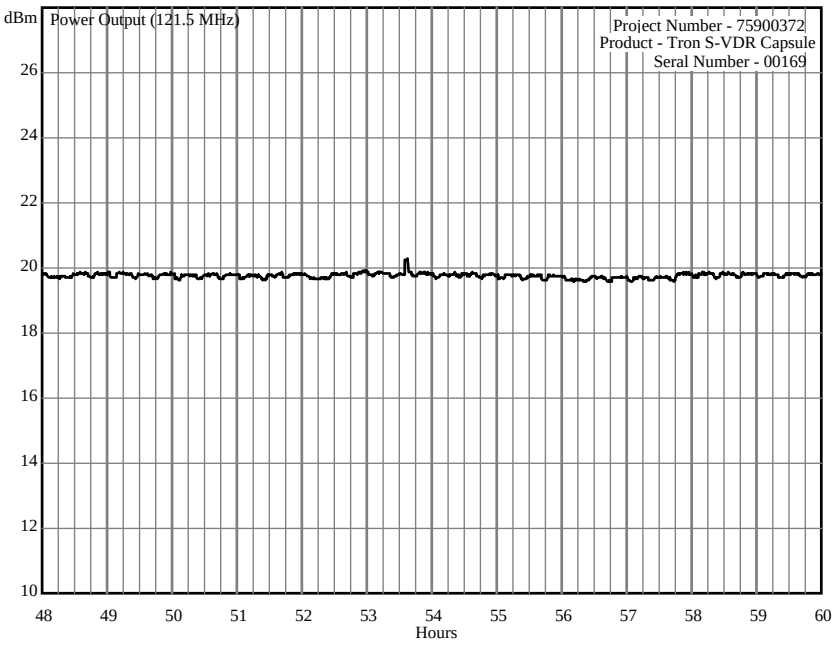
Power Graph 4



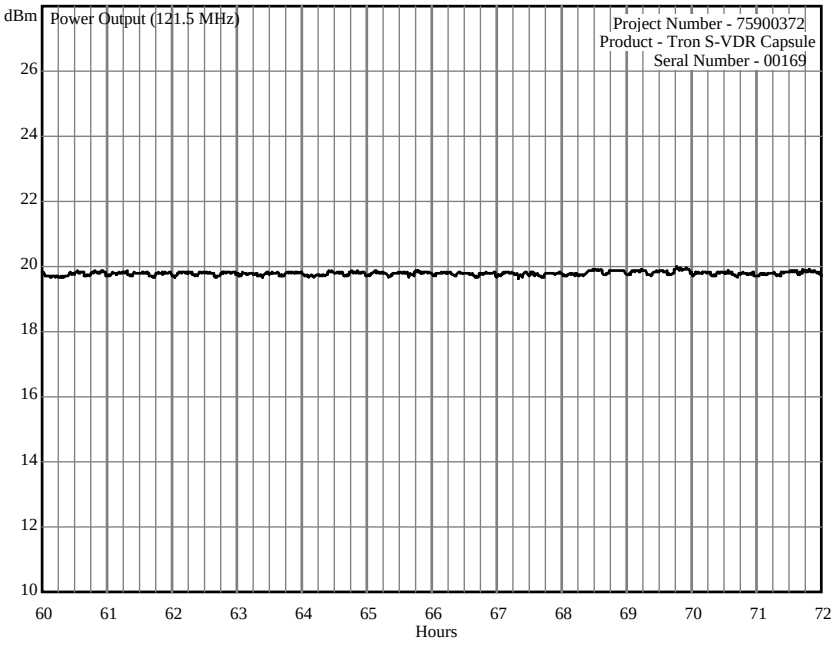
Power Graph 5



Power Graph 6



Power Graph 7



Power Graph 8